WHERE STEEL MEETS THE TRACK: EXAMINING THE FUNCTIONALITY OF REGULATORY POLICY IN THE CANADIAN GRAIN TRANSPORTATION SYSTEM

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ABSTRACT

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The last century has been an era of incredible advancements in grain production for Canada's agricultural sector. A large portion of the country's annual grain production is exported around the globe to a wide variety of international destinations. However, many of these exports originate from Western Canada – a fertile but land-locked portion of the country. This has left the grain handling and transportation system (GHTS) in Western Canada heavily reliant on rail transportation as a means of efficiently and cost-effectively moving product to tide water. With rapid modernization continuing to occur in both the production and grain handling sectors of the industry, it is important that the government policies regulating the transportation of Canadian grain by rail continue to best serve all the players involved in the face of a changing industry landscape.

The thesis explores three main policy measures currently used by the Canadian Transportation Agency (CTA) to regulate movements of grain by rail in Western Canada. These include the Maximum Revenue Entitlement (MRE), interswitching provisions, and Final Offer Arbitration (FOA). Discussion of these measures is augmented by the presentation of a game theory model to investigate current topics of debate related to interswitching regulations. The model is used to support an argument grounded in contestable market theory that using interswitching activity as a means of measuring the usefulness of interswitching provisions might be a poor metric. The model demonstrates that when a shipper's ability to call for an interswitch order is viewed by a railway as a viable threat, competitive outcomes can be achieved without an interswitch movement occurring.

Furthermore, the thesis also examines data obtained through experiments conducted with the Canadian Hub for Applied and Social Research (CHASR) to investigate aspects of the current FOA framework that could be optimized. A two-player game was designed and conducted with the help of 50 participants to investigate the effects of information asymmetry and variance in the length of FOA arbitrator rulings. Our findings underline the importance of minimizing information asymmetry amongst shippers and railways participating in the FOA process to ensure that the policy achieves its intended outcomes. Furthermore, trends in the data suggest that lengthening the period of time that an arbitrator's ruling is enforced may encourage even less extreme offers from the parties participating in the FOA process.

The thesis is intended as a means of better understanding the strengths and deficiencies of the current regulatory measures in place so that the industry is prepared for continued growth and advancement in the century ahead.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF EQUATIONS

LIST OF ABBREVIATIONS

CHASR – Canadian Hub for Applied and Social Research

CLR – Competitive Line Rate

CN – Canadian National Railway

CP – Canadian Pacific Railway

CTA – Canadian Transportation Agency

CWB – Canadian Wheat Board

FOA – Final Offer Arbitration

FOB – Free On Board

GATT - General Agreement on Tariffs and Trade

GHTS – Grain Handling and Transportation System

LHI – Long-haul Interswitching

MRE – Maximum Revenue Entitlement

STB – Surface Transportation Board

VRCPI - Volume-Related Composite Price Index

WGTA – Western Grain Transportation Act

Chapter 1: Introduction

1.0 Introduction

This thesis aims to provide insight into current rail regulation in Canada, specifically as it pertains to the transportation of grain by rail. I investigate three of the major policy measures that are intended to protect shippers of Canadian grain – the Maximum Revenue Entitlement (MRE), interswitching provisions, and Final Offer Arbitration (FOA). The thesis is divided into three major sections with a section devoted to each of the policy measures. The section on the MRE is comprised of a comprehensive discussion of the measure including its history, a detailed explanation of its mechanics, the impact that it has had on the Western Canadian grain transportation system, and adjustments that have been made to the policy measure since its inception. The next section focuses on the network access measure known as interswitching. The origins and an explanation of interswitching is provided along with a game theoretic assessment of how it works. The latter aims to demonstrate how interswitching can function as a successful competitive access measure without a shipper necessarily having to physically engage in interswitching activity. The final section discusses final offer arbitration with the presentation of novel experimental research. This economic experiment investigates some of the shortcomings associated with current FOA regulations, as identified through on-going criticisms levelled by Canadian rail shippers. Repeated experiments were designed to test how individuals would react to various modifications to the extant FOA rules. These results are summarized and assessed with respect to potential improvements in FOA as used in Canadian transportation. Since the thesis covers a range of topics and original research, it is intended to familiarize the reader with the evolving state of grain transportation policy in Canada as well as highlight areas where current regulations could benefit from further research.

1.1 A Brief History of Rail Regulation in Canada

The history of federal regulation of grain transportation by rail in Canada dates back to the 19th century. The first form of federal rate regulation governing the transportation of grain by rail came in 1897 with the signing of the Crow's Nest Pass Agreement between the Canadian Pacific Railway (CP) and the Government of Canada (Bennett, 2017). The agreement, which after being signed passed into legislation as the *Crow's Nest Pass Agreement Act*, would go on to have a

tremendous influence on rail regulation in Western Canada for many years to come. While the Crow's Nest Pass Agreement would be the mechanism that would first impose federal transportation rate legislation on Canadian grain rail movements, as Bennett (2017), Swanson and Venema (2006) and others note, regulating transportation prices was not necessarily the primary motivator behind this legislation. Rather, the agreement's primary purpose was to arrange a contract of sorts between the federal government and Canadian Pacific Railway whereby the railway would complete a railway line from Lethbridge, Alberta to the coal fields in the Kootenay region of British Columbia and the government would reciprocate with a cash subsidy of $11,000 per mile of constructed rail line. However, another condition required in the agreement was a reduction in the rates that the railway was charging at the time for eastbound grain and flour, as well as a reduction in the rates being charged on a specific list of westbound merchandise ranging from agricultural implements to coal oil (Library and Archives Canada, 2017). Importantly, the agreement made no provision for any adjustments to be made to the prescribed rates to correspond with changes in inflation or cost increases and essentially set a rate for movements of the regulated goods going forward in perpetuity. As Swanson and Venema (2006) note, this did not inflict any real hardship on the railway initially as freight rates generally decreased up until the beginning of World War I. However, this situation would soon be drastically altered with the changing economic environment that World War I would bring to Canada.

The turn of the century saw further introduction of regulation governing the railways in Canada. In 1903, the Government of Canada passed *The Railway Act*, a substantial act that contained many important elements that would shape Canadian rail regulation going forward. One such element was the formation of the country's first national independent regulatory agency - the Canadian Board of Railway Commissioners (Benedickson, 1991). As Benedickson notes, the Board of Railway Commissioners was created, in part, to create a suitable avenue for shippers to bring complaints against carriers rather than the previous options of either bringing disputes before the courts or else the Railway Committee of the Privy Council. While the concept of an independent regulatory agency was novel in the Canadian setting, it was, in fact, simply following a precedent already set in the United States in 1887 when the Interstate Commerce Commission was formed (Benedickson, 1991). While this paper will not explore all of the facets of the historic Board of Railway Commissioners, it is brought up due to its important role in eventually paving the way for the Canadian Transportation Agency (CTA), Canada's current independent regulatory

agency that still carries on many of the same duties of the Board of Railway Commissioners (Padova, 2015). Another important piece of *The Railway Act* was its requirement that railways provide adequate and suitable service and accommodation for all shippers due to their designation as common carriers (Padova, 2015).

While the Crow's Nest Pass Agreement did not pose a significant challenge to Canadian Pacific Railway's operations immediately after the signing, the arrival of World War I in 1914 would. As Swanson and Venema (2006) note, the arrival of the war brought with it significant inflationary pressures as the price of labor and other inputs rose substantially. In order to avoid railway insolvency and keep grain moving, the federal government introduced *The War Measures Act* in 1919 which removed the Crow Rate temporarily. However, as Bennett (2017) states, by 1922 the Crow Rate was reintroduced and in 1925, its reach was expanded even further. The 1925 amendment meant that now, the Crow Rates on grain and flour movements would apply to all railways and all delivery points in the Prairies, something Bennett (2017) states was largely a political move driven to win support in the West in the midst of a post-war economic downturn in the region. A further amendment was also invoked in 1927 that saw the Crow Rate extend to also apply to grain shipments movements being shipped through the West Coast as the grain export channel began to diversify away from only flowing to the East through Thunder Bay (Swanson and Venema, 2006).

After the amendments in the mid-1920's, the Crow Rate would remain virtually unchanged for 60 years, save for an expansion in the crops covered under the rate. Specifically, the Crow Rate was extended to apply to crops such as rapeseed, flax, and pulses that were increasing in acreage on the Prairies (Bennett, 2017). However, as shippers continued to benefit from the unchanging statutory rate, the railways began to suffer as wartime price controls were lifted in 1946 and their operating costs began to rise (Bennett, 2017). This situation was not going unnoticed. The Canadian government convened the Turgeon Commission in 1949 and later, the MacPherson Commission in 1959 to study the issue (Bennett, 2017). The MacPherson Commission estimated railway losses of $22.3 million in 1961, resulting in the recommendation that the railways should be compensated for their losses. However, due to the political environment of the day, namely a minority government facing pressure from their opposition, no government action was taken at that time (Bennett, 2017).

The financial reality facing the railways continued to deteriorate and by 1977, rising inflation paired with the unchanging legislated grain transportation rate meant that the only 32% of the railroads' variable costs were being covered by the freight rates that users were paying (Khakbazan and Gray, 1999). As Norrie (1983) notes, this shockingly low figure was calculated by economist Carl Snavely in a 500-page report on the Crow rate prepared for the Canadian government. The report exposed the crucial implications of keeping grain freight rates frozen at 1897 levels. While shippers had enjoyed this extended period of discounted rates, a deterioration in the state of the grain handling and transportation system had occurred due to the railways' refusal to reinvest adequate capital into the infrastructure of the system (Bennett, 2017). Underinvestment in the transportation and handling system began to become especially apparent with the opening of new markets for Canadian wheat in China and the Soviet Union (Swanson and Venema, 2006). Due to increasing livestock herds and a series of droughts in the Soviet Union, an explosion in demand for Canadian grain ensued through the late 1960's and early 1970's (Morgan, 1979). By 1973 there was over $1.5 billion worth of Canadian grain being exported to the Soviet Union and the grain handling and transportation system was being strained to its limits (Jenish, 2009). Klein and Kerr (1996) estimated that due to the perpetual under-investment in Canada's grain handling system as a result of the Crow Rate, over $1 billion worth of export grain sales were either lost or deferred throughout the 1970's. However, Bennett (2017) notes that while it was becoming clear that the Crow Rate was increasingly hindering the efficiency and capacity of the Canadian grain handling system, there remained intense support amongst many stakeholders on the Prairies to retain the Crow Rate. As a result, the government turned to other alternatives in their attempt to rectify the situation.

Beginning in 1972, the federal government began purchasing rail cars as a method of investing in the rail transportation system. Over a 14-year span the federal government purchased 14,000 hopper cars while the Canadian Wheat Board (CWB) and the provincial governments of Saskatchewan and Alberta combined to purchase an additional 6,000 (Bennett, 2017). In addition, the federal government further invested in the system by repairing railway branch lines to keep them operational (Swanson and Venema, 2006). However, despite outside support, railways were continuing to struggle. The 1977 Snavely report found that the railway shortfalls were increasing at a rate of 15.5 percent per year and were projected to reach $1 billion by 1990 (Bennett, 2017).

It would take until 1983, however, for the federal government to finally pass the first piece of legislation that would mark the beginning of the end of the Crow Rate.

The legislation that first began the government's move away from the Crow Rate came in the form of the *Western Grain Transportation Act* (WGTA) which was brought into law in 1983. While the new legislation did not necessarily end the premise of the Crow rate, it did begin a shift away from the era and specifically, it replaced the ad-hoc government subsidies to the railways with a formal method of determining railway subsidies while increasing the share of transportation costs that grain shippers were paying (Bennett, 2017). When the WGTA was first passed, the subsidy to the railways, known as the Crow benefit, was originally set at $658 million in order to compensate the railways for their revenue shortfalls in the face of the legislated rates (Doan et al., 2006). However, as Swanson and Venema (2006) note, soon after the WGTA was passed, there were already calls for it to be modified. However, none of the proposals put forth in government ended up being adopted and by 1995, the WGTA was simply repealed instead as the government moved to end the century-old policy tool (Bennett, 2017). As Doan et al. (2006) note, the removal of the subsidy was expected to lead to a decline in land values, due to the fact that the effective subsidy that grain farmers had been receiving through artificially low transportation rates had been capitalized into the price of their land. In order to counter-act this, as part of the repeal of the WGTA the government also issued a one-time cash payment to Prairie farmers of $1.6 billion.

Justice Willard Estey was commissioned in 1997 to conduct a comprehensive review of Canada's grain handling and transportation system in order to provide recommendations regarding how the government should move forward with grain transportation policy (Nolan and Kerr, 2012). Justice Estey made a number of recommendations in his review, one of which was to remove the rate caps that had been in place since the repeal of the WGTA. While Estey's calls for the removal of the rate caps were heeded, they were replaced with a revenue cap that was meant to allow the railways greater freedom in their pricing strategies while also protecting shippers. The revenue cap will be discussed in greater detail in the section regarding current Canadian rail policy.

Detailed discussion of more recent developments in Canadian rail regulation takes place in the sections that follow. However, an overarching objective that has influenced changes to Canada's rail transportation policy have been efforts to move towards more market-based solutions as opposed to the heavily regulated environment that dominated this sector for much of the 20th century. As Canada's current National Transportation Policy states, the objectives of Canada's

transportation system are “most likely to be achieved when competition and market forces are the prime agents in providing viable and effective transportation services” (Canadian Transportation Agency, 2018a). This shift in policy direction in Canada has largely mirrored the series of transportation policy changes that occurred in the United States over the last quarter of the 20th century that ushered in an era of deregulation (Dempsey, 2012). While there have been some complaints in recent years from the Canadian railways that they have been faced with a regulatory environment of increasing regulations, (Railway Association of Canada, 2015), it is difficult to contest the fact that the underlying approach of structuring regulation to allow market forces to shape the sector continues to be the guiding principle of regulators.

Chapter 2: The Maximum Revenue Entitlement (MRE)

2.0 Introduction

The Maximum Revenue Entitlement (MRE) is a regulatory policy on grain movements in Western Canada that has been active since the passage of Bill C-34 in 2000. The origins of the MRE can be traced back to the so-called Estey review (Nolan and Drew, 2002). The final Estey report was commissioned by then Transport Minister, David Collenette, in December 1997. As the report details, a major motivating factor for the comprehensive review of the grain handling system was the rail service crisis that grain shippers faced in the winter of 1996/97 (Estey, 1998). In fact, the level of service for grain shippers was so dismal that by April of 1997, the Canadian Wheat Board (CWB) filed a formal complaint with the Canadian Transportation Agency alleging that both Class I national railways had breached their level of service obligations.

Upon receiving the terms of reference from the Transport Minister, Justice Estey set out on nearly a year long process to collect information and perspectives from industry stakeholders throughout Western Canada. By the end of 1998, Estey was able to present his report to Transport Minister Collenette with a set of fifteen recommendations contained within. As Mulligan (2000) notes, the Estey review only provided general recommendations and thus, Arthur Kroeger[1] was given the task of providing the framework by which the broad visions of Justice Estey could implemented into the Canadian grain handling and transportation system (GHTS). Following the completion of Arthur Kroeger's report, the MRE was the result of one of Estey's original fifteen recommendations that successfully passed into legislation with the tabling of Bill C-34 in May of 2000. By August 1, 2000, the MRE officially replaced the former rate cap and took its place in Canadian rail legislation.

In the remainder of this section, I provide a discussion of the MRE to help better explore this somewhat unique policy instrument. I will begin with a discussion regarding the background of the MRE and the context into which it was introduced in Canada. I then provide an explanation of the different components of the MRE and the mechanism by which it functions. Finally, I review

[1] Arthur Kroeger was a career public servant who served in many roles within the Canadian civil service, including the post of deputy minister for six federal ministries from 1975 to 1992. Kroeger was the deputy minister of transport during the dismantling of the Crow Rate and thus, was well-suited to take on the role assigned to him in the Estey Review (Rampton, 1999), (Doern et al., 2019).

different assessments that have been conducted on the MRE, both in the academic literature and in commissioned reports.

2.1 Background Behind the MRE

Canada has a long history of regulating rail rates, especially as it relates to the movements of grain in Western Canada. As Bennett (2017) chronicles, this began with the signing of the Crow's Nest Pass Agreement in 1897. As discussed previously, from this initial agreement with Canadian Pacific Railway would evolve the contentious "Crow Rate" that would go on to shape the landscape of Prairie grain movement for nearly a century. However, as railway costs gradually began to rise with inflation, regulated grain rates remained static so government subsidies to the railways began to balloon, and it became apparent that a policy change was going to be necessary to correct the chronic underinvestment that was eroding the efficiency of the grain handling system in Western Canada. As Bennett (2017) details, the passage of the *Western Grain Transportation Act* (WGTA) in 1983 was the first step towards ending the era of the Crow Rate and towards the eventual MRE. However, while the passage of the WGTA was a first step, it would still be seventeen more years before substantial change would come to the method by which rail rates for grain moving in Western Canada were regulated.

As Vercammen (1996) writes, the aim of the WGTA was to create a framework by which freight costs could be shared by the Federal Government and grain shippers at rates that would be compensatory to the railways. However, while the WGTA did move to a more formalized method of determining the farmer's share of rail rates, a critical element that remained unchanged was the process by which regulated rates were set. As Doan et al. (2006) state, the government continued to dictate rates and continued to set them on a cost recovery basis. The National Transportation Agency would determine a base rate scale annually that would be used to determine the regulated freight rates that were to be charged at delivery points[2] across Western Canada. The rate scale was primarily determined based on the shortest distance by rail from the point of delivery to either Vancouver or Thunder Bay and was determined at 25-mile intervals (Alberta Agriculture, 1992). However, because the rates were primarily distance based, it meant that there was no special consideration within the rates themselves as to whether the delivery point was located on a low-

[2] Delivery points refer to facilities where grain can be delivered by producers to be processed and/or loaded onto rail cars. Examples include primary elevator facilities and producer car loading sites.

cost mainline or a high-cost branch line. The problematic issue of the railways being unable to differentiate rates to reflect the differences in costs associated with specific shipments remained at the heart of the WGTA, just as it had since the inception of the regulated Crow rates.

Interestingly, as Klein et al. (1994) note, while the original purpose of the WGTA was to support agricultural crop producers in Western Canada, the negative consequences of the program began to become apparent as the years passed. While the WGTA was crafted with the intention of shifting a larger portion of the rail transportation bill to farmers over time, the government continued to subsidize a major portion of the bill. As Khakbazan and Gray (1999) explain, because the rate of inflation was much less than anticipated after the WGTA was passed, the portion of the freight bill that farmers were paying increased at a much slower pace than expected. As part of effort to gradually shift more of the freight bill from government to shippers, the WGTA dictated that from 1983 to 1985, producers would bear the first 3 percentage points of inflation on freight rates. Following that, producers would bear the first 6 percentage points of inflation. Thus, when high inflation began to subside, the proportion of the freight bill being borne by shippers did not rise as quickly as the government had first anticipated. As a result, by the 1989-1990 marketing year, the government freight subsidy had risen to $720 million which accounted for nearly 70 percent of the freight bill, leaving shippers responsible for only 30 percent of the cost of moving their grain (Monteiro and Robertson, 2011). However, there were several major pressures that began to force the Canadian government to move away from subsidizing grain transportation.

The federal government was faced with the need to reduce a large fiscal deficit in the mid-1990s and the significant sums of money being used to help farmers move their grain was an easy place to cut back (Monteiro and Robinson, 2011). Additionally, the early 1990s were a time of ongoing General Agreement on Tariffs and Trade (GATT) Uruguay Round negotiations, of which Canada was a part. One of the main objectives of the Uruguay Round was to reduce agricultural subsidies and thus, the WGTA came under scrutiny. Finally, there was ongoing pressure from Prairie livestock producers and industry analysts to remove the WGTA (Kulshreshtha and Klein, 1994). In short, because the government subsidy decreased the freight differential between locations in Western Canada and export locations such as Vancouver and Thunder Bay, it encouraged the shipment of Prairie grains to export locations and also increased prices of feed grains for livestock producers on the Prairies. Additionally, other groups began to raise concerns that the WGTA could be discouraging diversification and value-added processing opportunities

from developing in Western Canada because the policy encouraged the production of crops that qualified for the subsidy and incentivized their export out of the Western Canadian region (Doan et al., 2006).

