

**The Institutional Aspects of
Competitive Access in the
Western Canadian Rail System**

A Thesis

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for the Degree of
Master of Science

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by
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CHAPTER 1 Introduction

1.1 Setting

Transportation is important to the Western Canadian economy because the region is highly dependent on grain production. Grain production in the region is much greater than domestic demand, meaning that much of the grain produced must be exported. In turn, the competitiveness of Canada's grain exports is strongly affected by the cost of moving grain between the areas of grain production and points of export. The distance to ocean port from a farm in the centre of Saskatchewan to the west coast of Canada is over one thousand miles.

Collecting the grain from diffuse production locations to ship to these distant export positions is not an easy task. But it is well established that the most economical mode to transport this grain to export position is via rail. The nearest water ports from which western grain can be shipped by rail are located on the west coast of Canada, in northern Manitoba, or on the edge of Lake Superior. Changes in demand for Canadian grain affects grain volumes through these ports by the grain handling industry, making efficient use of the rail system even more important to the grain trade.

Freight charges still constitute a significant portion of the total cost of producing and marketing grain (Baylis). In addition, world markets for many of the grains grown and marketed by western Canadian farmers are very competitive. The competitiveness of this market means that Canadian producers are unable to pass on any increases in freight rates to consumers of their products. The heavy reliance on rail for grain movement and the fact that rail freight charges constitute a significant portion of the cost of the grain moved mean that an efficient and competitive rail transportation system is crucial for many stakeholders in the agricultural economy.

Concerns about market power in rail meant that the Canadian railway industry has been regulated through the majority of its history (Bonsor, Currie). While at one time there were several railways across Canada, today only two major railways still provide service to the grain industry. Much of rail regulation has centred on the rates railways were permitted to charge for providing transportation services for grain movement. Over time the specifics of the rate regulation have changed from the

published tariffs set in the 1896-97 Crows Nest Pass Agreement to the current formula based grain revenue cap. But the gradual deregulation of freight setting has satisfied neither grain shippers nor the Canadian railways and there continues to be pressure for further regulatory change in the Canadian railway industry (Estey, Minister of Public Works).

Sweden's rail system, like that of many European countries, was run as a state monopoly. Like other state railways, the Swedish railway required significant subsidy from government in order to maintain operations (Gwilliam and Nash). In recent years, the Swedish government seriously considered methods to reduce the level of subsidy and to ensure that rail costs were consistent with other transportation modes (Nilsson 1992).

The Swedish government used vertical separation as the method to address these concerns. Vertical separation involves a separation of different parts of the industry production chain, often by separating ownership. Vertical separation in rail would mean that the network of physical rail track would be functionally separated from the rolling stock of the firms that use the infrastructure to provide rail service¹. The intent of this approach is to separate potentially competitive operational segments and leave the network portion separate because it possesses significant economies of density (Braeutigam). Operationally, this may mean one firm owns the trains and another firm owns the track that they run on.

The use of vertical separation as a tool for rail deregulation followed from examples in other network industries such as telecommunications (Newbery) or the electricity industry (Joskow). The theoretical advantages of vertical separation as well as a large degree of success in the deregulation of telecommunication and electricity have provided reason to be optimistic about the benefits of this approach for the rail sector (BTRE).

Only limited prior research exists pertaining to how competitive access to rail infrastructure could be managed in Canada. A report by Kopiki and Thompson (1995) acknowledged that a diverse set of options exist for restructuring railways, including

¹ The most effective way to create functional separation is through the separation of ownership. Functional separation should be possible, although complicated, even in circumstances of common ownership.

joint asset use and negotiated trackage rights. However, no overt reference is made in their study about increased access to the rail infrastructure in the context to be discussed in this work.

For all its potential benefits, a separated rail network creates several policy dilemmas that need to be resolved. For instance, a separated rail network will still be a monopoly and thus will still have to fall under the scrutiny of appropriate regulation. Relationships between the parties in a newly organized rail industry will become more complex and this will cause problems, especially for general acceptance of any new industrial organization. And finally, it is now understood that without careful restructuring, there can exist incentives for the network operator to under invest in rail infrastructure. At the same time, the prices for accessing rail infrastructure must be maintained at a level that will encourage entry but still provide a reasonable rate of return to the owner of the rail network.

1.2 Need for Study

There has been considerable discussion about reform of the western Canadian grain transportation system in the past decade. Two recent government sponsored studies have been completed but they have left the question of the exact type of policy reform open for discussion. The seminal report released by Judge Willard Estey in 1998 recommended that joint running rights or open access to rail infrastructure should be encouraged as a rail policy (Estey). In a follow up report done by Arthur Kroeger, a more reserved position was taken stressing that further study should be done before introducing any sort of increased access. Finally, in the most recent panel study reviewing current Canadian transportation legislation, a series of recommendations suggest moving closer toward a system of joint running rights in rail (Minister of Public Works). However, there has been little movement on the issue since that report and Canadian railways are still vertically integrated. However, the future of competition policy within the railway sector is still active and research needs to be done on the matter of assessing the merits of alternative rail organization structures.

1.3 Objectives of the Study

This thesis discusses and compares two alternate systems of rail organisation that have evolved at various times and places, vertical integration and vertical separation. Under Canada's current vertically integrated system, pricing distortions can arise if market power is exercised by the incumbent rail firms. This discourages competition in the rail industry. The costs and sources of this market power will be discussed.

In this thesis, I will compare and contrast two very different institutional structures in the rail industry by examining the industrial organization of the railway industries in both Canada and Sweden. While being of direct use to potential future rail policy in this country, this exercise will also inform policy and regulations in Canada about potential alternative organisation structures for industries that have characteristics similar to rail.

Implementing a vertically separated industrial structure would present new problems and incentives for the Canadian rail sector. Under a system of vertically separated infrastructure, competition needs to be fostered among those firms providing rail service. Yet current models stress that infrastructure will need to remain integrated to maintain the economies of scale present. Therefore, transaction costs will exist between users of the rail infrastructure and the administrators of the infrastructure, rather than between actors internal to the firm. Finding appropriate prices to access the rail infrastructure, implementing effective rail traffic control and safety measures, and providing efficient co-ordination and pricing of new investment and infrastructure maintenance are complicated by the presence of these transactions costs. Alternative methods to grant rail firms access to the track infrastructure need to be evaluated.