The passage of the 1995 *Budget Implementation Act* by the Canadian government spelled the end of the WGTA (Blandford and Hill, 2006). August 1, 1995 marked the date that Prairie grain shippers began paying full freight rates for moving their product. However, while government subsidies for transportation disappeared, the National Transport Agency committed to continuing to set maximum rates for grain shipments on a cost recovery basis (Schmitz et al., 2002). Furthermore, the federal government made a one-time payment of $1.6 billion to Prairie farmers that was intended to offset the expected increase in direct farming costs that would result from the removal of the subsidy. However, after removal of the subsidy, some reported grain freight rates more than tripled those paid over the previous crop year (Schmitz et al, 2002). Furthermore, the latter also provide arguments that the $1.6 billion payout was only a fraction of the sum that would have been fully compensatory for the loss that Prairie grain producers suffered as a result of the transportation subsidy removal. Regardless, the era of the Crow subsidy had officially drawn to a close, 98 years after first being instituted.

2.1.1 The 1997 Rail Shipping Crisis

The initiation of the Estey review and the ensuing implementation of the MRE policy cannot be explored without prefacing it with the rail shipping crisis that occurred in the winter of the 1996/1997 crop year. One of the influential factors that prompted calls for the Estey review was the action taken by the Canadian Wheat Board (CWB) on April 14, 1997 to file a level of service complaint with the Canadian Transportation Agency (CTA) against both major railways (Nolan and Drew, 2002). In fact, the CWB claimed that the railways' failure to meet their service obligations over the winter of 1996/1997 had resulted in more than $60 million in direct losses for farmers (CWB, 1997). Some described the filing of the case as the CWB's largest litigation effort ever taken on, with 425 binders filled with thousands of pages of documentation submitted (Schmitz and Furtan, 2000). Thus it is not surprising that this case would be cited as a major precursory factor to the significant regulatory changes that would soon occur in the sector.

The complaint that the CWB filed alleged that both railways failed to meet their statutory obligations and as a result, farmers suffered financial losses due to demurrage at port, additional

storage costs, lost and deferred grain sales, lost interest to the CWB pool account due to delayed sales, and other factors (Schmitz and Furtan, 2000). In its case, the CWB outlined how the railways had failed to meet the number of rail car movements as set out by the Car Allocation Policy Group throughout much of the year. As a Canadian Transportation Agency (1998) decision record shows, the railways countered with a defence that a higher number of blizzards and landslides over the winter had impeded their ability to meet the car movement goals.

While the case was still ongoing, the CWB ended up settling with the Canadian National Railway, leaving the CTA with the responsibility of ruling on the CWB's claims against Canadian Pacific Railway (Canadian Transportation Agency, 1998). When the CTA delivered its ruling on the matter in September, 1998 it found that while the railway had faced unusual weather-related challenges throughout the winter, it had nonetheless breached its level of service obligations by not allocating a reasonable share of its resources and capacity to CWB grain moving to the West Coast as it worked through its transportation backlog. Following this ruling by the CTA, the CWB then proceeded to file a statement of claim against CP in Federal Court for its breach of service. While the initial claim by the CWB was for $45 million, a settlement was eventually reached in March, 1999 that saw CP pay $15 million to the CWB (Schmitz and Furtan, 2000).

2.1.2 The Estey Review

As the terms of reference for the Estey Review clearly stated, the CTA case that the CWB filed against the railways was a major influence on the government's decision to conduct a review of the grain handling and transportation system (Estey, 1998). In July, 1997, after the backlog had been dissipated and the industry's stakeholders had time to consider what had gone wrong, the Canadian Minister of Transport, Minister of Agriculture and Agri-Food, and the Minister responsible for the CWB arranged a meeting with grain industry stakeholders regarding the operations of the grain handling and transportation system. The outcome of this meeting was a recommendation to conduct a comprehensive review of the entire grain handling and transportation system. As a result, the Minister of Transport appointed Justice Willard Z. Estey to conduct the review and provide recommendations by December 31, 1998 (Estey, 1998).

Upon receiving his mandate, Justice Estey oversaw an ambitious review period that included 147 meetings with over 1000 industry stakeholders, as well as the submission of 256 written submissions (Estey, 1998). At the conclusion of this year-long process, Justice Estey

reported back to the Minister of Transport with a set of fifteen separate recommendations that were meant to move the Canadian GHTS towards a more market-oriented structure. Justice Estey also expressed that implementing the entire set of recommendations as an integrated package should be pursued in order to achieve the overall objectives of the process (Nolan and Drew, 2002). Included in Estey's recommendations was a call to repeal the rate cap and focus on improving competitive or open access provisions in rail in order to provide a more market-oriented rate structure (Estey, 1998). It should be noted that included in Estey's recommendation for repealing the rate cap was a late alternate proposal on rate regulation put forward to the Review by CP. This proposal essentially laid out the basic premise for the MRE as formulated. In the proposal, CP promised that if the government were to repeal the regulated rate scale, the railway would commit to respecting a new rate regulatory system for grain movements that would see "overall weighted average freight rates" decrease by more than five percent over three years[3] (Estey, 1998). However, as Estey himself remarked, because this proposal was added to his Review only days before the report was to be submitted to the Minister of Transport, many of its finer and critical details remained to be sorted out. The submission of the report spelled the end of Justice Estey's involvement in the process, leaving the government with the task of finding the means to implement the recommendations put forward in the report.

2.1.3 The Kroeger Reports

Upon the completion of the Estey Review, the Minister of Transport tasked Arthur Kroeger, a retired civil servant, to head a consultative process that would produce a report detailing the steps that should be taken in order to best implement the recommendations put forward through the Estey Review (Doan et al., 2006). However, as Kroeger would soon discover, some elements of the recommendations would prove especially difficult to implement. Dion (2001) notes that one of the key issues that challenged Kroeger was the still diametrically opposed views of shippers and the railways on the issue of competitive rail access. Many Canadian grain shippers viewed themselves as being captive to rail transport and as a result, feared that the railways' new and improved ability to differentially price freight with the removal of rate caps would result in shippers being forced to pay excessive rates (Dion, 2001). But, as Dion (2001) explains, the railways countered with their view that shippers generally receive fair rates and adequate service,

[3]Hope (1999) notes that CN committed to similar cost rollbacks at the time.

ensured by a reasonable level of competition between the two, thus eliminating the need for new competitive access measures. Kroeger also faced the challenge of finding a way to implement a report that contained certain recommendations which a group of Western agricultural economists billed as being "unworkable" in a 1999 unpublished assessment of the Estey Report (Gray et al., 1999). Finally, as Kroeger (1999) noted in a letter to Marian Robson, Chair of the Canadian Transportation Agency at the time, the government's desire to quickly implement the suggested changes meant that certain measures, such as implementing a full costing review of the railways, could not be pursued due to their considerable time requirements.

When Kroeger passed on his final report in September 1999 the recommendations put forward fell into four main categories: the revenue cap, final offer arbitration, railway competition, and the CWB's role in grain transportation (Monteiro and Robinson, 2011). Despite the emphasis that Justice Estey placed on the need for all his recommendations to be implemented as a complete and holistic package, the Kroeger reports fell far short of the concrete directives for all of the recommendations that Estey had asked for (Nolan and Drew, 2002). Nolan and Kerr (2012) note that even Estey himself was critical of the final legislation that was eventually passed based on the Kroeger reports, as he felt that the latter had failed to satisfy all of the recommendations from his report. Estey's recommendation regarding increased competitive access to the rail network were especially contentious amongst stakeholders, which hindered Kroeger's ability to arrive at a solution that all parties could deem suitable (Nolan and Kerr, 2012). As a result, the only guidance regarding competitive access provisions provided by Kroeger in his final report was that the government should examine the range of options available before deciding on any future legislative action related to this issue (Monteiro and Robertson, 2011). Ironically, one issue that Kroeger did provide as a detailed implementation was to fully repeal the former rail rate cap and replace it with a form of incentive regulation, using a set formula to determine an annual ex post cap on grain revenues, to be applied by the CTA (Canadian Transportation Agency, 2000). With Kroeger's report submitted, the government set about to craft legislation that would attempt to encapsulate the recommendations put forward and by June 29, 2000, *An Act to amend the Canada Transportation Act* received royal assent (Parliament of Canada, 2000). Within the legislation was the directive that the newly crafted Maximum (Grain) Revenue Entitlement would come into effect on August 1, 2000, marking the beginning of a new era for grain transportation regulation in Canada.

2.2 Examining the MRE

The MRE is a policy tool implemented with the goal of allowing the railways more freedom in their pricing while still maintaining a level of shipper protection against excessive rates (Doran, 2008). When the MRE was first implemented, it was intended to serve only as a short-term measure (Pratte et al., 2015). These authors note that it was widely expected that following a scheduled review of the MRE after five years, the policy would be removed as the grain handling industry continued to move towards more commercialized pricing. However, it was also expected that the increased pricing freedom for railways available under the MRE would generate increased competition between the railways and facilitate greater system efficiencies, eventually resulting in lower grain rates and negating the need for the MRE (Pratte et al., 2015; Monteiro and Robinson, 2011). However, as data from the Canadian Transportation Agency (2016a) shows, while CN collected grain revenues that were substantially less than their maximum allowable amount in the 2nd and 3rd years following the introduction of the MRE, both railways quickly adapted their pricing strategies to ensure that they garnered grain revenue extremely close to their maximum allowable limit in each year. Despite what policy-makers had hoped for, the new regulations did not result in competitive forces reducing average grain rates below the regulated MRE levels. But while imperfect, grain shippers have sought to keep the MRE because without other regulatory changes, they fear a completely unregulated set of grain rates. In turn the MRE allows railways to mostly retain cost savings obtained through various operational efficiencies (i.e. longer unit trains and hauls, larger rail sidings, etc.) that are now part of today's Canadian grain handling and transportation system. Thus in spite of how it came to be and a general belief among participants that it would not survive for long, the MRE has retained its place as a key regulatory component for grain shippers in Canada.

2.2.1 The Formula

As Pratte et al. (2015) detail, the MRE is a formula that acts as a moderator of overall rate increases for certain movements of Western Canadian grain. As the members of the CTA Review Commission (2015) describe, the MRE ensures that any increase in rail revenue from one year to the next is attributable to changes in the tonnes of grain hauled, the average length of haul, or to inflationary pressures on the railway's operating costs. While the following section will discuss

the equation in greater detail, the MRE can be succinctly described as a formula that prescribes the average revenue per tonne-mile that the railways are able to charge across their entire network for qualifying grain shipments in a given crop year. The unique feature of the MRE as opposed to previous rate caps is that the railways are essentially granted the freedom to differentially price movements as they choose based on characteristics such as grain type, corridor, and seasonality (Pratte et al., 2015). Before proceeding with further discussion of the MRE, I introduce the formula below and elaborate on the various elements contained within it.

The MRE formula is listed below in Equation 1. It is computed by the Canadian Transportation Agency to determine the maximum allowable revenues on grain related movements that can be collected by each of the two Class 1 railways in a given crop year. The variables within the formula are divisible into two major categories: static base year variables and dynamic variables that are specific to the crop year for which the MRE is being calculated (Pratte et al., 2015). The MRE formula incorporates length of haul and tonnage figures for each railway (from 1998 data) as base year amounts within the equation (Pratte et al., 2015). The current figure used as the base year revenue was computed and arrived at through a process intended to help share with shippers some of the known productivity gains that the railways have achieved since the last railway costing review in 1992.

As a part of the former WGTA, costing reviews were mandated every four years to ensure that regulated grain rates were set at compensatory levels (Canadian Transportation Agency, 1989). However, when the WGTA was repealed, so too were the mandated costing reviews. Thus, Arthur Kroeger was faced with the challenge of determining what figures should be used as baseline revenues for the two railways, and how to account for any productivity gains that the railways had achieved since the 1992 costing review. As Pratte et al. (2015) explain, while the CTA did not perform another full costing review at that time, they did perform an analysis to estimate railway costs, revenues, and productivity changes that occurred between 1992 and 1998 to assist Kroeger. While the Kroeger Working Group discussed three different methods for determining the base grain revenue amounts, stakeholders were not able to arrive at a consensus on which option was most appropriate (Pratte et al., 2015). The government eventually decided on a strategy of using cost levels from the detailed 1992 costing review, then applying an inflationary factor for each year up to 2000, and then reducing those rates by 18% in order to reflect any productivity gains that had been achieved at the expense of shippers. As a result, the legislation

was passed with CN's base year revenue being set to $27.98/tonne and CP's being set to $26.12/tonne (Schulman, 2015).

As can be seen in Equation 1, average rate per tonne in the base year forms the foundation of the equation, with the division of the base year revenue by tonnes hauled in the base year. The next component of the formula adjusts for differences in the average length of haul by the railways in a given crop year as compared to the base year figure. This difference in distance is multiplied by $0.022 which is an adjustment factor that compensates the railways accordingly should their average length of haul in a given year be greater than that of their base year. It should be noted that this adjustment factor of $0.022 is a constant value that has not changed since the inception of the MRE, but due to the structure of the formula, it is effectively adjusted by the inflation multiplier each year (Canadian Transportation Agency, 2016b). Essentially, the portion of the formula that is contained within the brackets is simply the average rate per tonne, adjusted for length of haul, that a railway may charge across its network before inflation is taken into account.

Equation 2.0: Maximum Revenue Entitlement Formula

Maximum Revenue Entitlement = [A/B + ((C - D) × $0.022)] × E × F

where: A = Company's Base Year Grain Movement Revenues
B = Company's Base Year Tonnes of Grain Moved
C = Company's Average Length of Haul in Current Crop Year
D = Company's Average Length of Haul in Base Year
E = Company's Current Crop Year Tonnes of Grain Moved
F = Volume-Related Composite Price Index

(Canadian Transportation Agency, 2016b)

The variable outside the bracket that presents the most interesting point of discussion is that of the Volume-Related Composite Price Index (VRCPI). The VRCPI is the inflation multiplier that the CTA determines each year to reflect price changes in labour, fuel, and material and capital

purchases (Canadian Transportation Agency, 2016b). Revenue entitlements are calculated separately for CN and CP based on their individual tonnage, length of haul, and base year revenue data and their CTA-determined VRCPI factor for the given grain marketing year (Canadian Transportation Agency, 2012). Furthermore, it should be noted that the value of the VRCPI was set at 1.0 in 2000 and has then been adjusted each subsequent year since in order to reflect the changes in railway operating costs due to inflation (Government of Canada, 2018a). Additionally, the *Canada Transportation Act* (2018) specifies that the CTA is to make adjustments to the VRCPI in order to reflect any hopper car investments that the railways might make in a given year including costs related to obtaining and maintaining hopper cars (Government of Canada, 2018a). Other components that influence the VRCPI in a given year include price changes in labour, fuel, materials, and the railways' cost of capital (Canadian Transportation Agency, 2012). As Schulman (2015) notes, the VRCPI has averaged roughly 2% per year over the existence of the MRE.

The final remaining variable in the MRE formula is simply the tonnes of grain moved by the particular railway in the crop year that the MRE is being calculated for. This variable simply takes the inflation-adjusted average rate per tonne that is allowed under the MRE and multiplies it by the total tonnes moved in order to calculate the total allowable revenue that the railway of interest is permitted to have collected in the given crop year. It should be highlighted at this point that not all grain movements by Canadian railways are calculated as part of the MRE.

2.2.2 Qualifying Shipment Routes

As explained by the Canadian Transportation Agency (2011), the first major criteria that a shipment must meet is that it be the carriage of grain from any point west of Thunder Bay or Armstrong, Ontario that is destined either for one of Canada's export ports in British Columbia, or alternatively to Thunder Bay or Armstrong, Ontario. However, a major exclusion is that any grain that is destined for consumption in the United States that is shipped through ports in British Columbia is not counted under the MRE. Likewise, any exports that are shipped across the Western Canadian border to the United States directly by rail are not included. Moreover, rail shipments originating in Western Canada that are destined for another Western Canadian location, besides the export ports in British Columbia, are also excluded from the MRE. Finally, only movements

that are transported by CN and CP are counted under the MRE, thus excluding all shortline[4] railway movements. An additional point to note is that while the MRE only applies to shipments on Western Canadian track, it is not necessary for a shipment to have originated in Western Canada. Specifically, should an American grain shipper route their movement through Canada for export from a port in British Columbia or through Thunder Bay or Armstrong Ontario, the segment of the shipment that occurred within Western Canada would fall under the MRE. However, the portion of the movement that occurred within the United States would not be subject to the MRE, even if it was carried by CN or CP. Figure 2.0 gives a graphic representation of the various movements that the MRE would and would not apply to.

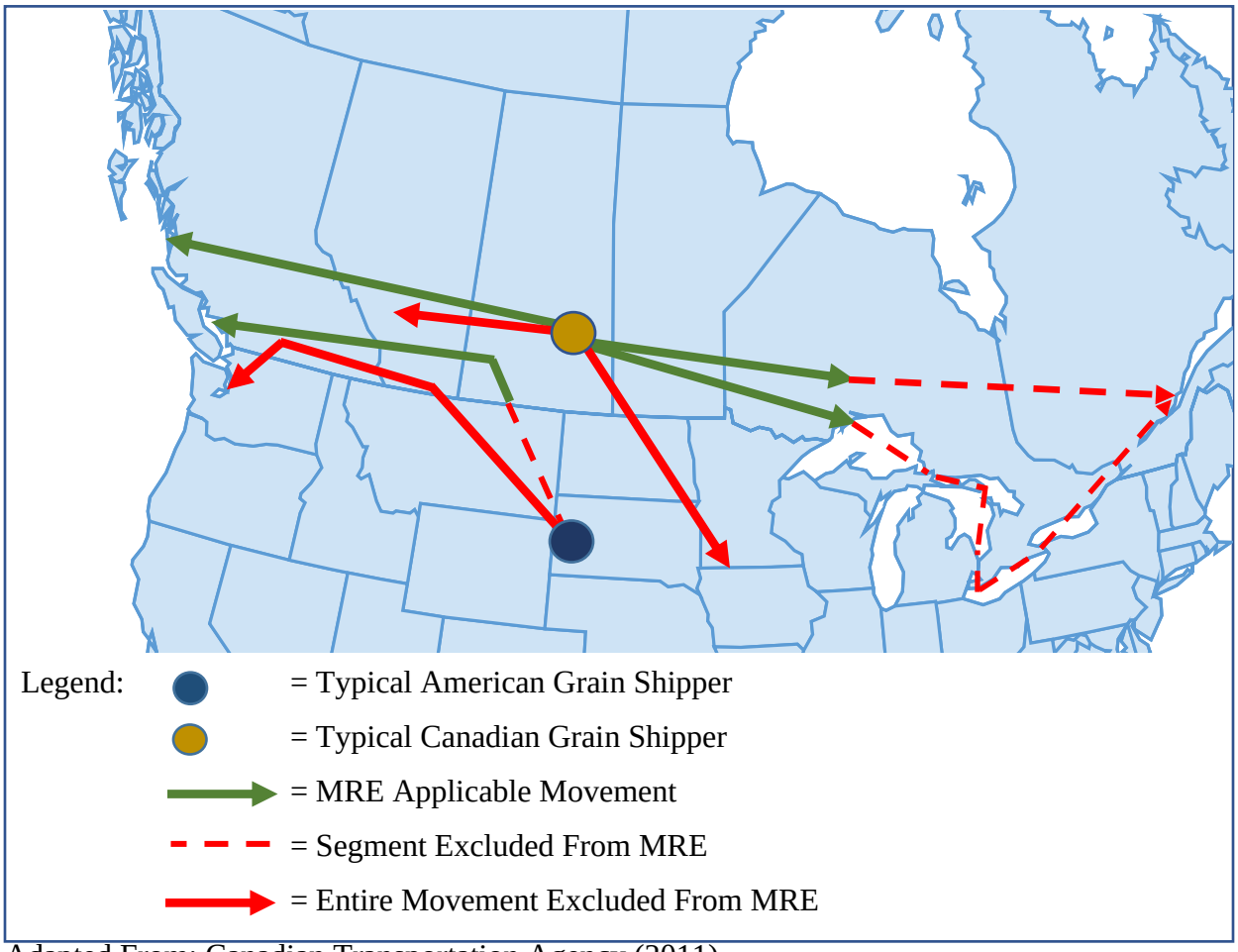
2.2.3 Qualifying Shipment Types

As highlighted in the *Canada Transportation Act*, the MRE applies to movement of all commodities that are listed under Schedule II of the Act. Schedule II lists the sixty-two different commodities that qualify, ranging from dehydrated alfalfa pellets, to wheat, to canola oil (Canadian Transportation Agency, 2020a). While most of the major Prairie crops are now included under the MRE, up until recently, two notable exceptions to the schedule were soybeans and chickpeas. As Loessin (2018) writes, when the MRE was first established in 2000, soybeans and chickpeas had not yet been established as common crops in the rotations of Prairie farmers. However, since that time, soybeans have rapidly increased in planted acreage. By 2017, soybeans had grown to become the sixth largest crop on the Prairies (Loessin, 2018). In response to this increase in soybean acreage and rail shipments, the *Transportation Modernization Act* (2018) included provisions to add soybeans, soybean oil, and soybean meal to the MRE. Chickpeas, however, remain as one of the crops that do not fall under the MRE. Additionally, while some specialty crops such as buckwheat and canary seed are included under the MRE, others such as quinoa and hemp seed are not. Furthermore, while the MRE applies to field crops and field crop products, it does not include other types of agricultural commodities such as vegetables and fruits, despite the significant export value of Prairie potatoes in particular (Agriculture and Agri-Food Canada, 2017). It should also be noted that since the passage of the *Transportation Modernization*

[4] Shortline railways are smaller railway companies that operate on spurs off of the mainline tracks and act as feeder lines, delivering product to and from junction points with the Class 1 railways. As of 2016, there were around 50 shortline railways in Canada, accounting for nearly 20% of the total track kilometers in Canada (Railway Association of Canada, 2016).

Act (2018), movements of containerized grain are now excluded from the MRE. While it used to be that the MRE rules did not distinguish by shipment type (Schulman, 2015), current legislation dictates that the MRE applies when the shipment is made by hopper car, boxcar, or tanker car, but not when transported by intermodal containers on flat cars.

Figure 2.0: The Applicability of the Maximum Revenue Entitlement to Select Rail Movements



Adapted From: Canadian Transportation Agency (2011)

2.2.4 Qualifying Revenue Additions and Reductions

The CTA, in accordance with the *Canada Transportation Act*, has determined whether specific elements are to be included or excluded in the determination of the railways' MRE revenue calculations. As the Canadian Transportation Agency (2001a) explains, there are several revenue sources that are included in the calculation of a railway's MRE besides the revenue earned from

transporting grains under contract or tariff rates. Also included are any revenues earned for providing premium service, for ensuring car supply, for car hire, and for additional switching that is requested by the shipper. However, performance penalties levied against shippers who fail to meet contractual obligations, rail car demurrage charges paid by shippers, and running rights compensation paid by other railways are all revenue sources that are not included in a railway's MRE determination (Canadian Transportation Agency, 2001a). The *Transportation Modernization Act* (2018) also brought about changes regarding the revenue earned by an originating railway in a regulated interswitch movement. The new legislation excludes interswitching revenues earned by a railway from their MRE calculation (Chong et al., 2017). Additionally, specific railway expenses that reduce the balance of a railway's revenue that is counted under the MRE include railway contributions towards grain-related facilities and any amounts paid by the railway to another railway for providing interswitching service. However, the Canadian Transportation Agency (2001a) also lists several items that are not eligible to reduce a railway's revenues including penalties paid to shippers for poor railway performance as well as any amounts paid by the railways to shippers in return for the expedited unloading or loading of cars prior to the expiry of the agreed upon loading/unloading period.

Another notable change that the *Transportation Modernization Act* (2018) brought about was a switch from railway MRE's being calculated using a shared VRCPI index to each railway having a separate VRCPI calculated by the CTA. This is important because it allows each railway to receive full credit for any investments into new hopper cars that they might make. When the VRCPI was a shared index, it created a free-rider problem when it came to the purchase of new railcars. This is because if one railway purchased cars, the other would benefit through the increased VRCPI despite not contributing any capital towards new rolling stock. Furthermore, the *Transportation Modernization Act* (2018) required that the full cost of purchasing and maintaining any new hopper cars be included in the calculation of the railways' respective VRCPI indexes. Following the introduction of this legislation, both railways have committed to buying significant numbers of new hopper cars. Since the passage of the new law in 2018, CN has officially purchased 3500 new hopper cars with plans to purchase a total of 6000 new hopper cars (CN, 2020; CN, 2021). Meanwhile, CP responded to the new legislation with a plan to purchase 5900 new hopper cars over a period of four years (CP, 2018). As the railway's response has shown, the changes to

the VRCPI have been quite successful thus far in prompting investment in new rolling stock in order to begin the replacement of the aging government-owned hopper car fleet.

2.2.5 Penalties for Exceeding the MRE

As mandated by law, the CTA must provide CN and CP with determinations of their maximum allowable revenues within 5 months of the end of a given crop year. In the event that the CTA determines that the revenue collected by a railway in a given crop year exceeds its maximum allowable amount under the MRE, the railway must pay back all of the excess grain revenue it collected, along with a fine (Canadian Transportation Agency, 2001b). In the event that the amount by which a railway exceeds its revenue limit is one percent or less of its total maximum allowable revenue, the penalty is five percent of the overage amount (Canadian Transportation Agency, 2001b). If the overage amount is greater than one percent of the railway's maximum allowable revenue, the railway is required to a pay a penalty equal to 15 percent of its overage. In those years when the railways collect revenues exceeding the MRE calculation, all of the overage and associated penalties are paid to the Western Grains Research Foundation (WGRF) (Canadian Transportation Agency, 2001b). The WGRF is a producer-funded organization that invests mostly in crop research benefitting Western Canadian farmers (Western Grains Research Foundation, 2018).

As Table 2.0 shows, over most of the history of the MRE, the railways have managed to land within one percent of their revenue entitlements as determined by the CTA. Despite the fact that the combined $111 million in penalties and overage that the railways have paid over the course of the MRE to date might seem like a substantial figure, we need to consider this in context. Over the course of the policy, the two railways have combined to haul over $21 billion worth of MRE-eligible grain movements (Canadian Transportation Agency, 2020b). Thus, the $111 million in overage and penalties that the railways have been required to pay back has equated to just 0.5 percent of the total MRE revenues that the railways have earned throughout MRE. Furthermore, it is a testament to the logistical expertise of both railways that, excluding the 2007-2008 crop year when a major numerical adjustment was made by the CTA in the determination of the allowable revenues, they have fallen within 1.1 percent or less of their allowable MRE revenues in every year since 2003 (Canadian Transportation Agency, 2020b). This despite the fact that demand for rail service from grain shippers has varied widely across this era, with a low of just 24.3 million

tonnes moved under the MRE by both railways in the 2004-2005 crop year to a high of over 48 million tonnes moved in the 2019-2020 crop year (Canadian Transportation Agency, 2020b).

Table 2.0: MRE Revenues - CN & CP

Year	% Over/Under MRE - CN	CN Penalty + Overage	% Over/Under MRE - CP	CP Penalty + Overage
2000/01	-0.80	-	-0.70	-
2001/02	-4.60	-	-3.00	-
2002/03	-9.00	-	-2.80	-
2003/04	-0.40	-	+0.10	$338,008
2004/05	+0.04	$124,650	-0.20	-
2005/06	+0.70	$2,713,251	+0.20	$699,529
2006/07	-0.60	-	+0.80	$3,532,821
2007/08	+6.30	$27,948,999	+9.00	$38,671,234
2008/09	+0.10	$717,432	-0.20	-
2009/10	-0.80	-	-0.40	-
2010/11	-0.20	-	+0.30	$1,314,636
2011/12	+0.04	$252,194	+0.10	$420,139
2012/13	-1.1	-	+0.03	$186,859
2013/14	0.7	$5,231,011	-0.3	-
2014/15	0.9	$7,209,925	0.3	$2,244,026
2015/16	0.2	$1,094,009	0.5	$3,555,807
2016/17	0.7	$6,062,428	0.1	$1,132,894
2017/18	0.1	$1,099,649	0.2	$1,575,539
2018/19	-0.04	-	-0.09	-
2019/20	0.34	$3,329,164	0.22	$2,278,511
TOTAL		**$55,782,712**		**$55,950,003**

Adapted From: Canadian Transportation Agency (2020b)

2.3 Assessments of the MRE

Due in large part to the fact that the MRE is such a central piece of grain shipper protections in Canada, there have been many different assessments of the policy in government-commissioned reviews, submissions to the CTA, and in academic literature. In examining various discussions of the MRE, it quickly becomes evident that there is no consensus among stakeholders in the Canadian grain handling and transportation system regarding the merits of the MRE. On one side, the railways now openly advocate for the removal of the MRE, as do some academics and shippers of other commodities that rely on rail. Meanwhile, essentially all Western Canadian producer organizations remain united in their efforts to maintain the MRE as a protective rate measure. In this section, I highlight some of the points argued by both sides of the MRE debate in order to provide greater insight into the various consequences associated with the MRE.

Despite the fact that the MRE conceptually originated from Canadian Pacific Rail as part of the Estey Review process (Estey, 1998), more recently both Canadian Class 1 railways have questioned its use and implementation. The railways have issued calls for Western Canadian export grain movements to be deregulated and treated like all other commodities moved in Canada. Their common argument against the MRE is that it depresses railway (grain) revenues and as a result, suppresses the railway's ability to make investments in increased capacity to support efficiency gains (CP, 2015; CN, 2015). In fact, CN (2015) even goes so far to state that the MRE "creates disincentives for railway innovation and investment." Additionally, CP (2015) argues that because they are unable to allocate car supply via market-based mechanisms such as the grain car auctions that are used by railways in the United States, their car capacity is not allocated as efficiently as it would be if price signals were used to dictate where supply should be allocated during periods of changing demand.

It should be noted that the passage of the *Transportation Modernization Act* (2018) recently addressed two aspects of the MRE that were previously points of criticism. This first argument often made against the MRE is that due to its static nature, it created a system that was not adequately responsive during periods of surging demand. Prentice (2014) argues that the formation of a competitive but containerized grain shipping supply chain could be used alongside the current bulk shipping system to provide excess capacity in periods of surging demand for rail services. Prentice goes on to state that because containerized movements of grain are costlier to perform as compared to a bulk grain movement, the MRE effectively prevented such a secondary supply chain

from developing. As containerized movements of export-bound grain were included in a railway's MRE revenue calculation, it meant that the higher rates they would have to charge on containerized movements would need to be offset by the reduction of rates collected from other movements, in order to avoid penalties. Thus, railways were disincentivized from creating this secondary supply chain to provide excess capacity for those willing to pay for it during times of surging demand (Prentice, 2014). However, the *Transportation Modernization Act* moved to address this purported deficiency of the system by removing containerized movements from each railway's revenue calculations. As the system evolves, it remains to be seen if containerized movements begin to provide an outlet for export grain during periods of surging demand.

Another issue that has been addressed by the *Transportation Modernization Act* was an area of the MRE that had seen more widespread criticism from all sides. This criticism dealt with the method by which the railways were essentially rewarded for any investments they might make replacing government hopper cars that had reached the end of their service life. In order to encourage investment in the hopper car fleet, the MRE specifically accounted for investments made by the railways through adjustments to the VRCPI index (Pratte et al., 2015). However, as previously mentioned, the VRCPI index was formerly a shared inflation index calculated by the CTA and used in both railway's MRE calculations. However, this situation created a free-rider problem regarding hopper car investment by the railways because if only one railway was to make an investment in replacement hopper cars, the system VRCPI would be adjusted accordingly. However, since the same VRCPI value was used in the calculation for both railways, the railway investing in hopper cars was forced to split the benefit with the other railway who did nothing. However, the *Transportation Modernization Act* contained measures to mitigate this issue and as noted previously, has prompted investment in new hopper cars as legislators desired.

On the other side of the debate, while initially skeptical, organizations representing shippers and elevators support the MRE. These proponents argue that agricultural shippers need special protections since a large proportion of grain shippers in Canada are only serviced by a single railway (Western Canadian Wheat Growers, 2015). While a 2010 Transport Canada survey of shippers across Canada found that 29 percent of shippers consider themselves captive to only one rail provider, this number jumps to 80 percent when the scope is confined to only looking at grain shippers in Western Canada (Lisitza, 2012). Due to such a large proportion of agricultural shippers being captive to a single railway, supporters of the MRE argue that it needs to remain in

place in order to prevent shippers from paying excessive or unfair rates. One study buttresses this perspective, with the authors finding that in the absence of the MRE, rail rates for moving grain in Canada could potentially increase by up to 115 percent if the railways were allowed to exert full monopoly power on these shippers (Brewin et al, 2017).

Those who support the MRE also have many common rebuttals to the grievances claimed by those opposed to the policy. For instance, while the railways state that the MRE depresses rates and thus disincentivizes investment which in turn leads to decreased service levels, supporters of the MRE point to grain movements that do not fall under the MRE as proof that removal of this policy would not substantially increase the quality of service provided to grain shippers. As Pratte et al. (2015) and Hume and MacKay (2015) both highlight, Canadian grain shippers report that they do not receive better service on movements bound for the U.S. or Mexico as well as movements of crops like chickpeas, all of which do not fall under the MRE. Thus, the argument is that if these unregulated movements do not receive better service, shippers are not convinced that the removal of the MRE would result in any level of improved service on those movements that currently do fall under the MRE. Furthermore, supporters of the MRE also argue that while the MRE does limit the overall revenues that the railways can collect, the formula is not structured in a way that forces the railways to share their productivity gains with shippers. As Hume and MacKay (2015) explain, the MRE formula adjusts allowable revenues for inflation each year but does not consider any efficiencies that are achieved by the railways through productivity gains. As Schulman (2015) notes, the base year levels for the MRE that were set in 2000 were based on a railway costing review that was conducted by the CTA in 1992. As it currently stands, this 1992 costing review retains its designation of being the most recent complete costing review conducted by the CTA. In the nearly three decades that have passed since this review, the Canadian grain handling and transportation system has undergone a transformational change. As Hemmes (2003) notes, in 1994 there were 1331 primary elevators in Western Canada and 6018 miles of track between CP and CN that was designated by the CTA as being grain dependent lines. Currently, the Western Canadian grain handling and transportation system is composed of 361 primary elevators and the amount of grain dependent lines serviced by CP and CN has fallen to 4022 miles

(Canadian Grain Commission, 2021; Government of Canada, 2018b). As Quorum Corporation[5] (2011) notes, this reduction in elevator numbers and the abandonment of grain dependent branch lines has also been accompanied by an increase in the number of high throughput elevators that have been built with much larger carspots than their predecessors. All of these factors have combined to result in more efficient operating conditions for the railways and thus, there are some stakeholders who have consistently called for another costing review to be performed in order to assess the productivity gains that the railways have been able to capture over the course of the MRE (Pratte et al., 2015). At the very least, supporters of the MRE often point to these productivity gains that have been fully realized by the railways as further reason why the MRE provides fair compensation to the railways and should be promoting adequate investment in rail infrastructure to serve grain shippers.

2.4 Concluding Remarks on the MRE

When the MRE was first implemented, it was intended to usher in the introduction of a more market driven approach to Canadian grain transportation. While the policy did replace government-mandated rate caps, as incentive regulation it was designed to provider rate protection to grain shippers while allowing the railways more freedom in setting rates and output. Two decades after the introduction of the MRE, it continues to enjoy support from many grain shippers (Pratte et al., 2015). However, since the MRE was introduced late into the Kroeger process by one of the Canadian railways, at least publicly it was intended to be a temporary stopgap that would transition the industry towards more commercial solutions. Many opponents of the MRE point to this fact and express the opinion that it is time for Canada to finally move towards a more deregulated system for setting grain rates (CN, 2015).

While the merits, relevance and overall success of the MRE may be up for debate in Canada, it is undeniable that the MRE has been a driving factor influencing significant changes in the Western Canadian grain handling and transportation system over the last two decades. In an unpublished grain industry funded report, Gray and Torshizi (2015) argue that since the MRE places a ceiling on the average rate that the railways can charge, it incentivizes the railways to

[5] Quorum Corporation is a company that has been appointed by the Canadian Government since 2001 to serve as the monitor for the prairie grain handling and transportation system by tracking various metrics in order to measure the overall efficiency of the prairie GHTS. (Quorum Corporation, 2018).

maximize their profits by minimizing their cost per ton-mile and moving all of the grain they want to move. If the MRE were to be removed, in the absence of other competitive forces the railways would be incentivized to arrive at the monopoly solution by further reducing the quantity of service provided and raising rates (Gray and Torshizi, 2015). They argue the MRE continues to be desirable because it incentivizes the railways to move the grain available to them. However, because the MRE also encourages the railways to maximize profits by reducing costs, the MRE reduces incentives for railways to move grain during periods of the year when their costs per ton-mile increase. For instance, when temperatures fall below -25C, it forces railways to reduce the length of their trains by 15-20 percent of their normal operating length due to limitations posed by the train's air brake systems under the cold conditions (Quorum Corp, 2014a). Since fall and winter seasons are the highest demand times for grain movement, these authors suggest altering the MRE formula in order to incentivize movements during the winter shipping season, offsetting the higher costs incurred by railways at those times (Gray and Torshizi, 2015).

Ironically, many of the ongoing debates surrounding the core principals of the MRE are similar to the old debates that took place for decades throughout the era of the Crow Rate. Due to the twenty year span that has elapsed since the last railway costing review, it is difficult to assess where current MRE rates sit on a continuum of potential grain rates, the continuum ranging from perfectly competitive to monopoly. While grain shipping groups remain generally in favor of maintaining the MRE, it is still not well understood what level of protection from market power the MRE provides grain shippers. Furthermore, it is important not to become solely focused on rates when assessing a measure such as the MRE – given some of the other possible incentives associated with market power exertion, it is imperative that the quality of rail services being provided to shippers continues to be monitored and included in discussions surrounding the MRE policy. Continued calls for greater data transparency are necessary to better assess how well the current policy environment is serving railways, grain handlers, and farmers. Accurate, reliable information is paramount in order for smart, evidence-based policy to be promoted in the Canadian grain handling sector.

While it is difficult to predict the future of the MRE, at this time it seems certain that the railways will continue to call for removal of the policy, ceteris paribus. It also appears that the general consensus amongst grain shippers is to advocate for MRE to be maintained in lieu of other changes. However, with suggestions for alternatives to the MRE still being put forward by various

stakeholders, it seems certain that if it survives, the MRE will need to evolve. While a government mandated review of the Canadian transportation system and the *Canada Transportation Act* by Emerson (2015) recommended that the MRE be modified and gradually phased out, so far, the Canadian government has refrained from taking any steps in this direction. Instead, the government has used legislation such as the *Transportation Modernization Act* to make small amendments to the MRE in order to address concerns that have been raised by stakeholders, including the issue of hopper car investments. Only time will reveal whether the government stays its current course or does eventually move towards a more deregulated grain handling and transportation system as envisioned in the Estey report over two decades ago.

Chapter 3: Interswitching and Extended Interswitching

3.0 Introduction

Interswitching has been a long-standing component in Canadian rail legislation since the creation of the provision at the beginning of the 20th century (Canadian Transportation Agency, 2014b). While it was first implemented to reduce the over-building of rail lines within urban settings where multiple railways sought to lay track to access the same shipper's facility, it has since evolved into a form of competitive access measure, a form of shipper protection (Canadian Transportation Agency, 2017). Interswitching was first used in the London Ontario Interswitching Case of 1905 and has retained a place in Canadian rail legislation ever since (Monteiro, 2006). While initial motivating factors behind the use of interswitching included alleviating concerns regarding service and the bankruptcy of several railways, the objective of using interswitching as a policy tool to promote competition amongst railways did not come to prominence until the 1980s (Monteiro, 2006). As Bonsor (1995) explains, the 1987 *National Transportation Act* reforms radically altered interswitching provisions by increasing the interswitching distance limits and making allowance for the National Transportation Agency to further extend the limits in given circumstances. The interswitching reforms were part of a suite of provisions introduced in the *National Transportation Act* that aimed to encourage rail competition (Bonsor, 1995).