If the rationale about natural monopoly holds only for a portion of an integrated rail firm, then we need to examine whether or not railways in Canada should remain vertically integrated. Furthermore, institutions that have evolved within a framework of vertically integrated, regulated railways need to be assessed to determine their fit in a cost minimising, deregulated railway system.

The discussion of efficient institutions in our context will rest on some key ideas. In no particular order market power must be controlled, incentives for investment must be maintained and transaction costs must be minimised. The goals of controlling market

power, maintaining correct investment incentives, and minimising transactions costs may conflict with each other such that some tradeoff among the three will likely be optimal. It will also be important that these three goals continue to be achieved over time.

I will argue that the system of regulatory oversight of the vertically integrated rail industry in Canada developed mostly as a consequence of historical circumstance, and does not represent the only feasible industry structure for Canadian rail. Vertical integration is only one of many possible organisational structures that can exist in network industries, and experience worldwide with rail regulation and policy has shown that there are other organisational structures that may be applicable to Canada.

1.4 Organisation of the Study

The purpose of this study is to compare the institutional structures in the rail industries of Canada and Sweden. Special focus will be on the use of vertical separation of rail operations and rail infrastructure. Chapter 2 presents a review of theory relevant to this examination. A model of the organisation of a rail system is introduced. Relevant theory about market failures in the rail sector, market power, transactions costs and a discussion of pricing access to rail infrastructure are all examined in this chapter. Next, Chapter 3 presents a detailed case study of the western Canadian railway system. The history of Canadian rail regulation is discussed, while emphasis is placed on the current competitive provisions of the Canada Transportation Act. Chapter 4 details a case study of the Swedish rail system. While this chapter briefly outlines the history of Swedish rail regulation, of greater importance is a discussion of the Swedish rail system reforms that resulted in vertical separation. Equally important are the market responses from the Swedish State Railway and other rail firms that have operated in the Swedish market. Chapter 5 presents an analysis and discussion of these competing systems of rail organisation. The key features of the Canadian vertically integrated system will be compared with those of the Swedish vertically separated system. This discussion will also focus on the problems and shortcomings with implementing the theoretical models discussed in Chapter 2 in the Canadian context. Chapter 6 concludes the thesis with an overview comparing Canada's rail system to that of Sweden. Each system's strengths and weaknesses are summarized. The chapter concludes by evaluating other explorations

in this line of research, including the foreseeable difficulties with implementing radical institutional change in the Canadian rail industry.

CHAPTER 2 Economic Issues in the Modern Rail Industry

2.1 A Transactions Cost Model of a Rail System

One of the primary models used in this thesis to study the comparative merits of railway industrial organization is that of transactions cost analysis (Coase). Central to this paradigm is the idea that considerable uncertainty exists in many economic transactions and this complexity leads to additional costs when these transactions have to be conducted within traditional markets. A simple example of a transaction cost is the cost of writing a complete sales contract to account for all contingencies resulting from a given transaction.

As a result of the potential costs, many transactions are not conducted through traditional markets. Instead, an organization called a firm has evolved to facilitate and lower the cost of various input transactions. Firms exist as a cost minimising way of organizing these transactions. Clearly, the optimal scale of the firm is related to the avoided cost or complexity of the input transactions inherent to its operations. Therefore, what we are interested in is whether or not the transactions between the elements of a railway operation are less costly as a whole when performed within a single, vertically integrated firm, or whether some other form of rail organization might produce better results for society.

To facilitate the exposition of economic theory used in this study and to aid in later analysis, a simple model of a rail network is presented to clarify the concept of a rail network and vertical separation.

A graphical representation of a transactional rail system is presented in Figure 2.1. A rail system refers to the physical infrastructure and human capital necessary to move goods on a network of fixed rail track. This infrastructure includes rail cars and engines, employees and the administration that renders operations functional. This representation also segments the rail system into customers, operators, rail administration, the physical rail track, and construction and maintenance. These units, and the transactions between them, are in turn affected by factors exogenous to the rail system itself. These factors include government regulation and competition from other

modes of transportation. Further descriptions of the transactions units and their relationships are given in section 2.1.1.

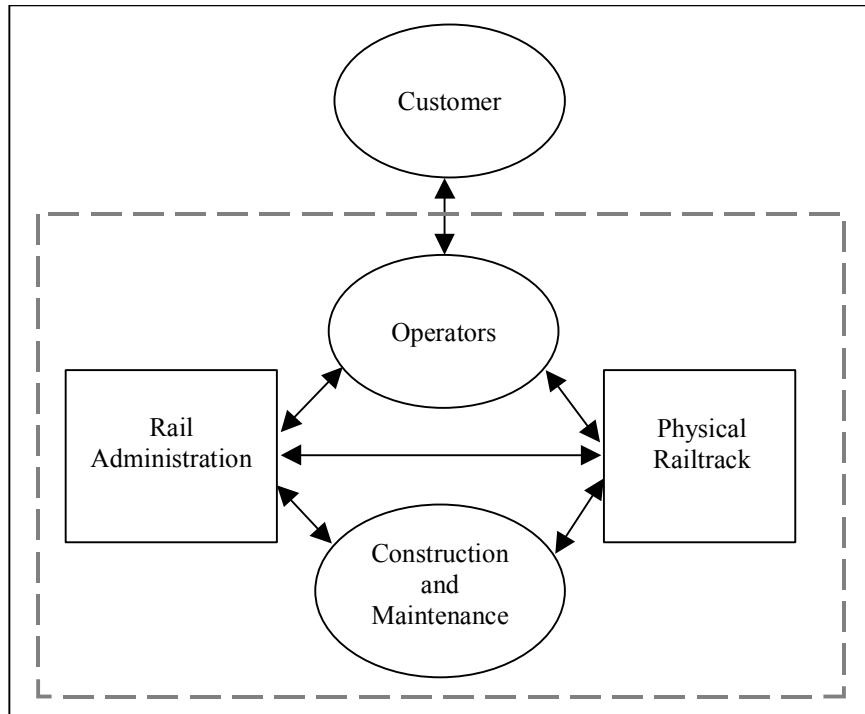


Figure 2.1 Transactions Units in a Rail System

Note that the dashed box in Figure 2.1 represents the elements that constitute part of a typical North American railway. In this case, the railway owns and controls the rail track that it operates, owns and controls the operating section that runs on the track, is responsible for construction and maintenance work on the network and co-ordinates operations between all sections of its business. The railway has to acquire customers from outside the railway firm. In our representation, the rail customer is not inside the box.

There is a case where all the transactions elements in Figure 2.1 are contained inside the box. Consider a small railway owned by an iron ore mine that hauls ore from the mine site to a smelter. This railway owns and controls the rail track that it operates on, owns and controls the operating section that runs on the track, is responsible for construction and maintenance work on the network and co-ordinates operations between

all sections of its business. But in this case the railway's customers, the iron ore mine and smelter, are also owned and controlled by the same company. Thus, one firm owns and controls all the elements of the railway.

It is also possible to create a situation where none of the elements listed here fall inside the dashed box. Consider a system where the rail track is owned by one group of agents, where the one or many rail operators do not have total control over the network, where one or more firms contract to do construction work and where the relationships between the groups is managed by an independent administration. In this system, the various operators contract all customer service individually. In fact, this is the example of a vertically separated railway, where vertical separation refers to the separation of relevant parts of a production process. Effectively, separation means that different economic agents control different parts of the production process. In the case of a rail system, separation might mean that one agent controls the rolling stock while another controls the physical network or track. It is clear that this system is markedly different from the typical North American freight railway described previously.

2.1.1 Transaction Units in a Rail System

The economic efficiency of a vertically separated network can be evaluated through those relationships that are in place between the units that transact within the network (Williamson). What might be part of an integrated system and thus typically considered as a single firm can in fact be separated and treated as a system of separate transactional units. In a vertically integrated system, the transactions that occur between the units are made outside the market yet inside the firm. To examine organisation in a vertically separated system, transaction units will necessarily be distinct economic entities, interacting through the appropriate market. We need to define each transaction unit for a rail system. In this light, a brief description of the units shown in figure 2.1 is presented.

Customer. The customer is the economic actor demanding the "end good." In transportation industries, traditionally this end good has been either the movement of freight or the movement of people. This good possesses both a measure of physical quantity that needs to be moved, as well as a measure of service quality that needs to be satisfied. Physical quantity usually takes the form of tonnes of cargo to be moved some

distance or the number of persons travelling some distance. Service quality means getting the goods to their destination on time or persons to their destination at an acceptable level of comfort by an acceptable time (reliability).

Operators. Operators are the companies that run the trains on the rail track. They are responsible for physically moving the persons or goods from one point to another along the rail network. Depending on the relationship with the other parts of the rail system the operators' responsibility may extend beyond this.

Rail Administration. As a network, all users of the rail track need to be co-ordinated. This applies both to the physical use of the network but also to the investment decisions regarding infrastructure expansion and maintenance. Rail administration is the unit responsible for performing these allocation and decision making functions. Compared with other modes of transport, rail transport has very restrictive physical conditions placed on it because unlike a road or airspace, it must often be confined to a single directional movement on a rail track (Bruzelius, Jensen and Sjöstedt). This physical constraint heightens the importance of the agent performing network co-ordination.

Physical Rail Track. The rail track represents the physical assets that make up the rail network including the rail itself, but also include elements such as sidings, marshalling facilities, loading terminals and passenger stations.

Construction and Maintenance. The network infrastructure itself must be maintained. As well, new rail track may be built and old rail track removed. This element represents those economic agents responsible for performing the maintenance and construction work on the infrastructure.

2.1.1.1 Environmental Factors

Two additional factors in the rail industry are not transactions units as considered above but they still play large roles in a rail system. These factors are intermodal competition and government intervention.

Intermodal Competition. Railways are frequently in competition with other modes of transportation. Competition comes from trucking, marine shipping, inland barge movement, and air transport. For passenger service, competition comes from private automobiles, motor coach and air transport. These other modes play a role in the

rail market by creating competition through the threat of extant rail shippers moving their business to these other modes. In fact in many jurisdictions, rail market share has been declining against these other modes of transportation, underlining this area's importance to the rail market. The strength of intermodal competition affects the other units. Viewing rail as a competitor with other modes of transport may add emphasis to the importance of rail service quality in customer decision making.

Government Intervention. Government regulation plays an important role in most network industries and rail is no different. Regulation interacts with all areas and can be considered like an operations blanket that covers all the units. Regulation affects the units themselves but more importantly the transactions between them. Government also impacts how different modes of transport can compete through the way in which different modes are taxed and how different environmental externalities from different modes are treated.

2.1.2 Transaction Linkages in a Rail System

The units described here are connected by the transactions that link the system. Several of the economic units are connected to more than one other unit. A graphical representation of the linkages is contained in Figure 2.1. Different transaction linkages will be discussed in turn.

Customer – Operators. This linkage represents the marketing relationship between the shipper and the carrier. Transactions occur when the shipper sets out a product to be moved with a certain, sometimes implicit, service level required. This transaction is usually done through a market. As mentioned above, it is possible this relation can be transacted within the firm. This occurs when a shipper owns its own rolling stock and also moves its own products.

Operators – Rail Administration. This linkage represents the co-ordination mechanism that exists between the various operators on a rail network. The rail administration is responsible for planning rail movements in a way that is efficient for the network. This relation will also depend upon the operators' obligations to the customer, the rail administration obligations to construction and maintenance companies and also the constraints of the physical rail network itself.