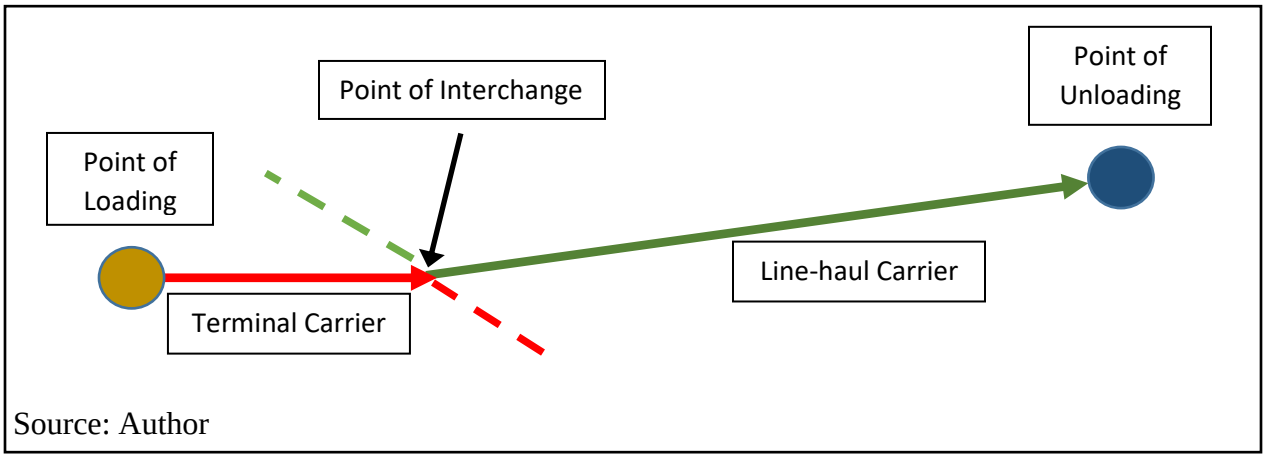
The role of interswitching as a competitive access measure has continued to evolve, including the temporary further expansion of interswitching limits by the CTA in 2014 (Padova, 2015), as well as the creation of long-haul interswitching provisions within the 2018 *Transportation Modernization Act* (Tougas et al., 2017). The following sections first provide an explanation of the mechanics of interswitching and then delve into the specifics of interswitching as a competitive access measure in Canadian rail legislation and discuss the ways in which the measure has evolved over the years. Finally, a game theory approach to interswitching is explored and discussed.

3.1 A Background on Interswitching

In the words of Heaver and Nelson (1977), "Interswitching is the movement of carload freight by the terminal carrier between the point of loading or unloading on such carrier's terminal tracks and the point of interchange with the line-haul carrier." Essentially, there are two different

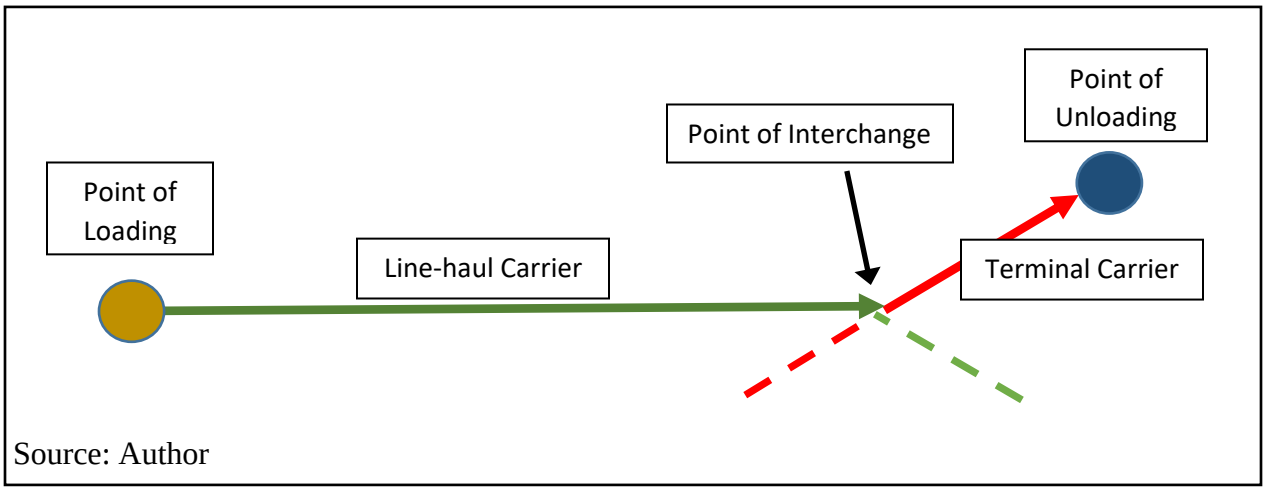
cases where interswitching can occur. In the first case, a shipper is situated on rail line belonging to Railway A. Interswitching occurs when Railway A, the "terminal carrier," moves carload freight from the shipper's location, "the point of loading," to the "point of interchange" where the cars are exchanged with Railway B, the "line-haul carrier." The Canadian Transportation Agency (2016c) designates the "line-haul carrier" as simply being the rail carrier which performs the majority of the linear distance of the overall railway movement. Figure 3.0 below illustrates what this first case of interswitching would look like.

Figure. 3.0: First Case Scenario of Interswitching



Source: Author

Figure 3.1: Second Case Scenario of Interswitching



Source: Author

The second case of interswitching that can exist occurs when the "line-haul carrier" is the railway that transports the freight from the point of loading and the interswitch with the "terminal carrier" railway occurs near the point of unloading, rather than near the point of loading. This scenario is illustrated above in Figure 3.1. It should be noted that while the remainder of this portion of the paper will be concerned with "regulated interswitching," there is certainly traffic that is transferred from one carrier to a second carrier through commercial agreements that is not regulated and does not fall under the umbrella of competitive access measures.

3.2 Regulated Interswitching in Canada

As previously mentioned, using interswitching with the purpose of providing shippers with a competitive access measure came into prominence in the 1980's in Canada (Monteiro, 2006). Since that time, several related policies have been introduced including extended interswitching, competitive line rates (CLR's), and long-haul interswitching (LHI). While extended interswitching and CLR's have since been repealed, all of these policies will be discussed in order to provide a complete picture of interswitching's place in Canadian rail policy.

As described by the CTA, "30-kilometer interswitching" is regulated by the agency in order to ensure shippers have "fair and reasonable access to service from more than one railway, which can increase competition in the system" (Canadian Transportation Agency, 2016d). The CTA's role in regulating interswitching activity is comprised of annually setting the rates that shippers can be charged by the terminal carrier for moving cars to the interchange location. The CTA plays no role in regulating what the line-haul carrier may charge the shipper for that portion of the movement. Importantly, while a shipper wishing to make use of LHI must make application to the CTA, no such application is required by a shipper wishing to make use of interswitching provisions. Shippers wishing to interswitch with a competing railway need simply to request such an arrangement from their terminal carrier after making arrangements with the line-haul carrier. The terminal carrier is then obligated to carry the traffic in question at the rate determined by the CTA and to furnish the interswitched traffic with a "level of service equal to the level of service accorded to the terminal carrier's line-haul traffic" (Government of Canada, 2021). While the CTA will play a role in resolving disputes regarding interswitching rates or the eligibility of a shipper

to request a regulated interswitching movement, the agency plays no direct role in the functioning of the access measure.

For a shipper to be eligible for regulated interswitching, their siding must be situated within a 30-kilometer radius of an interchange point or, as determined by the CTA to be within a "reasonably close" distance to an interchange point (Canadian Transportation Agency, 2016d). Each year, the CTA determines a series of rates that terminal carriers can charge based on the shipper's distance from the interchange point. As Blair et al. (2020) note, the CTA is mandated to set interswitching rates that are "commercially fair and reasonable" that cover the full economic costs of the movements and provide a rate of return to shareholders. Rates are set for four different zones ranging from movements less than 6.4 kilometers from the interchange to movements 30 kilometers or greater from the interchange point. Additionally, the CTA publishes rates for single car movements as well as discounted rates for car block movements of 60 cars or more (Canadian Transportation Agency, 2019c). So despite being a relatively simple measure, interswitching still provides an important avenue for competitive access for those shippers whose operations fall within the 30-kilometer limit from a certified interchange point.

For those shippers operating outside of the 30-kilometer track limit, access to interswitching may now only be granted through a so-called long-haul interswitching (LHI) order through the CTA. Introduced in the *Transportation Modernization Act* (2018), LHI represents a modified version of a different, well-intentioned historical track access (but little used) remedy available to rail shippers known as a competitive line rate or CLR (Tougas et. al, 2017). By design, CLR's were a more involved regulatory process than simple interswitching, but in the latter case the CTA was empowered to assign a rate for a movement by the originating carrier to a point of interchange with a competing carrier on a case-by-case basis. As Flemming et al. (2001) explain, an important detail to consider about CLR is that they could only be granted by the CTA after a formal application to the agency by a shipper, conditional on meeting several criteria. One of the key preconditions included that the shipper was required to have previously reached an operating agreement with the destination carrier over the balance of the proposed movement – and in a country with only two major railways, this requirement would prove to be a major barrier to the implementation of a CLR. As CN and CP would simply not compete with each other over CLR's, shippers were never able to meet the prerequisite of having an agreement with the destination

carrier in place, meaning the CLR remedy was essentially rendered inoperative (Tougas et al, 2017).

When LHI was introduced in 2018 as a replacement to extended interswitching as well as the former CLR, LHI removed the requirement of having the latter agreement in place. Instead, applicants must prove to the CTA that they have attempted but failed to negotiate acceptable shipping terms with their originating or local carrier (Canadian Transportation Agency, 2019d). However, Tougas et al. (2017) argue that LHI still contains other conditions that were endemic to the former CLR as well as being more restrictive than previous CLR provisions, attributable to limitations surrounding the range of applicants who can apply to the Agency for an LHI order. The extensive list of those ineligible for LHI include shippers in specific transportation corridors of the country, customers shipping specific traffic including motor vehicles, material that is a Toxic Inhalation Hazard, and containers on flat cars, as well as shippers whose nearest interchange is located within one of the excluded transportation corridors. Additionally, as with CLR's, LHI is a remedy that must be adjudicated upon by the CTA through a legal process that is projected to take some time (several weeks?) to complete – in stark contrast to the immediacy by which a shipper can obtain a standard regulated interswitching movement in the system.

The final topic to round out this section is the now defunct so-called extended interswitching limits. Extended interswitching was not a separate measure but rather just an extension of the current regulated interswitching regulations. In 2014, extended interswitching limits were introduced as part of the government's *Fair Rail for Grain Farmers Act*. The provisions expanded available interswitching rights from those located within a 30-kilometer radius around an interchange point to any shipper within a 160-kilometer radius. However, due to the regional nature of the legislation, these extended limits only applied to shippers in the Prairie provinces. Written into the act was a sunset clause that would see these new limits expire and after a one-year extension, but in fact the expanded limits were removed two years later by 2017. In their review of the *Fair Rail for Grain Farmers Act,* Sgro et al. (2016) noted that while the use of the new extended interswitching zone appeared to be limited in terms of the number of cars that had actually been interswitched, certain rail shippers noted that the threat of interswitching had acted as a successful passive tool to obtain more competitive rates. Interswitching data from Quorom Corporation presented in Appendix A also supports this sentiment – the monitoring firm tracked not only physical interswitches but also reported cases where shippers felt that the threat of

interswitching gained them leverage. The data, although limited in length, supports a narrative that over time, shippers were beginning to learn how to utilize the newly available credible threat in their rate and service negotiations with the railways. Amongst the strongest criticisms made against the extended interswitching policy by the railways is that it allowed for U.S. railways to extend their reach into Canada, but without any reciprocal measures allowing Canadian railways to access American shippers in the U.S. The railways argued that the new policy allowed for American railways to profit at the expense of the Canadian railways, who not surprisingly argued that the regulated interswitching rates applied on these movements did not adequately compensate them (Sgro et al., 2016). However, at the end of their review, Sgro et al., (2016) concluded that the extended interswitching limits should be maintained until a suitable alternative policy could be introduced that would "bolster the bargaining position of rail shippers where rail competition is extremely limited." In the end, the Canadian government chose to let the extended interswitching limits expire after the one-year extension. In the new legislation, the only new shipper protection introduced was LHI - a similar measure to extended interswitching but one that contrasts sharply in certain aspects as already discussed previously.

3.3 A Game Theoretic Approach to Interswitching

As part of research on interswitching, I have chosen to model the strategic game that occurs between railways and shippers when interswitching as a competition policy is made available to shippers by regulators. While the literature is somewhat sparse on modelling contestable markets using game theory, there is related literature to build off from game theory. Building off the seminal work of Baumol et al. (1982), I explain why regulated interswitching creates a contestable market environment. Additional inspiration to pursue game theoretical modelling comes from Huneke (2006), who explored a game theory approach to rate negotiations between railways and shippers. While Huneke (2006) modelled captive U.S. shippers who had various regulatory options including bringing their case before the Surface Transportation Board (STB), his shippers also possessed the ability to invest in their own rail spur to connect to the originating railway. The general analytic framework he developed was chosen to model the interswitching game. In order to capture the relationship between a railway and a shipper who has access to an interswitching option, I develop an infinite sequential move game where each player has the ability to choose between two potential actions in each period of the game. The game is explained in greater detail

below, and I report results in subsequent sections. To begin this analysis, we must start with a discussion of the contestable market literature.

3.3.1 A Discourse on Contestable Markets

From Baumol et al. (1982), a contestable market is one that is defined by easy and costless entry and exit where new entrants can enter a market if they believe that they can earn a positive profit by undercutting the incumbent's price. Due to the nature of frictionless entry and exit from the market that potential new entrants must rely upon, they are undeterred by the potential for the incumbent firm to respond with a retaliatory price cut should the potential new entrant actually enter the market. Furthermore, Baumol et al. (1982) state that unlike the classic perfectly competitive market, a large number of firms is not a necessary requirement of the contestable market in order to approach a competitive market outcome. Bailey and Panzar (1981) provided early evidence from the airline industry to validate contestability theory, showing that even markets served by only a single firm are still contestable. However, in contrast to aviation, Nash and Preston (1992) noted that significant sunk costs of infrastructure necessary for a new entrant railway poses a significant barrier to entry. Therefore, without some type of competitive access provision that would negate the barrier to entry posed by the sunk costs of rail infrastructure, it is difficult to argue that a true contestable market could exist naturally in the rail industry because, as Martin (2000) highlights, the absence of sunk costs is one of the requirements for a contestable market to yield long-run competitive market equilibrium results. With respect to Canada, I make the argument that if an extant competitive access provision like interswitching is made simpler to transact through additional regulation, it could allow shippers to benefit over both rates and service by emulating a viable contestable market environment.

When a shipper has the ability to call for an interswitch, it essentially allows a competitor railway to enter the market and compete for shipments coming from that particular shipper. With interswitching regulations in place, there is almost no sunk cost for an existing competitor to become eligible to serve the market. However, it should be noted that when referring to the competitor railway that gains access to the market, it is only applicable to those railways that share interchange points with the originating railway, and within the prescribed interswitching distance limit away from the shipper origin. However, in the event that there is a railway sharing such an interchange point with the originating railway, the rail market suddenly becomes contestable,

where the threat of entry by the competitor railway can effectively force the originating railway to provide more competitive like service to the shipper.

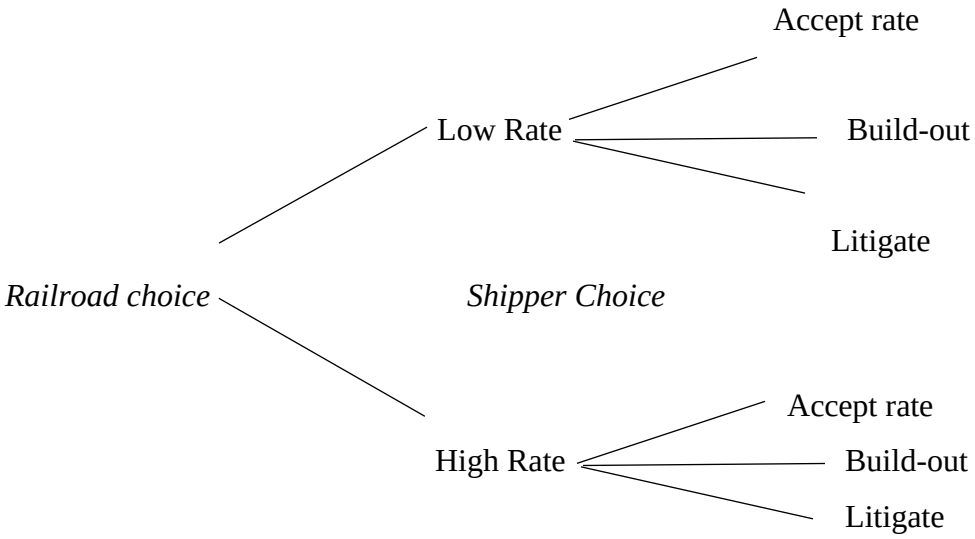
As Bailey and Panzar (1981) found for the airline industry, a contestable market can still exist even if the market is only being served by a single (monopoly) firm. If entry is actually costless, the incumbent firm would be aware that the threat of a new entrant entering the market is credible. In this case, the monopoly incumbent will choose to provide customers with a competitive service and rate in order to deter entry into the market. Building from this approach, it should be apparent that trying to measure the effectiveness of interswitching regulations simply by counting the number of interswitch orders conducted is not an accurate metric of contestability. In fact, contestability theory would suggest that once the shipper has established with the originating railway that the use of an interswitching order is a credible threat that the shipper is willing to use, it should be expected that very few interswitching orders will occur. As the Canadian interswitching data in Appendix A indicates, while shippers were reporting a certain level of actual use of the new extended interswitching provisions while they were in existence, they also reported benefits that they were deriving through their private negotiations with the originating railway using the leverage that a potential interswitch order provided them. The limited but promising interswitching data provides evidence that contestability theory works under the correct conditions, as the benefits provided by interswitching or access regulations extended well beyond just the actual regulated movements that were physically interswitched with a competing railway.

3.3.2 Huneke's Model

A significant degree of inspiration for this model came from work by Huneke (2006). In his paper, Huneke introduces a two-player game between a shipper and a railway. In the case that is presented, the railway has monopoly power and interacts with a captive shipper in a sequential game. In the game, the railway is the first mover and must choose between offering the shipper one of two rates. The railway can choose between offering the shipper a rate that maximizes the railway's short-term profit or alternatively, it can offer a lower rate to the shipper in order to limit the possibility of the shipper approaching the regulator (the Surface Transportation Board or STB) to litigate over the rate. Once the railway has chosen their rate, the shipper then chooses between three possible options. The first option is that the shipper simply accepts the rate that is offered to

it by the railway, signing a contract that locks that price in for a fixed term. The second option available to the shipper is to invest resources to build a rail link or spur to the nearest competing railway. By accessing the second railway, the shipper will no longer be a captive shipper and thus is assumed to receive future competitive rates for the movement of their product. Finally, the shipper can choose to litigate the offered rate through the STB if they feel that it exceeds the regulatory agency's rate ceiling. These options result in six possible solutions that can be reached when the game is played with the shipper choosing to either accept, build out, or litigate when offered the railway's profit-maximizing rate or else accepting, building out, or litigating when offered the lower litigation avoidance rate. Unlike the model developed here, Huneke's game is finite and only covers one period but by his own admission, he states that extending his model to a repeated game would likely provide a more realistic approach to analyzing the type of situation that would be played out between railways and shippers. The game layout presented by Huneke is presented in Figure 3.2 below.

Figure 3.2: Huneke Basic Decision Tree



Adapted from Huneke (2006)

While the model I present departs from Huneke's in a number of areas, the basic premise of the two models are the same. In both models, a captive shipper is engaging with a railway in a sequential move game. Additionally, in both models the shipper has the option to accept the service

or rate that is provided to it, or it can choose to seek redress with an alternative action. As such, the railway is faced with the choice of maximizing short-run profits but risking the shipper seeking redress or alternatively, choosing to offer the shipper a rate or service that may not maximize short-run railway profits but will result in a welfare-maximizing solution in the long-run. Finally, both games reward the players with various payoffs based on the solution that emerges from both players choices. Thus, it is from this base of common factors that I model railroad-shipper negotiations when interswitching is an option available to the otherwise captive shipper.