Operators – Physical Rail Track. This relation represents the need for the

physical use of the rail track by the rail operators. Interaction between the two units includes safety measures that need to be in place for operators to use the track. It will also include the requirement for the track to be of a minimum quality for safe operation. If the system operator is not, in fact, independent from other firms in the industry, then there can be problems with the system operator implementing technical standards with the goal of improving one firm's competitive position. Problems could also arise from the controlling firm preventing technical improvements to the network to maintain its competitive position relative to innovative firms.

Rail Administration – Construction and Maintenance. This relation represents how new construction and maintenance work is implemented by the rail administration. Construction and maintenance of track will cause disruptions in the train schedule and tradeoffs may have to be made with the rail operators.

Rail Administration – Physical Rail Track. This describes how the rail administration manages the physical railway track with respect to maintenance and construction planning, including the possibility of downsizing and track abandonment.

Construction and Maintenance – Physical Rail Track. This relation refers to the quality of the work done on the railway track. It is assumed that the agent responsible for doing any construction or maintenance is able to do the work. This linkage is of little interest for this analysis.

Intermodal Competition. Intermodal competition's relationship with the rail system is largely implicit. A rail system may be affected in this manner if a rail operator also has large interests in other modes of transportation. Intermodal competition would impact the operator transaction unit and these would flow through to the other parts of the rail system. Intermodal competition may also affect how public monies are spent on road networks and other public infrastructure versus rail. As will be described in chapters three and four, government intervention can play a large role in determining the relation between rail and other transportation modes. Through regulation or taxation, government policy has often affected the competitiveness of one mode of transport over another (Bonsor).

Now that I have introduced the basic notion of transactions cost analysis as applied to railway organization, we will next examine other theoretical issues that will

arise in the context of assessing the comparative industrial organizations of the Canadian and Swedish railway industries.

2.2 Market Failures/Distortions in Rail Transportation

This thesis also examines the nature of market failure in transportation systems and how new institutional economics can be used to help construct an optimal organization of the rail system. Rail freight transportation, at least with respect to the grain handling system in Canada, does not possess the characteristics of a perfectly competitive market. For instance, not every railway produces a homogenous good - different railways operate networks that connect different locations, market participants often do not have perfect information on market conditions, and finally, individual railways can often influence market price (Carlton and Perloff). These conditions can result in market distortions that in turn lead to inefficient use of resources due to incorrect pricing. This sequence of events is called market failure (Carlton and Perloff). Such distortions in the market may also pass incorrect signals for other system participants, causing them to act in ways that cause economic losses and inefficiencies.

What follows is a description of issues that are important to the study of rail economics in general, along with descriptions of the relevant theory that will be subsequently used in the case studies and analysis.

2.2.1 Economics of the Rail Industry

Rail transport involves the physical movement of people or physical goods from a point of origin to a point of destination. The capital used to do this is constrained to run on a system of physically fixed track. Due to these physical constraints, discussions in railway economics have held technical issues in high importance.

The way this industry is organised depends on factors such as economies of scale, economies of density, economies of scope and the characteristics of being a part of a network. These technical issues have been argued to be the fundamental determinant for both firm and market structure in the rail industry (Bruzelius, Jensen and Sjöstedt). This fundamental determinant in turn implies that economic activity in the rail industry is constrained by the physical attributes and cost structure of the rail network.

In sum, the fundamentals of railway cost structure represent a deviation from the

conditions of perfect competition and costs will affect the price of rail service in the market. A discussion follows of the four main ideas used to describe the cost structure of the rail industry: economies of scale, economies of density, economies of scope and network theory.

2.2.1.1 Economies of Scale (natural monopoly)

Among railway analysts, there has long been a traditional belief that railway firms exhibit significant economies of scale and should therefore be treated in the regulatory arena as a natural monopoly. Economies of scale describe the structure of the average cost curve of a firm. If a firm's average costs are declining throughout the entire relevant range of demand then economies of scale, or cost reductions with greater output, are present. This decline in the average cost curve over large ranges of output is due to the large amount of fixed costs that must be incurred in order to operate. Additionally, a consequence of this cost structure is that it is optimal for only a single firm to serve the industry output. And this firm will need to charge a price that is above its marginal cost in order to cover its total costs. This is graphically shown in Figure 2.2 below.

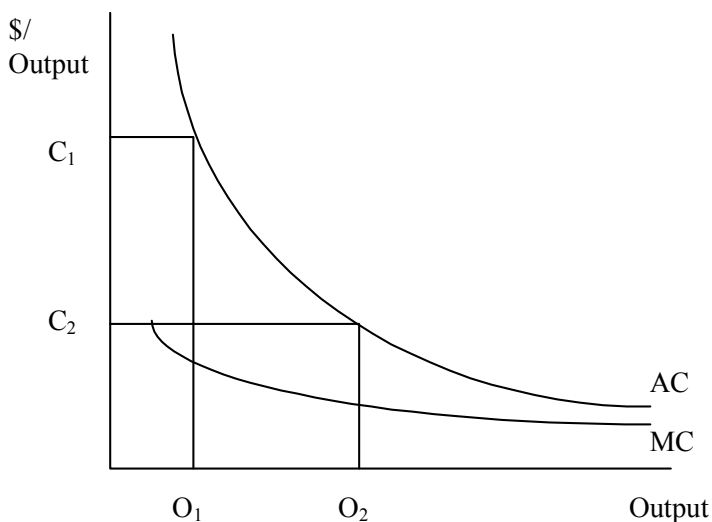


Figure 2.2 Economies of Scale

The AC line shows the average cost to the firm on the vertical axis and the amount of output on the horizontal axis. As the firm's output increases from O_1 to O_2 , while the firm's average cost decreases from C_1 to C_2 . In this way, to produce the good

at the least cost implies that a single firm should produce all of the output.

In many contexts, the concept of economies of scale is considered only at the firm level. Especially for network industries, many economists now believe that scale economies do not necessarily apply to all transactions units of an individual firm (BTRE).