3.3.3 Basis for the Interswitching Game

In this game, the railway is able to choose between offering the shipper good service or sub-par service. Unlike Huneke (2006), I select the level of service that a railway provides as the choice variable rather than the rate being charged. While interswitching can admittedly be used by shippers as a remedy against both unfair rates and poor service, I chose to focus on only one of these in order to simplify the game. Additionally, I chose level of service to be my choice variable rather than the rate because the majority of grain rail movements in Canada move under rate regulation. Thus, because of the protection that the MRE offers to shippers, it presumably limits the ability of railroads to charge the full monopoly rate to any captive shipper, as was the case in Huneke's model. While I do not determine a precise definition of what would constitute a case of "sub-par service" versus a case of "good service" in the context of this model, I will describe the general characteristics that would establish the level of service provided to a shipper by a railway. One metric of railway service that is monitored in Canada by the Ag Transport Coalition is the percentage of hopper cars that are spotted at grain shipper's facilities in the week for which they were ordered (Ag Transport Coalition, 2018). If we use this metric as an evaluation tool in the context of the game, the railway delivering cars to the shipper in the week for which they were ordered could be considered "good service." Conversely, a railway delivering the cars after the week for which they were ordered in can be considered "sub-par service." However, it should be noted that while the game will largely consider level of service as being measured by the railway's timeliness in dropping off empty cars and picking up full cars, there are certainly other aspects that determine the overall level of service provided to shippers. Service issues at the destination can include the railway presenting cars out of sequence, splitting cars that were ordered to be delivered in a block, and failure to provide timely updates to receivers on the expected time of arrival for an

ordered car or block of cars (Transport Canada, 2011). Transport Canada (2011) also notes additional service issues can occur at the point of origin including a failure to provide timely and accurate updates regarding when cars will be dropped, delivering the wrong type of equipment, and delivering cars that are in poor condition. All of these factors also constitute issues that can contribute to a deterioration in the level of service and lead to increased costs for shippers.

3.3.4 Interswitching Railway Payoffs

In this game, the solution that yields the highest possible payoff for the railway is when they choose to offer sub-par service. In order to model this interaction between the railway and the shipper, I had to take a somewhat stylized approach to certain aspects of the game and this was one such area. I assume that when a railway makes the decision to only offer sub-par service, they are essentially making the decision to commit equipment, labor, and resources towards system capacity at a level that the shipper would consider to be less than optimal. Essentially, the railway is deploying fewer crews, locomotives, and other resources than would be necessary to ensure that the shipper will always receive their cars in the week that they order them. In Canada, this type of situation where sub-par service is experienced by shippers often will occur during stretches of extremely cold winter temperatures when train lengths have to be reduced and thus, railway costs increase while system capacity decreases (Quorum Corporation, 2014b). Thus, it is on this basis that the game awards the railway a greater payoff if they provide a sub-par level of service to the shipper rather than a good level of service because they are not incurring additional costs to ensure that the cars are delivered in the order week. Rather, the railway is simply content to delay movement of the rail car until the backlog clears rather than incurring additional costs. This concept is supported by a ruling by the Canadian Transportation Agency (2014a) where in its comments, the Agency stated that in situations where competitive pressures are low or absent, "the supply of cars and motive power will tend to be set at a level that favours railway company (producer) preferences over shipper (consumer) preferences." In the model, the railway is awarded a payout of 5 if it successfully moves a shipment while providing sub-par service. In the event that the railway moves a shipment while providing a good level of service, it is awarded a payout of 4. However, it should be highlighted that the railway will only receive a payout if the shipper chooses to use their services.

Another possibility is that the railway can receive a payout of 0, should the shipper choose to interswitch with a competitor railway. In this event, the railway loses the potential business of the shipper for that particular shipment and therefore receives no payout. When a shipper chooses to utilize interswitching, they must pay a regulated rate to the originating railway to move the cars to the interchange point. However, in most cases where the shipment is a long-haul movement, the regulated interswitch fee received by the railway is a very small portion of the overall business lost. For instance, in the sample shipment of milling wheat from Rosetown, Saskatchewan to Chicago, Illinois that will be presented below, the interswitch fees only equate to 2.5 percent of the listed tariff rate that the originating railway would have otherwise received had they completed the entire shipment from origin to destination. Furthermore, the railways have put forward arguments that regulated interswitching rates are non-compensatory and inadequately account for all of the costs associated with performing an interswitching movement (Clements, 2016). For the reasons discussed above, when a shipper chooses to order an interswitch movement in the game, the railway is assumed to receive a payout of 0.

3.3.5 Interswitching Shipper Payoffs

When it is the shipper's turn to act during a given period of the game, they also have the ability to choose between two different options. As already mentioned, the one option of the shipper is to choose to accept the services of the railway that serves it. Should the shipper choose to forego its option of exercising an interswitching order and instead accept the services of the railway serving it, it can receive two possible payouts which are dependent upon the level of service that the railway chooses to provide. If the shipper accepts the services of the railway serving it and the railway chooses to provide it with a good level of service, the shipper receives its maximum possible payout which in this game is a payout of 5. However, if the shipper chooses to be served by the originating railway and the railway responds by choosing to offer sub-par service, the shipper will only receive a payout of 2. There are a number of factors that rationalize the lesser payout that the shipper receives in the game in the event that they receive sub-par service from the railway. As Canada's grain transportation system is based on a just-in-time delivery model (CP, 2009), failure to deliver cars to shippers in the week for which they have been ordered can cause a series of issues throughout the entire system. As Transport Canada (2011) notes, poor

service can have many impacts that result in both direct and indirect costs for grain shippers and producers.

One significant direct cost of hopper cars not being moved during their scheduled timeframe is the ocean vessel demurrage fees that accumulate as ships wait at port for the scheduled grain movement to arrive. While demurrage rates are often negotiated within individual shipping contracts, and thus difficult to accurately quantify, recent estimates for demurrage on Panamax-size vessels in the Port of Vancouver range from $8700 per day (Cross, 2017) to $13,000 per day (Lewis, 2018). This is a cost that the shipper is responsible for, even if the delay in loading the vessel is a direct result of poor rail service. Shippers can face additional direct costs when the railways fail to provide timely and accurate notifications of when cars will be dropped at a shipper's siding (Transport Canada, 2011). As shippers are charged demurrage by their railway if they do not load and release hopper cars within a time period specified by the railway, shippers are incentivized to quickly load cars once they are delivered to them. If a shipper fails to load and release a railcar within a time period specified by their railway, shippers can face demurrage charges and/or be forced to forfeit discounts they can receive for loading cars in a timely fashion (Transport Canada, 2011). As the Western Grain Elevator Association (2014) states, when shippers are loading unit trains, they must load the train within 24 hours of receiving the cars in order to receive reduced unit train rates. Due to these incentives, shippers will schedule loading crews for when cars are scheduled to arrive in order to ensure the expedient loading and release of those cars. Therefore, when a shipper does not receive cars in the time period that they were scheduled for, they incur added costs due to the inefficient use of labour (Western Grain Elevator Association, 2014). Additionally, when cars are not received on schedule it can force shippers to defer producer deliveries to the elevator due to elevator capacity being filled with unshipped grain. Finally, another example of direct costs that can be incurred by shippers due to poor rail service are sales contract penalties (Transport Canada, 2011). When poor rail service delays the delivery of grain to the customer, the grain shipper may not be able to deliver the product within the time period specified in their contract with the customer and thus, be forced to pay penalties.

While it is not difficult to find evidence that shippers suffer a wide range of direct costs when they suffer poor rail service, there are also indirect costs that should be considered as well. As unpublished work by Gray (2015) shows, poor rail service has damaged the reputation of Canadian shippers' ability to be reliable trading partners in the past. This work points to the change

in the spread of wheat prices Free On Board (FOB) Vancouver, British Columbia and FOB Portland, Oregon over the course of the 2013/14 crop year as proof that world buyers were beginning to discount Canadian wheat due to concerns over delivery assurance. In combination with the direct costs already mentioned, this evidence of past damage to the reputations of Canadian shippers only provides further rationale to why shippers receive a discounted payout in the model when they are provided with a poor level of service by the railway that is serving them.

The final possible payout that a shipper can receive occurs when they choose to exercise their ability to call for an interswitching order. In the model, the shipper will receive a payout of 4 should they choose to interswitch. I make the assumption that when the shipper calls for the interswitch order, they will receive a reasonable level of rail service. Therefore, their payout will not be discounted by any of the consequences of poor service that were listed above. However, I also make the assumption that shipping via interswitching will be slightly less cost-efficient for the shipper than if the railway providing them with service simply provided a good level of service. This assumption is based on evidence that is presented below but it is central to the premise of the contestable market theory that this model is based on. As contestable market theory predicts that, in the long-run, one should observe an equilibrium where interswitching is utilized very little with shippers simply relying on the threat of interswitching to guarantee them a good level of service, it is essential that the model presents a choice-set to the shipper that incentivizes them to choose to not interswitch, should they believe they will receive good service.

In order to demonstrate evidence of how interswitching can cost shippers more than if they were to receive good service from the railway that serves them, I use published tariff rates from CN along with the CTA's regulated interswitching rates. I chose a route from the Cargill elevator in Rosetown, Saskatchewan to Chicago, Illinois to be used as an example in this case. The Cargill location in Rosetown was chosen to represent a typical shipper in Western Canada that is only served by one railway but was eligible to use extended interswitching provisions when they were a part of Canadian rail legislation. The location was eligible to use extended interswitching due to the fact that it is located roughly 107 kilometers from a designated interchange point in Saskatoon, Saskatchewan and thus, is well within the 160-kilometer interswitching limit. Furthermore, Chicago was chosen as a destination due to the fact that it is served by both CN and CP and thus, would make interswitching a reasonable option for the Cargill elevator to consider in the event

that it was dissatisfied with the railway providing service to it, which in this case happens to be CN.

For the purposes of determining the tariff rate to be used in this example, a commodity had to be chosen so I arbitrarily selected milling wheat as the product that was shipped. I then used the current tariff rate published by CN for a movement of milling wheat moving from Rosetown to Chicago as well as the published rate from Saskatoon to Chicago. I chose the rate that is listed for movements of milling wheat in railway provided equipment that is comprised of hopper cars with a capacity that is greater than 207,500 pounds. Moreover, three tariff rates are listed for each location depending on the block size of the cars that are being moved. For the purposes of the example, I look at both the single car rate and the rate for a car block of 50 or more in order to assess the impact of the car block provisions that were laid out under extended interswitching regulations. The tariffs are published by CN in US Dollars so to provide an accurate comparison, I converted the tariff rates to Canadian Dollars using an exchange rate of $1 CAD = $0.784 USD that was current at the time that the calculations were made. It should also be noted that while I fully realize that individual shippers may have contracts with CN that contain rates that differ from those listed here, this is simply an exercise to demonstrate the slight increase in costs that a shipper faces when they choose to utilize interswitching, all other factors being held constant. The rates are laid out in Table 3.0 and as can be seen, while shipping from Rosetown is slightly more expensive than shipping from Saskatoon due to the longer distance of the trip, the difference is only $29 per car more for both the single car rate and the large car block rate.

Table 3.0: CN Tariff Rates for Milling Wheat Movements

Origin	Destination	Single Car Rate	>50 Car Block Rate
Rosetown, SK	Chicago, IL	$10,647/car (CAD)	$8,882/car (CAD)
Saskatoon, SK	Chicago, IL	$10,618/car (CAD)	$8,853/car (CAD)

Source: CN (2017)

The next step in the assessment was to acquire the regulated extended interswitching rate that would apply in this situation that would be charged to the shipper for the movement from Rosetown to the interchange point with CP. If a shipper was located less than 160 kilometers but greater than 30 kilometers from an interchange point, the shipper was eligible to use extended

interswitching and was subject to the Zone 5 rates set out by the CTA. For movements of less than 60 cars, this meant a base charge of $325 per car for the first 40 kilometers with an additional charge of $2.10 per kilometer for every additional kilometer. For movements of 60 cars or more, the base charge was reduced to $118 per car with an additional charge of $1.60 for every kilometer over the first 40 (Canadian Transportation Agency, 2014b). The charges as they pertain to the movement in this example are displayed below in Table 3.1 for both the single car interswitch rate and the large car block rate.

Table 3.1: Interswitching Charges from Rosetown to Saskatoon

	Flat Fee	Fee for 67 Additional Km	Total Interswitch Fee
Single Car Movement	$325/car	$140.70/car	$465.70/car
>60 Car Movement	$118/car	$107.20/car	$225.20/car

Source: Canadian Transportation Agency (2014b); Author's Calculations

As Table 3.1 shows, while moving 60 or more cars does decrease the interswitching fee per car paid by the shipper, both of the possible interswitching fees are not insignificant charges. If the interswitching fees are compared to the $29 per car difference in CN tariff rates between Saskatoon and Rosetown, the shipper essentially ends up paying $436.70 more per single car of wheat to get that car to Saskatoon than if they were to simply move it with CN all the way from Rosetown to Chicago. Admittedly, in some situations shippers may be able to access rates from the competing railway that will be more competitive than the originating railway for the main part of the movement and thus, interswitching will end up being a more cost-effective option overall. In other words, if the shipper receives a rate on the linehaul portion of their shipment that undercuts their originating railway by more than the cost of the interswitching fees, interswitching may be financially advantageous for the shipper. However, because this model focuses on a shipper using interswitching as a remedy for poor rail service rather than non-competitive rates, this case will be disregarded for the purposes of the game. While I have been able to use published tariff rates and regulated interswitching rates to demonstrate how the monetary costs of interswitching can be a disincentive for shippers to utilize interswitching, there may be other disincentives as well. For instance, if a shipper was to receive good service from their originating carrier, it is likely going to be the more expedient method of getting the grain to its final destination. As interswitching

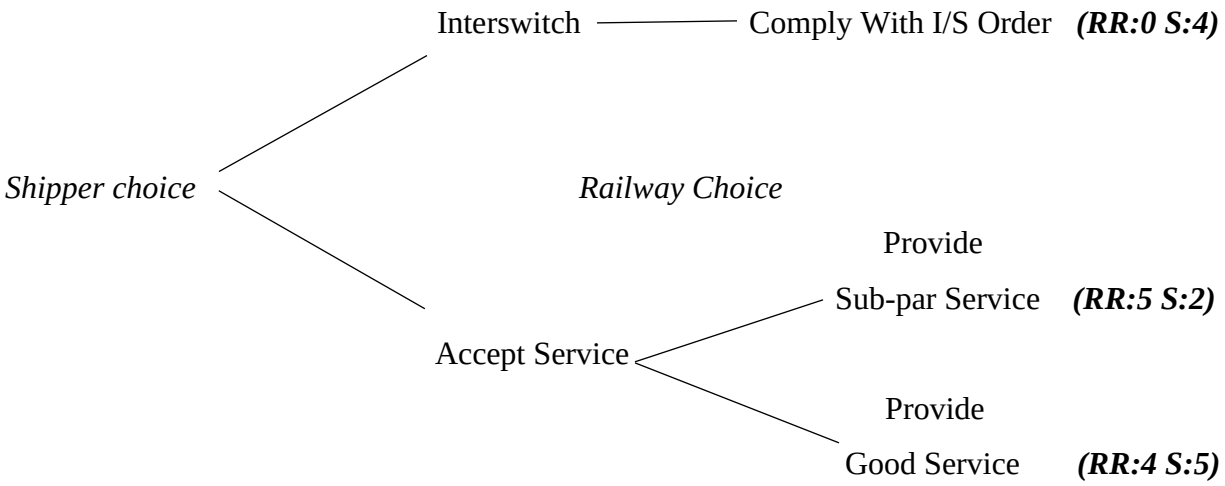
involves additional work events to process cars to and from interchange locations, the railways claim that their operating efficiency is limited and overall system capacity declines (Clements, 2016; Schulman, 2014). While it is difficult to quantify the extent that interswitching affects the overall timeliness of a delivery, it is reasonable to assume that a shipment that is interswitched with another railway will face at least some amount of delay as compared to a shipment that is only handled by a single railway that provides excellent service from origin to destination. However, should a railway choose to provide a shipper with sub-par service that includes delays in executing the shipment, interswitching may provide a delivery to the final destination that is more expedient.

In combination, these two issues provide the rationale behind why an interswitching shipper receives a payout of 4 in the model while a non-interswitching shipper receives a payout of 5 should they receive a good level of service. In order to provide clarity regarding the choice sets and payouts for each of the players, I provide a summary below before proceeding to a graphical representation of the game. As Figure 3.3 summarizes, shippers can receive payouts of 2, 4, or 5 and railways can receive payouts of 0, 4, or 5. In the game, the shipper will always be the first mover by choosing whether or not to interswitch. In the event that the shipper chooses not to interswitch, the railway will then be able to choose what level of service to provide the shipper with. In the event that the shipper chooses to interswitch, the railway is unable to act and must simply comply with moving the cars to the specified interchange location.

When a shipper chooses to interswitch in a particular period of the game, the railway's choice-set for that period is constrained to having to comply with the interswitching order. This makes the game somewhat unique from the railway-shipper game presented by Huneke (2006) in that the actions of one player can remove the ability of the second player to choose their course of action in the given period. However, designing the game in this way closely resembles the reality that a railway faces when a shipper chooses to make use of interswitching. Another important aspect to note from Figure 3.3 is that overall welfare of the two players is maximized when shippers choose not to interswitch and the railway chooses to provide them with good service. In this case, total welfare is assigned a value of 9, which compares to a value of 7 when interswitching is foregone but sub-par service is provided, and a value of 4 when a shipper chooses to interswitch. It should be highlighted that this measure of welfare only accounts for the two players in the game. In the case that an interswitch occurs, calculating total social welfare would also require accounting

for the welfare earned by the second railway that the traffic is interswitched with. However, in analyzing the results of this game, I choose to contain the scope of analysis to only include the two players involved in the game.

Figure 3.3: Interswitching Game Payouts



Source: Author

3.3.6 Specifications of Game Play

As previously mentioned, I feel that modelling this as an iterated infinite game most closely models the situation faced by these types of players in reality. While it is true that specific regulations and shipper-railway relationships are not going to be literally infinite in length, it is also true that neither the railway nor the shipper can be expected to know in a given period when the game they are involved in might come to an end. Therefore, in any given period of the game, this lack of knowledge regarding when the game might end can be best represented by simply modelling it as an infinite game. The fact that the game in this model is played as a repeated game is extremely important because as Romp (1997) states, players can condition their actions based

on observations of their opponent's previous moves. Additionally, the fact that it is an infinitely repeated game is also very important when it comes to predicting the outcome of the game. As Romp (1997) also states, when a repeated game is finite in nature, one can use a strategy of backward induction to arrive at a solution that is the subgame perfect Nash equilibrium. However, when a game is infinite in nature, there is no end point from which to begin backward induction logic. Moreover, in the case of a finite game, the structure of the game will alter as players realize they are approaching the final period - something that cannot occur in an infinite game (Romp, 1997). However, in infinite games, Romp (1997) notes that provided players do not discount future returns too heavily, they can learn over time to coordinate in order to avoid Pareto inefficient outcomes.

The issue of cooperative strategies has been covered extensively in the game theory literature including the early experimental work of Axelrod (1984). In his work looking at successful strategies for players to utilize when playing a prisoner's dilemma game, Axelrod found that a Tit for Tat strategy performed very well in computer simulated tournaments. Furthermore, Axelrod (1984) states that when actors used a strategy that placed value on being "nice" and not being the first to defect, they tended to perform better in the tournament. However, Tit for Tat is only one of a number of possible strategies that players could employ. Other possible strategies for infinitely repeated games that Dutta (1999) covers include trigger strategies such as the grim trigger strategy and the forgiving trigger strategy. However, Dutta (1999) also outlines the basis of the folk theorem of repeated games which essentially states that there are infinitely many subgame perfect equilibria in an infinitely repeated game which makes predicting the actions of players in these games difficult.

In the following section, I explore what results would be expected to occur if players were to use certain strategies. Additionally, I will present a decision tree representation of what three rounds of the game would look like in order to better assess the payouts that will result from employing specific strategies.

3.3.7 Analysis of the Interswitching Game

I begin the analysis of the interswitching game by providing a brief explanation regarding the decision tree that is displayed in Appendix B. As noted previously, the figure provides a graphic representation of the various outcome solutions that can result through three rounds of the game.

Readers are also reminded that the full model is in fact an infinitely repeated game but for the purpose of better analyzing the game, three periods of it are demonstrated below.