In the rail sector, there are important differences between the various transaction units. In fact, the cost structure for rolling stock, marketing functions and construction and maintenance activities likely do not exhibit economies of scale. The physical network consisting of the rail tracks, other infrastructure and administration probably do possess some economies of scale. Differences in the cost structures of units within a vertically integrated rail firm may make it cost efficient to functionally separate those units exhibiting economies of scale from those with other cost structures. For the rail industry, re-structuring has meant ownership separation of the rail track from all other units in rail operations. When referring to economies of scale in this thesis, we are referring to economies of scale that are present in rail infrastructure alone.

Some empirical work suggests that economies of scale do not exist for large U.S. rail firms. An important study by Caves et al. found that there could well be economies of scale for small carriers but for medium and large sized carriers, there appear to be constant returns to scale. This result hints at the need to treat the physical rail network as a separate transactional unit within a large railway.

2.2.1.2 Economies of Density

Economies of density in transportation industries refers to a situation where average cost decreases due to more traffic on any existing infrastructure or network. This notion is more subtle yet distinct from economies of scale because economies of scale imply that the size of the network must increase to reduce costs. With economies of density, cost reductions to the firm come from increases in traffic on all parts of an existing network. Economies of density have been found in recent empirical work on railways (Caves, Christensen, Tretheway and Windle, Braeutigam). In addition, the presence of economies of density is more pronounced when allowance is made for unobservable network effects, which are designed to account for characteristics of a transportation network that cannot be captured by simple output measures.

For any rail network, economies of density can become diseconomies above some level of utilization. This happens when the amount of traffic on the network exceeds capacity and creates congestion. In this case, the presence of congestion on the whole or even on a part of the network means that the overall cost of using the network increases. This increased cost may come from lost time while waiting to access the congested part of the network or costs from physical damage (i.e. spoilage) to goods using the congested part of the network.

2.2.1.3 Economies of Scope

Economies of scope in rail exist when it is cost saving to jointly offer two services within one firm compared to two specialised firms offering services separately. The idea is that a firm can achieve a lower cost of producing any single good when it produces at least one other, possibly similar, good. The production of each good infers a cost reduction for the production of the others. Algebraically, the cost function of a firm producing multiple goods in this less costly manner is subadditive. The existence of common inputs in production, particularly specialised inputs such as knowledge and other human capital, are important sources of economies of scope (Carlton and Perloff).

Since vertically integrated railways have substantial common inputs in the form of the rail infrastructure, theory would lead us to believe that there would be substantial economies of scope in the rail industry. In fact, empirical work (Braeutigam) has provided evidence to the contrary and suggests that there are actually no economies of scope in rail, at least among U.S firms. Braeutigam's research examined two different rail products, both passenger and freight transportation. Passenger and freight rail service share one key input because of a common need to use a rail network. The absence of economies of scope may be explained by the fact that the technical requirements of service quality and the logistics associated with freight movement are significantly different than for passenger movement.

2.2.1.4 The Economics of Networks

Since all trains must run on track that is interconnected, rail systems form a physical network. The field of network economics offers at least two important insights to the study of rail systems. One is the idea of network externalities. In the rail context,

network externalities are benefits that are created when another node is added to an existing network. This externality arises because there are benefits to all existing users of the network through access to new users. While the potential for increased customer access is the positive externality, conversely the potential for decreased use due to network congestion is the potential negative network externality. In general, the larger the network, the greater the overall benefits to all users of the network.

The magnitude of network externalities in network industries has been the subject of some debate (Liebowitz and Margolis). Some have argued that the generality of the definition of a network externality renders it meaningless. This situation could be remedied by an improved definition of market externality that would differentiate between externalities that cause market failures and those that do not². Another reason to be sceptical of the prevalence of network externalities as a benefit to large, integrated networks is that certain networks may reach a size where additional expansion no longer provides any marginal benefits.

Though these criticisms are valid, for the particular case of rail transport they do not apply. Network externalities are still present in the Canadian rail industry because all potential users are connected and benefit from the connection. With reference to the theory, network considerations in rail are not concerned about whether it is cheaper to move freight by rail because the existence of many rail networks has reduced the price of leasing a locomotive (a network effect). Instead, the issue is that any shipper could benefit from having high connectivity to any other shipper. This potential benefit could include any shippers served by another railway or a shipper who is not currently served by rail. Anecdotally, concerns in the rail industry about the cost of switching cars between carriers and possible inefficient routing when this occurs suggest that there are positive network externalities in rail networks (BTRE).

The second contribution of network economics is the idea that network incompatibility may be exploited as a method of market exclusion (Economides and White). In a system where one or few firms have control over what standards must be met to use the network, this control may be used in a way that will benefit them and

² It is suggested that externalities that do not cause market failures could be named “network effects” (Liebowitz and Margolis)

make operations for competing firms more difficult – in this way network standards can be used as a barrier to entry. Exclusion of other operators by the rail track owner is clearly a very important component of rail organization.

2.2.2 Why rail organization matters: Issues pertaining to market power

Rail markets are characterised by large sunk costs³ and few firms in any one marketplace, therefore, market power continues to be a concern in the rail industry. Market power is defined as the ability of a firm to raise price profitably over marginal cost (Carlton and Perloff). To do this, the firm must be able to charge a price above average cost, and concurrently, it must be able to prevent new firms from entering the market.

2.2.2.1 Deadweight Loss

To maximise profits, a firm with market power can restrict supply. The firm has an incentive to restrict supply up to a point where the marginal cost of production is equal to the marginal revenue earned from the transaction. This is illustrated in Figure 2.3 at the point where $MC = MR$. This action raises the price paid for the good or service from P_C , the competitive price, to P_M , the monopoly price. Quantity traded on the market is reduced from the competitive quantity, Q_C to the monopolistic quantity, Q_M . As a result of these changes in the market, losses to society are created. These losses are termed deadweight loss from monopoly. The shaded area in figure 2.3 represents the losses created by the use of the selling firm's market power. These losses are a result of resources that are not used in the best interests of society.

³ The definition and discussion of sunk costs can be found in section 2.2.3.1.1.

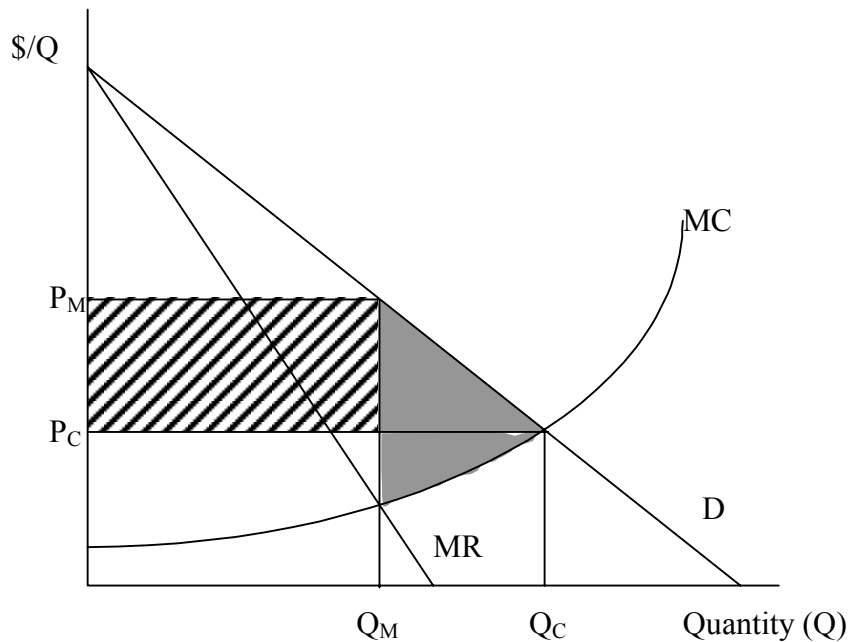


Figure 2.3 Deadweight Loss in a Market With a Monopoly Seller

Market power also results in a transfer of surplus from consumers to the firm with market power. The surplus that is transferred from consumers to the firm is represented in figure 2.3 by the diagonal hatched area. Economically, these transfers in themselves do not necessarily imply a loss to society, but if the firm uses resources to acquire and maintain monopoly power, rather than let the resources be put to their best use, additional losses will be created (Posner).

2.2.2.2 Third Degree Price Discrimination

Price discrimination refers to the practice of charging different prices to different customers. One type of price discrimination occurs when a firm charges different prices for the same good or service in two different markets with different demand conditions. This type of price discrimination is called third degree price discrimination. There must be different demands in the two markets and there must not exist an opportunity for customers in one market to resell the good or service to the other market. This is certainly the case for rail transportation, as one cannot resell the movement of a commodity to another person. The effects of third degree price discrimination in two

markets are shown in the graph below. In Figure 2.4, the demand in market one is very inelastic with demand curve D_1 and corresponding marginal revenue curve MR_1 .

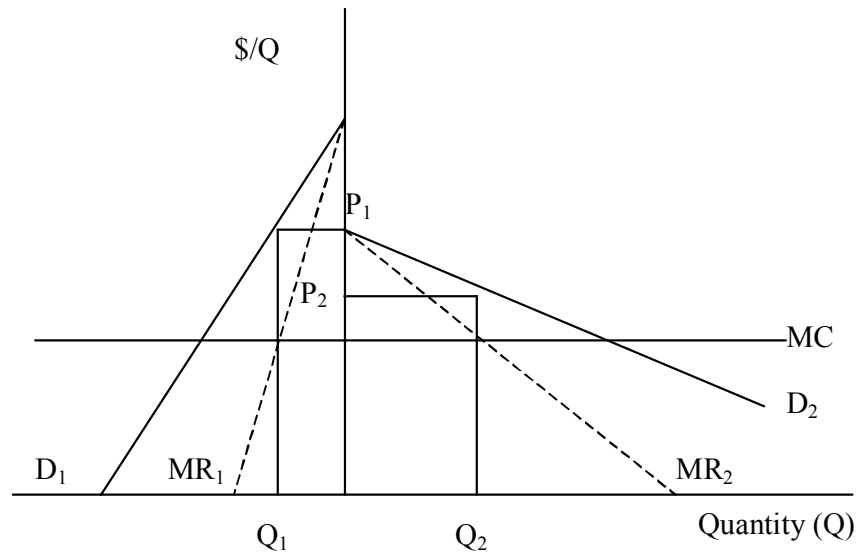


Figure 2.4 Third Degree Price Discrimination in Two Markets

The second market has a more elastic demand and a demand curve of D_2 with a corresponding marginal revenue curve of MR_2 (MC is assumed constant throughout the relevant range of output). To maximise profits, the firm will produce where MR is equal to MC . But since the firm can distinguish between the two markets, it will end up producing at the point where $MR_1 = MC = MR_2$. From the firm's perspective, this is superior to a situation where the firm charges one averaged market price, since with price discrimination the firm can charge a higher price to the inelastic portion of the market without losing many customers and increasing profits. The firm then decreases the market price to the elastic market and gains customers, again increasing profits.

The welfare effect on consumers depends on whether the consumer is in market 1 or market 2. Compared to a situation in which each market is independent, we find that consumers in market one (the inelastic demand market) will lose surplus as they will be charged a higher price and consume less. Consumers in market 2 (the more elastic demand market) will gain surplus as they are charged a lower price and consume more. In this way, the practice of third degree price discrimination can have considerable distributional effects between groups of consumers.

2.2.2.3 X-efficiency

Another item associated with the existence of market power is the existence of x-efficiency (Leibenstein, Shepherd 1990). X-inefficiency exists when a firm operates at a point above its theoretical least cost curve (Viscusi, Vernon and Harrington). This means that firms may purchase and use more than the optimal amount of all inputs, including labour.

X-efficiency relates to market power since some argue that firms possessing monopoly power will never achieve x-efficiency. The argument is that they are not forced to compete in the marketplace and do not have to invest in new technologies in order to decrease costs. Factors such as managerial laziness, pursuit of non-business goals and risk averse behaviour will also contribute to this problem. With market power, these x-inefficient firms do not exit the industry or lose money and are protected by the economic rent they earn from their market power. The inefficiencies of monopoly firms can be more pronounced since they will be hidden by the excess profits or rents that are earned.