The first round of the game begins with the shipper choosing to call for an interswitch order or to accept the service being provided to it currently by the originating railway. All subsequent shipper choices throughout the game are represented by green boxes in the decision tree. If the shipper chooses not to interswitch, it is then the railway's turn to decide whether to provide good service or sub-par service. Railway decisions are represented throughout the decision tree by blue boxes where the railway must choose what level of service to provide the shipper. As readers might notice, if a shipper chooses to make use of an interswitching order, the railway has no opportunity to decide between any choice variables before the next round is played. As explained previously, this is due to the fact that once a shipper calls for an interswitch order, the railway must simply comply with the order and thus, has no choice variables to choose from. It should also be noted that once a round is complete, payouts are represented by the values found in the white boxes. The first value in each box represents the railway's payout and the second value represents the payout received by the shipper. Moreover, the values displayed are the accumulated payouts from both the current round and all previous rounds. For instance, the payouts displayed in the third round include the payout earned in the 3rd, 2nd, and 1st rounds for both the railway and the shipper. By analyzing these accumulated payoffs, some interesting characteristics of the game and payoff structure can be assessed.

One interesting element of the game is that is very evident by examining the payoffs is that the shipper has the unique ability to punish the railway without fear of retribution by continually choosing to call for an interswitch. This strategy can be observed by following the very top line of decision outcomes on the decision tree. By the end of the third round, the shipper has received a payoff of 12 and the railway has yet to receive any payout. While it is possible that a shipper could follow this strategy in reality, there are a number of reasons why a shipper might not choose such a strategy. Perhaps the most obvious reason is that if a shipper chooses a strategy of cooperating with the railway and the railway provides good service in return, the shipper will maximize their payout. As can be seen in Figure 3.3, the maximum shipper payout possible is a value of 15 that can only be achieved if a shipper chooses to not interswitch and the railway responds by providing good service. It should also be noted that this solution is Pareto efficient – that is, neither of the two parties can achieve a higher payout without making the other party worse off.

The payoffs found on the decision tree also demonstrate how in the short-term, the railway is incentivized to provide the shipper with poor service in order to maximize its payout in the next round. However, if the railway chooses to provide poor service, it does so at the risk of the shipper choosing to interswitch in the subsequent round. In the event that a railway chooses to cheat and provide poor service in period t and the shipper chooses to retaliate by interswitching in period $t+1$, the railway's payout at the end of $t+1$ will always be less than if it had provided good service in period t, provided that the shipper does not punish the railway without provocation. This demonstrates that unless the railway does not believe that the shipper's threat of interswitching is credible, the railway should always provide good service to maximize its long-term payout. Accordingly, the shipper should never interswitch without provocation if it desires to maximize its long-term payout. As a result, if both players wish to maximize their long-term payouts, they should engage in a cooperative strategy whereby the railway always provides good service and the shipper never interswitches. It should be noted that this is the same solution that is predicted by contestability theory. By examining a grim trigger strategy, one also arrives at a solution that predicts that the presence of interswitching will incentivize both parties to cooperate. The evidence for this is presented in the following section.

3.3.8 The Grim Trigger Strategy

As can be observed in the decision tree models associated with this game, a strategy of cooperation where the shipper chooses not to interswitch and the railway chooses to provide good service, will yield the maximum combined payout for the two parties. The railway receives a payout of 4 while the shipper receives a payout of 5. This will be referred to as the "cooperative outcome" for the remainder of this section. However, there is also a non-cooperative outcome. This is the result of the case where a railway chooses to provide poor service, something that is costly to the shipper, and as a result, the shipper chooses to exercise its right to interswitch. While a railway can attain a payoff of 5 in any given period by defecting to the non-cooperative solution, it does so risking the possibility that the shipper will respond in the subsequent round by calling for an interswitching order, thus resulting in the railway receiving a payoff of 0. The method of the grim trigger strategy will be described in the following section.

The grim trigger strategy for infinitely repeated games was first formalized by Friedman (1971) and is a strategy that delivers harsh and immediate punishment to any player who should

choose to be digress from the cooperative outcome in order to pursue a higher payoff in the current round of the game (Wright, 2013). The grim trigger strategy is harsh in the sense that it does not allow for any forgiveness for players who choose to deviate from the cooperative outcome. The strategy dictates that so long as the opposing player cooperated in the previous iteration, the player employing the grim trigger strategy should choose to cooperate in the current round. However, should the opposing player deviate from the cooperative outcome, the grim trigger player should punish them by subsequently choosing the non-cooperative outcome for the remainder of the game. While the likelihood of a shipper employing such an extreme strategy conceivably varies considerably amongst individual shippers, it has been chosen to be one of the strategies presented in this section due to its ubiquitous presence throughout the literature regarding infinitely repeated games. The following section will present a mathematical approach to the application of a grim trigger strategy to the interswitching game.

As Garratt (2012) details, in an infinitely repeated game, the present value of a payoff value *P* being received every period for an infinite length of periods can be simplified and expressed as:

Equation 3.0: Present Value of Payoff Equation

$$P[\frac{\partial}{1-\partial}]$$

where: ∂ is the player's discount factor that is calculated as:

$$\partial = \frac{1}{1+r}$$

where: r is the player's implicit one-period interest rate

By calculating the present value of future payoffs, one can ascertain the critical discount factor that will influence a player's decision of whether to deviate or continue to cooperate. The first situation investigated is the choices facing the railway player in this game.

As mentioned previously, the cooperative solution for the railway is to provide good service and receive a payout of 4 every round. The alternative is for the railway to provide poor service and receive a payout of 5 in the immediate round. However, if the shipper is playing the game with a grim trigger strategy, they will respond to this deviation by calling for an interswitch order for the rest of the game. Therefore, the railway is faced with a choice of either receiving a

payoff of 4 units per round in perpetuity, or a payoff of 5 in the immediate round followed by payoffs of 0 in perpetuity. The following calculations reveal the discount rate that would be required to cause the railway to deviate from the cooperative solution in the case where the players are employing a grim trigger strategy.

The discount rate can be assessed by solving the following inequality:

Equation 3.1: Discount Rate Equation

$$Gain_{Dev} > \frac{Loss_{Dev}\partial}{1-\partial}$$

where: $Gain_{Dev}$ is the increase in payout that the player receives in the immediate round from deviating from the cooperative strategy

and

$Loss_{Dev}$ is the decrease in payout that the player will receive in each subsequent round from deviating from the cooperative strategy

In the case of the railway player, $Gain_{Dev}$ is equal to 1 (the difference between the cooperative strategy payoff of 4 and the immediate round deviation payoff of 5). Meanwhile, the railway player's $Loss_{Dev}$ value is equal to 4 (the difference between the cooperative strategy payoff of 4 and the subsequent round deviation payoffs of 0). Solving for ∂ yields the following calculations:

Equation 3.2: Solving for the Discount Factor

$$1 > \frac{4\partial}{1-\partial}$$
$$1 - \partial > 4\partial$$
$$1 > 5\partial$$
$$\frac{1}{5} > \partial$$

Therefore, if $\frac{1}{5} < \partial < 1$, the inequality does not hold and the railway player will be better off always playing the cooperative strategy. Using our previous expression for the discount factor ∂ , we can solve for the theoretical one period interest rate that would be necessary to cause a rational railway player to choose to deviate from the cooperative outcome in the case where a grim trigger strategy is being employed.

Equation 3.3: Grim Trigger Solution

$$\frac{1}{5} > \partial$$
$$\frac{1}{5} > \frac{1}{1+r}$$
$$\frac{1}{5}(1+r) > 1$$
$$r > 4$$

As this equation shows, should a rational railway player choose to deviate from the cooperative outcome, it would imply that their one period interest rate is 400% or greater. Of course, in most practical situations, such an interest rate is far beyond the realm of possibility. Therefore, given the parameters of the game that we have described above, we would expect that when both players participate using a grim trigger strategy, the cooperative outcome is an achievable sub-game perfect equilibrium.

3.3.9 Applying the Folk Theorem

In game theory, the Folk Theorem encompasses a number of different forms that can provide for the possibility of cooperative outcomes in noncooperative games when players are engaged in play that they know they will be repeated many times (Friedman, 2000). While there are multiple individual theorems that fall under the Folk Theorem umbrella, the one that we consider for the sake of this discussion will be what Friedman describes as, "Folk Theorem 3." This theorem pertains to an infinitely repeated game where the players apply a discount factor to future payoffs. As Fudenberg and Maskin (1986) note, the theorem "asserts that any individually rational outcome can arise as a Nash equilibrium in infinitely repeated games with sufficiently little discounting." As Huang (2011) further explains, "any strategy profile that is Pareto superior to some Nash equilibrium of the stage game can be supported as infinite play on the equilibrium path of a subgame perfect equilibrium if players are patient." In other words, if the players sufficiently value future payoffs, they will be willing to continue playing within the confines of their strategy profile, despite the fact that they may be able to receive a higher payoff in a particular stage of the game by reverting from that profile. As may be evident to the reader at this point, this criterion is very similar to that laid out in the previous grim strategy section. This should not be surprising, as the infinite horizon with discounted payoffs theorem presented by Fudenberg and Maskin (1986) featured grim trigger as the method of punishment.

As Friedman (2000) details, while Folk Theorem can provide a theoretical background to explain why the cooperative outcome can be a subgame perfect equilibrium in game play, the predictive power of the theorem is very weak as it allows for a multitude of payoff outcomes to be theoretically possible. However, as Friedman (2000) also explains, the theorem is able to provide an explanation as to why cooperative outcomes can be an achievable outcome in non-cooperative games.

3.3.10 Continuous Strategy Sets

One weakness that exists in this modeled interswitching game surrounds the imposed assumption of discrete choice variables for both players in the game. While this is true for the shipper (they choose whether to call for an interswitching order or not), in reality, the railway's choice set is more accurately characterized as being continuous. The quality of service that a railway chooses to deliver lies along some theoretical continuum. As explained by Webb (2007),

the player (in our case the railway) is not choosing its actions from a discrete choice set but instead, their pure strategy set is a subset of the real line. Rather than simply choosing to deliver "good service" or "sub-par service", there is the potential for significant variation in the quality of service that is delivered. It should also be noted that the labels of "good service" and "sub-par service" are obviously quite arbitrary and even federal regulators have been challenged with properly defining what constitutes an adequate level of service. In the recently introduced *Transportation Modernization Act, 2018*, Canadian lawmakers sought to provide regulators with a more precise definition of what constitutes "adequate and suitable" rail service. Less than a year after the act became law, the CTA used its newly vested "own motion" powers to investigate whether CP, CN and BNSF had violated their rail service obligations in the Vancouver area in the fall of 2018 (Canadian Transportation Agency, 2019a). In their decision, the CTA found that while CP and BNSF had not violated their service obligations, CN had breached its service obligations to a particular group of its customers. However, in the proceedings CN strongly denied that its actions had resulted in a breach of its service obligations (Canadian Transportation Agency, 2019b). The case provides an example of how despite an attempt to clarify the definition of "adequate service," discrepancies regarding what constitutes a breach of service obligations continue to arise at times amongst the various players.

3.3.11 Discussion Regarding Model Assumptions

While the previous sections have provided rationale for many of the assumptions that were made when designing this game theory model, this section provides a brief discussion regarding the quality of some of my assumptions and how some of them may in fact present opportunities for further extensions of the model in the future. Additionally, this section will demonstrate that the author has been careful regarding the factors that influence the actions of shippers and railways in reality.

An important first note is that the game is introduced as an infinite play sequential game. While a well-supported argument for this characterization is provided in previous sections, it is important to note that this characterization also results in the implicit assumption that the rules of the game and the nature of the bargaining relationship between the railway and shipper is static in perpetuity while the game is played repeatedly. While this assumption may not pose any real issue in the short-run, it should be noted that there is a very credible argument against the rigidity of this

assumption in the long-run. For instance, bargaining power could shift towards one player or the other due to new regulations, changes in market structure, or the introduction of new competitive forces. Such a shift in bargaining power has the potential to encourage shifts in the playing strategies of those involved in the game and thus, alter game outcomes.

Another aspect of the model that deserves discussion is the fact that the game is played between a single shipping facility and a given railway. This leads to the implicit assumption that the shipping facility will act only with consideration to the game it is engaged in individually with the railway player. In reality, the majority of the shipping facilities in Western Canada are owned by line companies who operate multiple locations across the Prairies. This results in complex relationships arising between shipping companies and the railways that serve them. Individuals in the corporate offices of elevator line companies responsible for managing rail logistics presumably must weigh the consequences that calling for a regulated solution like an interswitch order at one location might inflict on their overall relationship with the railway in question. By having to consider consequences in a system-wide approach rather than a one-on-one game, the strategy for these types of players might be altered. Alternatively, there is the possibility that line companies with multiple locations may possess greater bargaining power than a single captive shipper and this too may alter the strategies employed in the game.

Finally, it should be noted that negotiations between railways and shippers likely involve broader considerations than presented in this model. With many grain rail shipments now moving under confidential contracts, negotiations and relationship management that occurs between shipping companies and railways is undoubtedly much more complicated than the simple interactions used in the model. Additionally, my implicit assumption of completely inelastic demand for rail services on the part of the shipper is likely to be overly rigid in most circumstances. At some rate and without other intervention, even captive shippers will seek alternative solutions, and this set can include expensive trucking or else simply shutting down operations.

Overall, while there are some assumptions made in this game design that can be challenged, it is the opinion of the author that they are not particularly detrimental to the validity of the process. However, these questions present opportunities for other researchers to extend the model and explore other avenues of the strategic games played between grain shippers and railways. For instance, additional future research might explore alterations to the sequence of decisions, or how

to more accurately model the game faced by shippers with multiple loading locations, or how to better reflect the fact that demand for long-haul rail service isn't completely inelastic in most cases.

3.4 Concluding Remarks on Interswitching

Interswitching remains an important competitive access provision in Canada. The game theory model presented here reinforces that the success of interswitching as a competitive or contestability policy tool cannot be measured by the number of executed interswitch orders. When a shipper is able to leverage interswitching as a credible threat against a carrier, competitive outcomes can be achieved without an actual interswitch. Further, it is important to note that although the recently introduced LHI policy shares some similarities with historical interswitching policy, the ease or immediacy by which LHI orders can be granted to a shipper has been significantly reduced. The latter is because the shipper must wait for the CTA to grant an LHI order upon individual request. Considering the extra steps involved for a shipper to obtain an LHI, we argue that LHI as a policy tool offers considerably less leverage as a credible competitive threat for shippers compared to historical interswitching policy. But today standard interswitching is once again only available to shippers located within 30 kilometers of a recognized interchange point. As mentioned previously, this interswitching radius was expanded temporarily in recent history in response to a prolonged issue with grain car supply. Its merits and effectiveness in providing better rail service to ships remains a topic of discussion in debates on Canadian rail policy. The natural experiment provided by the temporary extended interswitching limits provides a rich field of investigation for further research on interswitching measures.

Another issue that continues to prove contentious, at least for the railways, is the regulated rate that the terminal carrier is permitted to charge for their portion of such a movement. Railways have made it known that they feel these rates are non-compensatory and do not adequately consider the true cost involved in completing these movements. While the CTA currently determines this rate using methodology that estimates railway costs for the upcoming year by applying inflation and productivity metrics to known historical unit costs, recently the CTA has initiated formal discussions regarding possible alternative methods of determining these rates (Canadian Transportation Agency, 2020c). A policy of Ramsey pricing (i.e. zero profit pricing based on inverse demand elasticity) was one alternative that was proposed by the

CTA, but none of the participants in the consultation process expressed approval for this alternative (Canadian Transportation Agency, 2020c). Determining a more desirable method of compensating terminal carriers for interswitched movements that has the approval of all participants involved remains an area of regulatory research.

In conclusion, even the limited interswitching provisions continue to act as a competitive access measure in Canada for shippers who can use the policy. These provisions remain desirable because they also facilitate negotiations for a commercial settlement over the movement while potentially providing a competitive alternative for shippers who might otherwise be captive to a single serving railway. While there are certain aspects of the policy that deserve continued scrutiny and debate, interswitching is well-placed to serve as a valuable policy tool for years to come.

Chapter 4: Final Offer Arbitration (FOA)

4.0 Introduction

Final Offer Arbitration (FOA) is the main mechanism that the Canadian Transportation Agency (CTA) offers to Canadian shippers who wish resolve rate disputes in cases where the shipper has been unable to negotiate a rate with the railway that the shipper feels is reasonable (Samrout et al, 2009). In this section, I introduce the policy including its history and the process that is followed once a shipper submits a formal complaint to the CTA. I then proceed with a section that assesses how FOA has been used by Canadian grain shippers and analyze its effectiveness as determined through official submissions by stakeholders as well as reviews that have been published.

Final offer arbitration (FOA) is a dispute resolution mechanism that has been an important component of Canadian rail regulation since it was introduced in the *National Transportation Act, 1987* (Monteiro and Atkinson, 2009). Like conventional arbitration, FOA requires the two disputing parties to submit their respective offers to the appointed arbitrator. However, unlike conventional arbitration where the arbitrator can decide on a compromise solution from the continuum that lies between the two submitted offers, in FOA, the arbitrator must choose one offer or the other. The dispute mechanism is designed this way with the intention of encouraging the parties to take more reasonable positions, thus promoting settlement prior to an arbitrated ruling (Feuille and Long, 1974). As the Canadian Transportation Agency (2018a) details, FOA is intended to be one of the tools that shippers can access in order to arrive at a resolution when disputes regarding rates or service arise between a shipper and a railway. FOA was first formally suggested as a possible dispute resolution mechanism by Carl Stevens (1966) and has since proven to be a useful tool to deal with negotiation impasses in a wide variety of negotiation situations. The first time that FOA was used as a solution to solve an impasse in negotiations came in 1972 when the city of Eugene, Oregon used it in contract negotiations with groups of its public employees (Feuille and Long, 1974). Since this time, FOA has been used in situations as varied as contract negotiations with police officers in New Zealand (McAndrew, 2003) to the settlement of insurance claims in the US (Bazerman and Kahneman, 2016). However, perhaps the most widely known example of FOA is its use in resolving salary disputes in Major League Baseball (Farmer

et al., 2004). Through its ongoing use in such a wide variety of situations, FOA continues to demonstrate its usefulness in its ability to resolve impasses in negotiation proceedings without the parties having to resort to other costlier avenues such as litigation or strikes. The remainder of this section of the paper discusses the intricacies of the version of FOA that is used in Canadian rail legislation as well as some of the aspects of the policy that shippers have identified as being problematic. Additional discussion is focussed on game theory models of FOA as well as the presentation of novel experimental work that was performed as part of this thesis. The experimental work investigates how tweaking certain aspects of the FOA process might impact the outcomes for railways and shippers and better allow the policy tool to achieve its stated outcomes.

4.1 The Advantages of FOA

When FOA was first proposed, it was meant to provide a solution to the alleged "chilling" effect that conventional arbitration can have on negotiations between two disputing parties. One criticism of conventional arbitration is that because arbitrators are often perceived to seek some "middle ground" between the submitted offers of the two parties, it is in the strategic interest of each party to not compromise on their positions prior to the arbitrator making their decision (Feuille and Long, 1974). In other words, as Farber and Bazerman (1989) note, conventional arbitration encourages the two parties to maintain extreme positions in order to receive a favourable arbitration outcome when the arbitrator decides upon a solution that lies between the two positions. However, FOA is meant to encourage the parties to not take extreme positions that they will likely be penalized for by the arbitrator (Singh, 1986). Rather, because the FOA process is structured to encourage the parties to make reasonable offers, it can better facilitate the settlement of the dispute between the parties even before the arbitrator makes a ruling. Additionally, the inherent riskiness that exists for both parties, should they allow the arbitrator to decide upon the resolution in an FOA case, also encourages settlement (Bazerman and Kahneman, 2016). By choosing to settle with the other party prior to an arbitrator's decision, each party may have to allow for a certain degree of compromise from their final offer but will have the security of being able to manage the degree of compromise necessary to arrive at a resolution. As Farber and Bazerman (1989) indicate, in both experimental and field studies, the nature of the FOA resolution process has been shown to promote higher rates of negotiated settlements between

parties when compared to conventional arbitration. As negotiated settlements are generally considered to be superior to an arbitrated decision (Farmer and Pecorino, 1998), evidence supporting FOA's superior ability over conventional arbitration to encourage settlement perhaps helps to explain its widespread use in resolving disputes between parties in a wide variety of situations.