These firms' inefficient use of resources represents a loss to society. There are also potentially larger losses to society when innovations that would have been undertaken in a competitive environment are not pursued. The possibility of cost saving or service enhancing changes from innovation not being undertaken due to x-inefficiency is crucial because the magnitude of these losses could be quite large (Ferguson and Ferguson).

Economists do not universally accept the argument that x-inefficient firms exist. The opposing view is that the fundamental economic desire to prefer more to less applies to firms with market power as well as those that do not (Carlton and Perloff). In order to maximise profits, a firm with market power will want to minimize costs. If considered in this way, the incentives for a firm with market power could be identical to those of a firm in a perfectly competitive market.

2.2.3 Other market typology relevant to railway organization: contestability

When discussing the behaviour of firms with economies of scale or of those firms who may have market power, an overview of the theory of contestable markets is useful. A market is contestable when a firm faces competitive pressure on the price it can charge from another firm that is not currently operating in that market. In other words, contestability assumes there are conditions in the market such that outside firms can simply enter the market if they are able to earn economic profits from doing so. A market is contestable if there are any such firms capable of entering and exiting and producing in the particular industry (Carlton and Perloff).

If a market is truly contestable, then the incumbent firm cannot set price above marginal cost and cannot earn economic rents. If an incumbent firm was pricing a good in a manner that could earn economic rent, then conditions for contestability assert that another firm would readily enter the market, produce the same good, set price lower than the incumbent firm, and still earn an above normal return. This threat of potential entry causes economic rents to disappear and the outcome of the market to be efficient. With such a threat of entry, firms already in the market must price efficiently.

Two conditions must exist for the mechanism of contestability to be viable. These are free entry into the industry and free exit from the industry. In turn, for free entry and exit to exist, a number of other conditions will have to be met. For instance, sunk costs must be small and there can be no institutional barriers to exit or entry in the industry. Extended discussion of barriers to exit and entry can be found in section 2.2.3.1.

The most theoretically pure form of a contestable market is the “ultra-free entry” or “hit-and-run entry”. For a market to be perfectly contestable, three conditions must be possible (Shepherd 1990). Entry must be free and without limit, meaning that the entrant should be able to entirely displace the incumbent if this would mean the lowest cost of industry production. Entry should also be absolute, meaning that the entrant should be able to enter without the incumbent being able to reduce its price in response to that entry, and the firm that has the lowest costs should displace the higher cost firm. Finally, entry should be perfectly reversible for the potential entrants. It is important to note that the U.S. rail regulator (the Surface Transportation Board) uses a test derived from

contestability theory to compute upper permissible limits on freight rates in those cases where a shipper formally files a complaint about excessive pricing.

Given its importance to rail regulation in the U.S., we note that there is considerable criticism about the effectiveness of contestability in applied situations, including from within the rail sector (Tye 1990, Shepherd 1995⁴). Essentially, the three conditions that constitute a perfectly contestable market seem to be impossible to meet. It is not easy to find an industry lacking barriers to entry and the condition of an entrant completely and quickly displacing the incumbent would be very difficult to meet.

The use of contestable market theory is then limited to those situations where the market is not perfectly contestable but yet competitive pressures from possible entry actually impose some price discipline on firms that operate in the market. The example of the airline industry in the U.S. is offered as a nearly ideal contestable market by the several authors (Baumol, Panzar and Willig) but other observers note that some airlines possess market power (Phillips, Shepherd 1990). The debate about airlines casts serious doubt on the importance of contestability theory as applied to the regulation of the rail sector.

2.2.3.1 Barriers to Entry

Barriers to entry are conditions that prevent firms from entering or exiting a market. A formal definition proposed by the proponents of contestability theory is that “an entry barrier is anything that requires an expenditure by a new entrant into an industry, but imposes no equivalent cost upon an incumbent.” This definition differs from that of earlier ones in that it does not consider economies of scale as a barrier to entry (Baumol, Panzar and Willig). This is due to the fact that both the incumbent and the entrant are assumed to be subject to the same technologies and therefore face the same cost structure. In this way economies of scale do not form a barrier to entry.

Shepherd (1990) offers a more specific definition of barriers to entry. He characterises barriers to entry as coming from two sources: exogenous and endogenous. Exogenous sources are those that are outside of an incumbent firm’s control. These include factors that relate to the technology used in the industry, capital requirements

⁴ These sources present the debate around the usefulness of contestability theory as it applies to real

and the nature of the product sold. Shepherd (1990) distinguishes among eight different sources. An additional exogenous barrier to entry is included from his later work (Shepherd 1998);

1. **Capital Requirements.** The size and reputation of an established firm give it an advantage through its ability to access cheaper capital. This advantage may also apply to patents, favourable access to raw materials and favourable access to location.
2. **Economies of Scale.** Where production exhibits economies of scale, incumbents with large market share may have a cost advantage over a new entrant. The likelihood of high market shares in an industry with economies of scale means that incumbents will be more likely to collude to punish any new entrant.
3. **Product Differentiation.** Established firms may create customer loyalty to brands or may use advertising campaigns to the detriment of an entrant. This argument may work in reverse however, in that the entrant may be able to use advertising to its advantage as well.
4. **Absolute Cost Advantages.** The incumbent firm may have absolute cost advantages from factors such as superior talent and differential wage rates as well as from random luck. Of course, these factors could also apply to an entrant.
5. **Diversification.** Firms that operate in more than one market have the ability to transfer resources to specific areas to combat entry. Research and development, marketing and financial management are three areas where this could create an advantage.
6. **Research and Development Intensity.** Certain markets need a great deal of research and development before a firm may enter. These expenditures will be even larger if the research and development must be long term in nature.
7. **High Durability of Firm-Specific Capital.** If entry requires the entrant to incur sunk costs, this creates a barrier to entry. Advertising, low opportunity cost assets and research and development are examples.

policy debates and also give references to other sources.