4.2 FOA In Canada

FOA has been enshrined in Canadian rail policy since 1987. It constitutes one of the three different arbitration measures available to shippers through the Canadian Transportation Agency. In addition to FOA, shippers can also access rail level of service arbitration as well as rail arbitration[6] (Canadian Transportation Agency, 2018b). However, unlike FOA, rail level of service arbitration and rail arbitration both utilize conventional arbitration as a resolution measure and thus, is not focussed on in this discussion. FOA was passed into legislation with the aim that it would result in fewer adversarial dispute resolutions, allow for a more accessible and affordable dispute resolution mechanism for shippers, and provide a more efficient and effective avenue to resolve disputes than what previously existed (Montiero and Atkinson, 2009). Since first being introduced as a legislated measure in 1987, FOA has seen four amendments – in 1996, 2000, 2008 and 2018 (Monteiro and Atkinson, 2009; Canadian Transportation Agency, 2018c). These amendments will be discussed in detail below.

As Emerson (2015) highlighted in his Review of the Canada Transportation Act, despite some suggestions from shippers to improve certain aspects of FOA, it is a remedy that is generally considered by rail shippers to function well. While it is difficult to track the details of FOA cases in Canada due to their confidential nature, transportation lawyer François Tougas (2005) states that some of the largest rail disputes in Canada as measured by monetary value have been settled through the FOA process. However, it should also be noted that the Rail Freight Service Review conducted by Transport Canada (2011) found that there are still many shippers who report being

[6] Rail level of service arbitration and rail arbitration are arbitration processes offered to by the CTA. When a shipper and a carrier are unable to negotiate a contract, the shipper can apply for the CTA to appoint an arbitrator to make a legally binding determination on service levels. The arbitrator need not choose exclusively between the two parties' positions (Canadian Transportation Agency, 2016e). Similarly, parties can apply to the CTA for rail arbitration for other disputes with rail carriers including the application of a rate or charge for any movement of goods, road and utility crossings, charges for incidental services, and net salvage value of discontinued lines (Canadian Transportation Agency, 2016f).

unfamiliar with FOA provisions. Moreover, due to the significant time and financial investment required for a shipper to bring a FOA case before the Agency, the usefulness of FOA as a dispute resolution measure is somewhat limited to shippers who possess adequate financial resources to bring a case before the Agency. A complete discussion of the challenges shippers face when attempting to access FOA is explained later in the section.

4.3 The FOA Process

FOA is intended to provide some measure of recourse for shippers that are unable to negotiate mutually acceptable terms on rates, level of service, or both with the railway providing them service. As Emerson (2015) mentions in his review, the ability of FOA to provide a remedy to rates and service conditions is of particular importance to captive shippers who rely on rail service to stay in business but are only serviced by one railway. As the Canada Transportation Act (1996) details, a shipper who has received proposed rates or conditions associated with the movement of goods that they are dissatisfied with may submit a written request to the Canadian Transportation Agency for FOA if the shipper is unable to negotiate a suitable resolution with the railway proposing the rates or conditions. A request for FOA may only be submitted by a shipper. Furthermore, should a shipper intend to make a request for FOA, it must provide notice to the carrier at least five days in advance of doing so (Canadian Transportation Agency, 2018a).

As specified in the Canada Transportation Act (1996), in a submission for FOA a shipper must include its final offer to the carrier with dollar amounts excluded, the period for which the shipper wishes the arbitrator's ruling to apply to (up to a maximum of two years), an undertaking that the shipper agrees to ship the goods to which the arbitration relates to, as well as an agreement to pay half of the costs related to the arbitrator. Finally, if a shipper so wishes, they may list the name of the arbitrator, chosen from the Canadian Transportation Agency's list of qualified arbitrators, that they would like to preside in the case.

Upon a submission for FOA being served to the Agency, both the shipper and carrier are required to submit their final offers, including dollar amounts, within 10 days of the submission being filed. Once both final offers have been received by the Agency, copies of the offers are provided to the respective parties by the Agency. So long as no applications are filed with the Agency by the carrier, the Agency will then at this point refer the matter for arbitration. Importantly, FOA is not a proceeding before the Agency and therefore, the only duty of the Agency

is to determine whether a matter qualifies to be referred to an arbitrator, not to intervene in any part of the arbitration decision (Canada Transportation Act, 1996). Once the Agency has referred a matter for arbitration, the parties have fifteen days to exchange with each other the supporting evidence that they intend to submit to the arbitrator. Upon receipt of this information, each party has the right to submit interrogatories to the other with the requirement of a response within another fifteen days (Canada Transportation Act, 1996). Importantly, a critical feature of the FOA process in Canada is the ability for shippers and carriers to keep all the proceedings confidential, thus allowing them to not have to publicly reveal critical information that is provided to the arbitrator within the proceedings (Monteiro and Atkinson, 2009). Finally, once all of the information has been submitted to the arbitrator and they have considered the final offers of each party, the arbitrator must choose one of the offers as the solution to the impasse. The arbitrator's decision is final and binding in the manner and is in effect for up to two years, or as otherwise requested (Canada Transportation Act, 1996). A final important feature of the FOA process is that at any point, up until the arbitrator has rendered their decision, both parties can request that the Agency terminate the proceedings should they arrive at a resolution to the dispute on their own terms (Monteiro and Atkinson, 2009).

There have been a few adjustments to FOA since it was introduced. The first such change occurred in 1996 when the scope of shippers eligible for FOA was expanded to include, amongst others, shippers of western grain who had previously been excluded (Monteiro and Atkinson, 2009). Additionally, some of the legislated timelines related the arbitration process were slightly adjusted at this time. The next time adjustments were made to the FOA process came in 2000 when efforts were made to allow for a shortened and more streamlined FOA process for disputes that involved rate disputes with values less than $750,000. These amendments also made provision for the option to have a three-person arbitration board if the shipper and carrier both request it rather than the conventional one-person arbitrator scheme (Monteiro and Atkinson, 2009). Further refinement to the FOA process came in 2008 when the ability for groups of shippers to submit for FOA in a joint proceeding became available. As Monteiro and Atkinson (2009) explain, this provision was introduced in order to allow for shippers with a common issue to share the cost of resolving a dispute through FOA, thereby reducing the overall cost for each individual shipper. While there are limitations regarding the ability of shippers to submit a joint application, in cases where a joint application is a permissible option, the measure can provide some recourse against

the significant costs of submitting an FOA case for shippers. The fourth and latest adjustment to the FOA process came in 2018 with the passage of the *Transportation Modernization Act, 2018.* These adjustments included an increase in the limit for disputes that are eligible to be settled under the summary FOA process from $750,000 to $2,000,000, as well as an increase in the period of time that an FOA ruling can apply for by doubling the limit from one year to two (Canadian Transportation Agency, 2018c). Examining witness evidence at parliamentary committee hearings regarding the *Transportation Modernization Act, 2018,* shippers seem to feel that these measures will help to combat the relatively costly process of submitting an FOA dispute. By broadening the number of cases eligible for arbitration through the summary FOA process, it has been rendered more accessible to all shippers because the expedited process is less costly than the conventional FOA process. Additionally, doubling the maximum amount of time over which an FOA ruling applies should make it more worthwhile for a shipper to invest in the process of submitting a dispute for arbitration (Canada, 2017).

4.4 Criticisms of FOA by Shippers in Canada

In 2015 David Emerson was charged with conducting a review of the *Canada Transportation Act, 1987.* As part of the review, dispute resolution mechanisms available to shippers were examined, including FOA. The Emerson report notes that stakeholders reported many of the dispute mechanisms being difficult and expensive for small and medium-sized shippers to use. In witness testimony from committee hearings on the *Transportation Modernization Act, 2018,* a representative from a large Canadian mining company reported that the cost for the business to undertake an FOA case would generally run "in the millions of dollars" (Canada, 2017). An attorney from a prominent Canadian law firm specializing in transportation law also corroborated this figure, stating that the average FOA case would generally cost a shipper a minimum of $1 million (Stuhldreier, 2019). Furthermore, in its submission to the *Canada Transportation Act* Review Panel, the Competition Bureau of Canada (2015) estimated that the costs for a shipper to make an FOA application range from $500,000 to $1 million. Additional criticism included frustration over the fact that while many of the dispute mechanisms are time-consuming, costly, and complicated, the solutions that are provided by certain mechanisms such as FOA were, at the time, only valid for a maximum of one year. Additionally, the review also found shippers complaining that the summary FOA process being limited to situations with a

maximum of $750,000 in freight charges at the time of the review meant that the summary FOA process was unavailable to many shippers due to the cap being relatively low in relation to the freight charges faced by many shippers. As a result, even smaller shippers were being forced to either use the more expensive process of conventional FOA or not use the mechanism at all due to the prohibitive costs of a conventional FOA case. Overall, there certainly seems to be significant evidence that the cost of submitting a dispute for FOA is a significant barrier for some shippers.

Another issue with FOA that was presented by witnesses in the committee hearings regarding the draft legislation of the *Transportation Modernization Act, 2018*, revolved around the perceived information asymmetry that shippers believe exists in the FOA process. As Gallagher and Tougas (2013) explain, because shippers submitting a case for FOA are not privy to the same information regarding costing and rates across the rail network that the railways possess, it results in a decrease in the information base available to a shipper and makes it more difficult for them to protest the railway's rate before the arbitrator. They go on to explain that generally, regarding accurate pricing information, a shipper will only have access to the rates it has been quoted by the railway. While access to public tariff rates is readily available, these rates are generally the highest rate in the market and are of little use to a shipper in determining whether a private quote they have received is reasonable or not (Gillen, 2017). Meanwhile, access to cost information for shippers is even more scant with the only available outside information coming from third-party consultants who can provide shippers with estimates. From this information, shippers can calculate the estimated contribution margin of their shipment and try to convince an arbitrator of its unreasonableness (Gillen, 2017). Meanwhile, the railways have complete information regarding the costs associated with the movement of the shipment, rates for comparable shipments across their entire rail network, and the average contribution margin received from shipments with similar characteristics. In addition to this disparity in information affecting the quality of a shipper's argument before an arbitrator, the lack of information available to shippers also has the effect of increasing the cost of submitting a dispute for FOA due to the need for shippers to hire third party experts to produce rail cost estimates to include in their arguments before the arbitrator (Tougas, 2017).

The issue surrounding information disparity in the FOA process was accentuated since 2009 when Statistics Canada ceased to publish certain railway cost information that had previously been available for shippers to reference when determining the reasonableness of quoted rates and

pursuing FOA action (Gillen, 2017). Related concerns were relayed in committee hearings regarding the *Transportation Modernization Act* when witnesses requested that the committee consider amending the legislation to allow for shippers to request an expert costing review from the Agency in FOA cases without requiring the cooperation of the railway involved in the dispute (Canada, 2017). While this request did not find its way into the legislation, it highlights the frustration in accessing accurate information that shippers experience when trying to utilize FOA. Finally, information problems can inhibit the ability of the parties to arrive at a settlement due to the divergent expectations that result from an asymmetry of information concerning the situation (Farber, 1980). Thus, reducing information asymmetry is an important aspect to achieve the overarching goal of FOA of promoting settlement between parties and reducing the number of disputes that need to end up being decided by the arbitrator.

4.5 Criticisms of FOA by Canadian Railways

The railways have also expressed certain criticisms regarding FOA and its place in Canadian rail regulation that is briefly discussed in this section. As Monteiro and Atkinson (2009) note, a general complaint from the railways is that they feel that FOA is a regulation that favours shippers. One of the aspects of FOA that favours shippers is the fact that shippers can spend time preparing their case prior to applying for FOA, while the railways are forced to formulate their response within the legislated time limits (Mongeau, 2014). Furthermore, Mongeau criticized the fact that the process has become highly legalistic over time. The Railway Association of Canada (2015) also criticizes the fact that the FOA process only considers the individual case of the shipper involved in the case and ignores the fact that they are just one piece in an entire network. The submission by the association warns that by forcing railways to serve one customer in a certain way through an FOA decision could cause the rest of the rail network to suffer.

4.6 Experimental Work in FOA

Since FOA gained popularity as a dispute resolution mechanism in the 1970's, there has been a considerable amount of work in the FOA literature that utilizes experimental economics to explore various aspects of the widely used regulatory tool. Topics that previous experimental studies have focused on have included variances in the dispute rates associated with various types of arbitration mechanisms (Ashenfelter et al., 1992), the investigation of final offer strategies

(Deck and Farmer, 2009), and the effects of risk aversion under FOA (McCallister, 1987) to name a few. A review of some of the various experiments that have been conducted has been useful in informing some of the approaches that are taken in the experimental design that is outlined in the following section.

4.7 An FOA Experiment

In this experiment, I attempted to design a stylized game that would closely map onto the reality of the Canadian FOA process in rail shipping. While many of the experiments in the literature have either focused specifically on the theory of FOA or else on its use specific to salary disputes, to our knowledge there have been no prior experiments attempted that incorporate elements specific to the use of FOA as a dispute resolution mechanism in a transportation policy context. We note again that Canadian rail shippers have identified both the cost of FOA, as well as a lack of access to adequate costing and pricing information relevant to individual cases, as two major issues that currently hinder the effectiveness of the process. As such, the experiments conducted aimed to investigate the effects that these two issues have on the ability of FOA to remain as an effective pro-competitive policy measure in Canadian rail.

4.7.1 Experimental Design

The experiments were conducted using an open-source web framework known as "oTree." Due to Covid-19 restrictions, the experiments could not be conducted on site at the Canadian Hub for Applied and Social Research (CHASR) laboratory at the University of Saskatchewan as originally planned. Participants were instead recruited online from the CHASR research participant pool and assigned a session. Participants would log in to their session at their assigned time via an internet-connected device and then perform the experiment. A total of six different FOA sessions were run, with 50 individual participants taking part.

The basic design uses two players paired with each other for a total of twenty rounds. This allows us to capture any reputation effects that can exist between shippers and a railway in reality. Both players knew that they would be paired with the same partner throughout the game, but player identities remained anonymous, and no communication occurred between the two partners at any point in the game. In the game, both players were tasked with jointly arriving at a solution that

divided a fixed endowment, a procedure common to several prior FOA related experiments. The endowment was an arbitrarily allocated value of 100 units.

As has been commonly done in other FOA experiments, the arbitrator (in this case the computer) chose a unique "fair value" from a random distribution at the beginning of each round. The specific value that was chosen remained unknown to the players but the distribution from which the value was drawn was known to the players. Players were provided with one minute to submit their offers to the arbitrator. Once the offers were submitted, the offer that had the smallest absolute difference in value from the randomly chosen "fair value" was declared the winning offer. At the conclusion of each round, players were notified whether their offer or their opponent's offer was chosen by the arbitrator. Additionally, both players were notified of the payout that they received from that round of play once the round was completed. The player who submitted the "winning" offer in a given round received a payout equal to the offer that they submitted. Their opponent received a payout equal to the endowment (100 units) less the winning player's offer.

Two different treatments were administered in order to test the two issues identified in this paper as being aspects of FOA that decrease its effectiveness for shippers. One treatment is a variance of the contract length that is being arbitrated and the other treatment deals with varying the degree of information asymmetry present between the two players.

As previously mentioned, lengthening the enforcement duration of an FOA arbitrator ruling has been called for and this was altered slightly in recent changes to Canadian transport legislation. By increasing the duration of any given ruling, the fixed costs of submitting an FOA case are spread over a greater period of time for both parties, but especially the shipper. Additionally, I hypothesize that by increasing the length of time that an arbitrator ruling can be enforced, this will serve as an incentive for players to be more moderate in their submitted offers to the arbitrator, as the stakes of "losing" in any individual arbitration are increased. In my experiment, players were notified at the beginning of each round whether they were negotiating over a 1-year contract or a 2-year contract. In the case of a 1-year contract, the player submitting a "winning" bid received a payout equal to that bid. However, in the case of a 2-year contract, the player submitting a "winning" bid received a payout equal to 2x their bid, as the bid was enforced for an additional virtual year during which neither player was able to do anything to alter their payout. Similarly, the player submitting the "losing" bid received an amount equal to the

endowment (100) less the winning player's bid in the case of 1-year contracts and received twice this amount in the case of 2-year contracts.

The treatment I chose as per information asymmetry involved providing the players with a differing amount of information regarding the distribution from which the computer arbitrator would be choosing the "fair value." In the first case of symmetrical information, it was revealed to both players that the range of the distribution from which the "fair value" would be chosen was 0-100. In this first scenario, neither player had an advantage in regard to their knowledge of what the arbitrator might choose as a "fair value."

A second subset of subjects were subjected to the strong information asymmetry treatment. In this case, the participant designated as "Player One" was provided with extra information regarding the range from which the arbitrator's "fair value" would be chosen for the particular round. In the case of strong information asymmetry, "Player One" was provided with a relatively narrow range of only 20 units. Each round, this player was provided with one of seven different ranges that the chosen "fair value" for that round would fall into including 50-70, 55-75, 60-80, 65-85, 70-90, 75-95 and 80-100. Meanwhile, "Player Two" was only told that the "fair value" for each round would fall somewhere between 0-100. This information advantage was meant to simulate the asymmetry that might occur in a real FOA case between an experienced railway who has participated in the FOA process before and has access to the railway costing information regarding a particular shipping contract, and a small shipper who perhaps has little prior experience with FOA and is forced to guess at what a railway costing model might look like for the shipments under dispute.

The third treatment was similar to the second treatment but the information advantage was not as great for "Player One." Rather than being provided with a 20-unit range within which the "fair value" would fall, "Player One" was only provided with a 40-unit range. Each round, they were presented with one of three ranges within which the "fair value" would be chosen – 50-90, 55-95, and 60-100. Meanwhile, "Player Two" continued to receive the same limited information as in the second treatment, simply being informed that the range from which the "fair value" would be chosen would be between 0 and 100. As stated previously, this information asymmetry was meant to simulate the conditions that might exist in an actual FOA process between a shipper and a railway. The variance in the degree of information asymmetry was introduced as a means of testing the sensitivity and robustness of the findings.

Participant compensation was provided at an average of $15.00 per participant. Players were guaranteed a minimum compensation of $10.00 each. An additional $10.00 was then divided between the partners based on their performance throughout the duration of the experiment. Performance was judged solely based off arbitrator payouts received by each player. This payout structure was explained to participants prior to the commencement of any game play. At the conclusion of the experiment, most players ended up receiving a total payout between $13.50 and $17.50 as compensation for their time and their gameplay performance.

4.7.2 Summary of Results from Case 1: Symmetric Information

The first results displayed below in Table 4.0 are for participants who played the game with no information asymmetry. Both players were simply told that the arbitrator's preferred fair value would be chosen from a range of 0-100. However, during the twenty rounds that they players played the game, they were randomly assigned a contract length of either 1 year or 2 years. In total, data from this iteration of play was collected from 160 rounds of play between eight pairs of participants, providing a total of 320 data points. Data collected from each round included each player's bid, the arbitrator's preferred value, contract length, and the payouts received by each participant. Included in the summary statistics below are the maximum average bid value submitted, the average spread between participant bid values submitted, and the average spread between participant bids and the arbitrator's preferred value.

Table 4.0: Summary Statistics of Case 1 - Symmetric Information

	1-Year Contract Length	2-Year Contract Length
Average Player Bid Value	54.54	58.83
Average Spread b/w Player Bids	18.96	18.10
Average Spread b/w Player Bids & Arbitrator Value	28.08	27.10
Number of Observations	160	160

As the summary statistics show, the average value of the bids submitted by players increased slightly when players were in arbitration over a contract with a longer length. However, the average spread between player bids decreased in relation to contract length. Additionally, the average spread between player bids and the arbitrator's preferred value also decreased.

4.7.3 Summary of Results from Case 2: Strong Information Asymmetry

The results displayed below in Table 4.1 are for participants who played the game with strong information asymmetry. Player 1 was given a large information advantage in regards to the range from which the arbitrator's "fair value" would be chosen, as compared to what was revealed to Player 2. In total, data from this iteration of play was collected from 120 rounds of play between six pairs of participants, providing a total of 240 separate observations.

Table 4.1: Summary Statistics of Case 2 - Strong Asymmetric Information

	1-Year Contract Length	2-Year Contract Length
Average Player Bid Value	69.75	71.05
Average Spread b/w Player Bids	14.93	12.01
Average Spread b/w Player Bids & Arbitrator Value	14.86	11.80
Number of Observations	120	120

As the summary statistics show, average player bid values increased with the longer contract length, as was seen in the case of symmetrical information. Also, similarly to the first case, both the spread between player bids and the spread between player bids and arbitrator value decreased as the contract length was increased. However, this effect appeared to be even more pronounced in the case of strong information asymmetry.

4.7.4 Summary of Results from Case 3: Weak Information Asymmetry

The results displayed below in Table 4.2 are for participants who played the game with weak information asymmetry. Player 1 was given an information advantage in regards to the range from which the arbitrator's "fair value" would be chosen, as compared to what was revealed to Player 2. However, this advantage was not as great as the advantage received by Player 1 participants in the previous case of strong information asymmetry. In total, data from this iteration of play was collected from 220 rounds of play between eleven pairs of participants, providing a total of 440 separate observations.

Table 4.2: Summary Statistics of Case 3 - Weak Asymmetric Information

	1-Year Contract Length	2-Year Contract Length
Average Player Bid Value	70.90	70.15
Average Spread b/w Player Bids	19.26	18.73
Average Spread b/w Player Bids & Arbitrator Value	17.68	17.64
Number of Observations	220	220

As the summary statistics show, in the environment of weak information asymmetry, the average player bid value showed little variation between 1-year and 2-year contract lengths. The trends of smaller player bid spreads and smaller player/arbitrator bid spreads in 2-year contracts continued, albeit at a reduced magnitude compared to the figures observed amongst participants who faced strong information asymmetry. The following section will include results from econometric tests conducted on the data and will include more discussion in regards to the experimental data collected.

4.7.5 Analysis of Arbitration Wins, Bid Spread, and Payouts

All data analysis was conducted using Stata 15.1 software. A random effects GLS regression model was used to analyze several aspects of the FOA results that were collected in the experiments. The first aspect of the process that was analyzed was the effect that various treatments

had on the likelihood that a given player would win a particular round of arbitration. Table 4.3 displays the results for the analysis of the factors that influence the likelihood that a Player 1 type player would win a particular round of arbitration. As a Player 1 win constitutes a Player 2 loss, an analysis of these factors from the perspective of a Player 2 type player would have simply yielded the inverse of the results found in the table.

As seen in Table 4.3, the length of the contract being arbitrated does not appear to correspond with any significant change in the likelihood that a Player 1 participant will win a particular round. However, the presence of information asymmetry does correspond with a significant difference in the likelihood of winning. As expected, because Player 1 type participants receive extra information in treatments where information asymmetry is present, the presence of asymmetry of information is associated with an increased likelihood of winning a particular round. In the case of strong asymmetry, the extra information received by Player 1 participants corresponded with a 21-percentage point increase in the likelihood of them winning a particular round. This finding was highly statistically significant. In the case of weak asymmetry, the extra information received by Player 1 participants was associated with an 11-percentage point increase in the likelihood of winning a particular round. This finding was statistically significant at the 5 percent level.

Table 4.3: Random Effects Model of Player 1 Arbitration Wins

	Coefficient	Std. Error	z-value	p-value	Significance
1-Year Contract	0.01	0.03	0.27	0.79	
Strong Asymmetry	0.21	0.06	3.74	0.00	***
Weak Asymmetry	0.11	0.05	2.26	0.02	**
Constant	0.51	0.04	12.70	0.00	***

*** p<.01, ** p<.05, * p<.1

Table 4.4 displays the results for the analysis of how the spread between bids from the two players in each round corresponded to the various treatments. As can be seen, neither changes in contract length nor the degree of information asymmetry produced results that were statistically significant at the 10% level. However, the trend of shorter contract length corresponding with an

increase in the spread between submitted player bids can be observed and produced a p-value just outside of the 10% confidence level. Further discussion regarding why we failed to find results of statistical significance takes place in the next section.

Table 4.4: Random Effects Model of The Spread Between Player Bids

	Coefficient	Std. Error	z-value	p-value	Significance
1-Year Contract	1.21	0.78	1.56	0.12	
Strong Asymmetry	-5.06	4.20	-1.20	0.23	
Weak Asymmetry	0.47	3.62	0.13	0.90	
Constant	17.93	2.78	6.45	0.00	***

*** p<.01, ** p<.05, * p<.1

The final tables of results that will be presented in this paper can be found in Table 4.5 and Table 4.6. In these tests, I examined the associated effects of the various treatments in relation to the expected arbitrated payouts to both types of players. The payouts compared were all based on a one year equivalent, assuming a discount rate of zero for the purposes of this exercise. That is, payouts awarded for 2-year contracts were divided by two in order to compare all payouts based on the award that a player would be receiving for a single year. Table 4.5 displays the results for Player 1 payouts and Table 4.6 displays the results for Player 2 type participants.

Table 4.5: Random Effects Model of Player 1 Expected Yearly Payout

	Coefficient	Std. Error	z-value	p-value	Significance
Player 2 Wins	-36.07	1.41	-25.60	0.00	***
1-Year Contract	2.09	1.31	1.59	0.11	
Strong Asymmetry	1.06	3.17	0.34	0.74	
Weak Asymmetry	1.60	2.77	0.58	0.56	
Arbitrator Value	-0.08	0.03	-2.36	0.02	**
Constant	73.59	2.84	25.92	0.00	***

*** p<.01, ** p<.05, * p<.1

As Table 4.5 shows, the most statistically and economically significant variable was whether or not Player 2's offer was chosen as the winning offer by the arbitrator. Of course, this is not surprising, but it is of interest as it provides a magnitude to the payout losses suffered by Player 1 when their bid fails to meet the arbitrator's criterion of being chosen as the winning bid. When the arbitrator fails to select Player 1's submission as the winning bid, it is associated with a 36.07 unit decrease in Player 1 single year payout. This represents a significant impact on player payout and underlines the importance of a player being successful in submitting an offer that is as close as possible to the arbitrator's "fair value" in order to avoid suffering a significant payout hit.

The table in Table 4.6 tells a very similar story regarding the expected yearly payouts for a Player 2 type participant. Once again, the biggest and most statistically significant impact is associated with the opponent's bid being selected as the winning bid. Similar to the results in Table 4.5, the economic impact of losing a round of arbitration is, on average, quite significant for the losing player.

Table 4.6: Random Effects Model of Player 2 Expected Yearly Payout

	Coefficient	Std. Error	z-value	p-value	Significance
Player 1 Wins	-36.11	1.44	-25.19	0.00	***
1-Year Contract	-2.06	1.34	-1.54	0.12	
Strong Asymmetry	-0.61	3.04	-0.20	0.84	
Weak Asymmetry	-1.54	2.66	-0.58	0.56	
Arbitrator Value	0.09	0.04	2.59	0.01	**
Constant	61.69	2.76	22.33	0.00	***

*** p<.01, ** p<.05, * p<0.1

4.7.6 Results and Discussion

Perhaps the starkest result yielded by my experiments is that information asymmetry amongst participants in an FOA process can result in the party with more information being greatly favored to submit a winning bid, and as a result, receive the more favorable economic outcome. While varying the contract length did produce trends that matched my prior hypothesis, I failed to produce statistically significant results at a 10% confidence level. This could have occurred for a

number of reasons. Firstly, perhaps contract length does not have as significant of an effect on influencing the spread between player bids as I originally hypothesized. Alternatively, perhaps more significant results would be observed if the longer contract was for a greater amount of time rather than just a one-year increase. For example, a more significant response might have been observed if the longer term contract was over a (virtual) period of five years rather than two. Finally, there is the possibility that the design of my experiment failed to adequately convey to some participants that the stakes were twice as high in relation to their final payouts when they were in a 2-year contract length situation. Regardless, several conclusions can be drawn in order to provide context to the policy discussions surrounding the use of FOA in disputes between shippers and railways.

My findings do suggest that steps need to be taken to ensure that information asymmetry is minimized between FOA parties in order to ensure that both participants are approaching the negotiations on a level playing field. The first step for policymakers in Canada would be to ascertain whether or not information asymmetry currently exists between shippers and railways in an FOA context and, if it does, to assess the degree of asymmetry present. As my results suggest, if it is determined that a significant amount of information asymmetry is present, it is critical that steps be taken to correct this to ensure more fairness within the FOA process. Corrective action such as the release of actual or modelled railway costing data through the regulator may need to be considered.

Additionally, my results hint that the duration of the arbitrator's ruling might offer a potential avenue of encouraging more moderate bids from parties participating in FOA. As suggested by the trend observed amongst the spread in player bid values, lengthening the term of rulings may provide a means of reducing extreme offers from the parties, encouraging them to submit more moderate offers due to the higher stakes of being locked into the arbitrated decision for a longer period of time. This moderation of offers could help to promote the ultimate goal of FOA – the settlement of the dispute between the two parties prior to a ruling being handed down by the arbitrator.

4.7.7 Limitations and Further Research

One limitation of this study is the fact that unlike true FOA, there was no opportunity for the two players to settle the dispute amongst themselves rather than relying fully on the arbitrator

to choose a winner and allocate payouts. Due to the complexities involved with designing such a game, I chose to focus instead on certain aspects of the FOA process applicable in situations where the parties proceed with the arbitrator making a final binding ruling. However, investigating further the influence that some of these factors might have on settlement rates would be a fruitful area of research. Additionally, including the opportunity for parties to settle rather than proceed with arbitration would allow for the modelling of the costliness associated with proceeding with FOA. It would be of utmost interest to better understand how cost, contract length, and information asymmetry all relate to a shipper's decision to initiate FOA or not and subsequently, to choose to settle at any point in the proceedings or to continue all the way through to the arbitrator handing down a binding decision.

Another limitation of the experiment is the fact that exit interviews could not be conducted to garner information regarding participant's experience playing the game. Without exit interviews, there was no way to gauge the level of participant engagement. Further research that focuses on gathering data from a pool of participants with a known vested interest in rail negotiation outcomes might provide an interesting data set for comparison to the results acquired in this experiment.

4.8 Concluding Remarks on Final Offer Arbitration

The majority of this chapter focused on the mechanics of FOA as well as how to design the process so that it can function as a fair and equitable dispute resolution process applicable to rail. However, it is important to note that FOA's effectiveness can extend beyond its use as a reactive recourse. Drawing on the contestable markets literature, the ability of shippers to easily access FOA as a credible threat to rail market power could help promote competitive outcomes without the need to proceed through an actual FOA process. However, for FOA to be viewed as a credible threat by railways over their behavior, FOA needs to be a readily accessible option for shippers. Further research is needed to establish the current level of credibility that the threat of FOA as used in this sector carries for both shippers and carriers in their negotiations. Particularly, the ability of small shippers to use FOA as a credible threat to induce a competitive outcome is questionable due to the financial barriers currently associated with initiating FOA proceedings. And as experimental results presented in this thesis showed, market information asymmetry between shippers and carriers can greatly reduce the ability of FOA to provide fair and competitive

outcomes. In order for FOA to serve as a credible pro-competitive policy moving forward, steps need to be taken to ensure that information asymmetry is minimized between shippers and carriers prior to enacting an FOA proceeding.

Continued attention is required on the issue of how to best promote settlements between competing parties prior to a final offer arbitration ruling. More experimental work that incorporates the ability of players to negotiate a settlement rather than receive an arbitrated solution has the potential to provide great insight into this under-researched area. Changes such as increasing the duration of the applicability of arbitration decisions (from single years to multiple years) might also help to promote desired outcomes.

Chapter 5: Conclusions

5.0 Conclusion

As the Canadian grain handling and transportation system continues to modernize and adapt to a changing world, it is imperative that transportation policy adapts along with it. Due to the structure and importance of the rail sector in Canada, domestic grain shippers feel strongly that they still require regulatory protection to ensure they receive good service at a fair price. At the same time, it is important that the Class 1 railways are sufficiently compensated to allow them to make investments that are necessary for their infrastructure to meet growing market and shipper needs. This leaves a thin line for regulators to tread in order to balance these often competing demands from both sides. In response, the CTA publicly states that it prefers to utilize market forces as a means of shaping the rail sector – and this has called for creative policy-making.

Over the course of this thesis, three main regulatory policies that relate to the transportation of grain by rail were discussed. The chapter regarding the MRE highlighted the history, features, downfalls, and criticisms of this policy, one that is unique to the shipment of Western Canadian grain. Through my investigation of this regulatory tool, it becomes quite apparent that while it was intended that its introduction would usher in an environment of more commercialized rate setting, many of the issues that currently plague the MRE are not dissimilar to those seen in the era of fully regulated rail rates that previously characterized the Western Canadian grain handling sector. Issues such as a lack of comprehensive railway costing information and obscurity surrounding rates and agreements between larger shippers and railways due to a dramatic rise in the use of confidential contracts have led to growing difficulties in accurately assessing the distributional aspects of the policy. While the MRE has been no stranger to scrutiny during reviews, for now it retains its place as a critical piece of regulatory protection for shippers of Western Canadian grain. Any further research and study of this unique regulation has the potential to shape future policy regarding rail freight rates for grain in Western Canada.

In the chapter on interswitching, I aimed to demonstrate using game theory and contestable markets theory that interswitching can provide competitive outcomes without an actual interswitching order having to be called. The interswitching game presented in this chapter demonstrates a theoretical basis for why a shipper's ability to leverage interswitching as a credible

threat can help lead to the delivery of better rail service and Pareto-efficient outcomes. However, this theory could benefit from the validation of its arguments through further research. Avenues of approach might include the design of an experimental game where player strategies could be examined in order to determine if their gameplay matches the hypothesis presented in this thesis.

The final policy investigated was Final Offer Arbitration, a broader relief mechanism not unique to grain transportation. Some of the identified deficiencies of FOA were discussed and then demonstrated using an experimental design. Results from the game generated evidence that asymmetric information between participants in an FOA can result in a significant advantage for the party able to access more detailed information regarding the dispute being arbitrated. However, the experiment was just a simplified version of the process occurring in reality when a shipper utilizes FOA to settle a dispute with a railway. Future research should focus on incorporating some ability for shippers and railway players to negotiate settlements within the experimental game in order to more closely match reality. Additionally, work needs to be done on deciding how this information asymmetry can be best mitigated in the context of Canadian rail shipping. Challenges include the fact that much of the information in question has the potential to be commercially sensitive in nature. Furthermore, additional creativity will be required to allow small shippers to access FOA in a more economical manner. Despite steps that have been taken to try to address this concern, accessing FOA continues to be cost-prohibitive for many small shippers in Canada. Notwithstanding these shortcomings, FOA remains a useful tool in cases where serious rail freight disputes cannot be easily resolved. Thus, continued improvement of this policy is of utmost importance so a greater number of shippers might gain from the benefits it can provide.

The hope is that some of this thesis will serve as both a resource to those less familiar with current Canadian rail regulations, as well as a building block for those looking to pursue research across various aspects of the grain transportation sector. While the theoretical and experimental research done here contributes to our understanding particularly with respect to interswitching and FOA, much work remains to be done in these areas of regulation and competition policy, as under certain conditions, we have shown that both policies can meet the Agency's stated goal of providing market-based solutions in inherently uncompetitive situations. However, these are both measures that have been at various times criticized by both shippers and railways alike, thus presenting an opportunity for identifying related creative solutions that will better societal welfare. Additionally, while this thesis has focused on the transportation of grain by rail, there is the

opportunity for further research into how measures such as FOA and interswitching can be best adapted to fit the unique needs of shippers for other rail-dependent industries in Canada such as lumber, coal, and others. As an export-driven nation, it is important that all parties in the sector continue to work towards the common goal of keeping Canada as a competitive provider of resource-based commodities on the global stage. As we press forward into the future, it is important that the policies in place promote success for all members of the sector to ensure that this overarching goal is met.

Grain handling in Canada promises to continue to provide an interesting field of study in the coming years. With a combination of potential consolidations, new entrants, and recent new infrastructure builds amongst Western Canadian grain handlers, the structure of grain handling continues to evolve. Increasing use of confidential contracting between grain companies and railways continues to complicate rail rate information for farmers, shippers, and researchers. Importantly, it is critical that policy makers consider the impact that future policy might have on the entire grain handling system. Just as past policies, such as those surrounding branch line abandonment, have drastically altered the nature of grain handling and transportation in Western Canada, it is important that the full scope of impacts associated with proposed policy changes are considered for all parties involved – railways, grain handlers, and farmers. Through the implementation of carefully considered policy, regulators can do their part in promoting a healthy and vibrant agricultural sector in Canada for many years to come.

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Extended Interswitching
Car Counts and Savings (Costs) by Route pattern

Car Counts by Routing

	2014-15	2015-16											
	July	August	September	October	November	December	January	February	March	April	May	June	July
Extended IS													
CN-BNSF	104	107	311	6	7	223	9	9	113	115	15	14	111
CN-CP		1	1			1			1		1		
CP-BNSF		52		50		1061	143		32	93	105	180	289
CP-CN								500	10	162	26	78	174
	104	160	312	56	7	1285	152	509	156	370	147	272	574
Leveraged													
CN-CP													
CP-BNSF													
CP-CN													
CP-CP													
	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	104	160	312	56	7	1285	152	509	156	370	147	272	574

Savings/ (Costs)

	2014-15	2015-16											
	July	August	September	October	November	December	January	February	March	April	May	June	July
Extended IS													
CN-BNSF		10,465	20,773	20,773	24,262	38,657	33,961	31,395	30,351	37,413	49,776	47,897	23,805
CN-CP		3,462	3,462			3,488			2,653		3,464		
CP-BNSF		0		0		1,031,151	0		198,919	83,379	135,254	267,628	535,663
CP-CN								5,100	62,162	145,241	33,492	135,149	383,314
	0	13,927	24,236	20,773	24,262	1,073,296	33,961	36,495	294,085	266,033	221,986	450,673	942,782
Leveraged													
CN-CP													
CP-BNSF													
CP-CN													
CP-CP													
	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total		13,927	24,236	20,773	24,262	1,073,296	33,961	36,495	294,085	266,033	221,986	450,673	942,782

Definitions:

Extended IS	**Shipper used extended interswitching (EI)provision to acquire cars from origin to interchange with desired destination carrier**
CN-BNSF	EI from a CN origin and interchanged to BNSF (Private fleet or BNSF supplied cars)
CN-CP	EI from a CN origin and interchanged to CP (Private fleet or CP supplied cars)
CP-BNSF	EI from a CP origin and interchanged to BNSF (Private fleet or BNSF supplied cars)
CP-CN	EI from a CP origin and interchanged to CN (Private fleet or CN supplied cars)
Leveraged	**Shipper used the threat of EI to gain car supply or reduced price**
CN-CP	Leveraged from a CN origin using the interchange to CP as leverage
CP-BNSF	Leveraged from a CP origin using BNSF as a leveraged option
CP-CN	Leveraged from a CP origin using CN as a leveraged option
CP-CP	Leveraged from CP to obtain better price

2016-17											
August	September	October	November	December	January	February	March	April	May	June	July
110	12	18	220	7	13	19	50	129	29	153	24
1		89									
274	347	418	320	308	303	278	622	315	286	276	278
174	92	71	55	190	257	146	62	1217	285	158	111
559	**451**	**596**	**595**	**505**	**573**	**443**	**734**	**1661**	**600**	**587**	**413**
						256					
				22	42	66	67	90	73	60	65
				400	10						
			41	169	414	216	269	203	207	210	178
0	**0**	**0**	**41**	**591**	**466**	**538**	**336**	**293**	**280**	**270**	**243**
559	**451**	**596**	**636**	**1096**	**1039**	**981**	**1070**	**1954**	**880**	**857**	**656**

2016-17											
August	September	October	November	December	January	February	March	April	May	June	July
20,684	42,435	63,281	42,781	24,766	45,501	66,068	177,565	88,478	76,937	129,997	63,672
1,299		0									
497,789	797,081	982,942	735,364	644,251	706,862	658,527	763,764	710,363	756,278	712,227	643,442
384,716	227,462	156,355	106,123	-32,695	13,182	42,712	43,945	-143,185	-58,566	-57,152	-67,824
904,489	**1,066,978**	**1,202,579**	**884,269**	**636,322**	**765,546**	**767,308**	**985,274**	**655,656**	**774,649**	**785,072**	**639,290**
						132,070					
				105,064	26,695	41,910	43,364	58,882	47,152	38,355	39,852
				0	9,900						
			41,046	142,068	409,552	170,981	216,050	167,317	165,161	163,510	133,340
0	**0**	**0**	**41,046**	**247,132**	**446,147**	**344,962**	**259,414**	**226,199**	**212,313**	**201,865**	**173,191**
904,489	**1,066,978**	**1,202,579**	**925,315**	**883,454**	**1,211,692**	**1,112,269**	**1,244,688**	**881,855**	**986,962**	**986,938**	**812,482**

*The data presented does not encompass the entire period over which extended interswitching was enacted but represents all of the information that was made available to the author by the source that provided the data.

Appendix B: Interswitching Game Decision Tree Graphic