8. Vertical Integration. An entrant may be forced to enter into two markets to compete with vertically integrated incumbents. This will raise the capital requirements of entry and possibly increase the risk of entry.
9. Formal, official barriers set by government agencies or industry-wide groups. These are usually regulatory barriers or legal oligopolies that may limit the ease of new entry.

Barriers to entry caused by endogenous sources are those that are caused by actions of the incumbent firm. These actions may include threats to take measures that will harm the entrant should entry actually occur. Shepherd identifies seven different types of endogenous barriers (Shepherd 1990, Shepherd 1998).

1. Retaliation and pre-emptive actions. These are actions that incumbents can take to harm an entrant. Price decreases, advertising campaigns, and actions in other markets are all possible manifestations of this barrier.
2. Excess Capacity. By building and maintaining excess capacity, an incumbent commits to retaliating against any entrants. This point touches upon the idea of credible threats, a concept that will be discussed further in section 2.2.3.1.2.
3. Selling Expenses, Including Advertising. Actions by the incumbent firm can create the need for any entrant to incur these expenses. This barrier is another way of looking at product differentiation.
4. Patents. Patents allow firms to control key innovations. Through strategic use of patents, firms may control entry into the market.
5. Control over other strategic resources. Incumbent firms may gain control over key inputs or marketing channels through exclusive contracting or vertical integration. This point generalises points four and six in this section.
6. “Packing the Product Space.” Incumbent firms may differentiate products and fill the market with their items. This has the effect of preventing niches for new entrants to exploit.
7. Secrecy about crucial competitive conditions. Incumbent firms may take measures to limit the dissemination of market information. This increases the risk of entry and possibly increases the cost of capital for new entrants.

As this discussion indicates, the theory surrounding what constitutes a barrier to entry is still not completely defined, leaving room for debate about the existence and magnitude of barriers to entry in any industry. What is clear from the theory is that barriers to entry are an integral part of contestability theory. Through the costs they impose on potential entrants, barriers to entry work against contestability in any market. Strategic action may make entry unprofitable in the short run, as product price would decrease to an unprofitable level. An increase in the potential loss from entry increases the uncertainty of entry and will accordingly make it less appealing.

Alternately, barriers to entry are not always considered by policymakers to be a burden to society. Barriers to entry are sometimes offered as a solution for protecting large economies of scale, scope or density in utility-type industries (Tye 1990). This attitude often occurs as part of a process of industrial liberalization, where government decides it will not or cannot continue to provide direct subsidies to high fixed cost industries. In this case, a natural monopoly industry will find that it must employ systematic price discrimination to recover large fixed costs.⁵ Therefore to allow the natural monopolist to be able to price discriminate in the interest of economic efficiency, barriers to entry may need to be created to actually prevent the market from becoming contested – whereby the latter could lead to eventual market failure.

2.2.3.1.1 Sunk Costs

Sunk costs are an important common element of barriers to entry. A sunk cost is any cost that, once incurred, cannot be fully recovered at a later time (Berg and Tschirhart). These costs are expenses for services and for the purchase of specific assets that cannot be resold or can only be resold at a significant loss. A special issue that results from a consideration of sunk costs is the following: costs that will not be recouped if a firm decides to leave a market affect the firm's likelihood of entering that market in the first place. To restate this in the language above, a barrier to exit is also a barrier to entry.

Many of the barriers to entry described above are considered sunk costs. Certain physical assets, advertising, and research and development are sunk costs since, once

⁵ This practice is referred to as Ramsey pricing and is discussed in more detail in section 2.3.2.

resources are invested in them, they are usually only useful in the market that they were developed for. If a firm were to leave the industry before it could recoup its investments in, for example, research and development, the investments in research and development would be considered sunk. For a firm that is considering entering a market, sunk costs are equivalent to risk. This is the case because when a firm enters a market and makes sunk investments, any retaliatory behaviour that causes it to leave the market will also mean that the firm will have received no return on its sunk costs.

2.2.3.1.2 Credible Commitments, Credible Threats and Entry

When discussing excess capacity as a barrier to entry in section 2.2.3.1, we noted that this committed the incumbent to retaliating against an entrant. The economic term for such an investment is a “credible threat”, so called because it indicates that the firm is credible in its threat to attack any entrant. The credibility of the threat comes from the fact that it will be more profitable for the incumbent to bring its excess capacity into production than let the entrant produce.

Incurring sunk costs may also serve as a way for a firm to avoid retaliation by incumbent firms. An entrant can make an investment that commits the entrant to staying in an industry. This investment is termed a “credible commitment” (Williamson 1983). By way of example, a credible commitment occurs in the following situation: in period one, a firm enters a given market and incurs one million dollars of costs that are sunk. In period two, when the entrant and the incumbent decide how to price, the entrant knows that the incumbent is better off to stay in the market than lose its one million dollars in sunk costs. This gaming logic in turn limits entry into the market.

2.2.4 Optimal organization and transactions costs theory

As alluded to earlier in this chapter, an understanding of transactions costs is crucial to a comparative study of railway organizations. We will now detail this theory in a more general context.

In his now famous paper, Ronald Coase (1937) described his reasoning as to why all transactions do not happen through the market economy. In its essence, the explanation clarifies the reasons for the existence of firms in an economic system. Firms are created as a cost minimising method of organising certain transactions. The simple

reason for a transaction to happen inside a firm is that it must be less costly for the transaction to occur inside the firm than for the transaction to happen through the market. In his seminal work, Coase was vague about the exact nature of the costs of using market mechanisms. He noted that there were marketing costs as well as tax savings as a result of transactions taking place inside a firm. Today, transactions costs are discussed in the context of four specific issues. These issues are uncertainty, bounded rationality, opportunism, and asset specificity (Carlton and Perloff).

Uncertainty refers to the fact that the future is unknown and no prediction can be guaranteed to be accurate. Even complex planning for the future may lead to outcomes that cannot be envisioned or anticipated.

Bounded rationality refers to the idea that people make rational decisions but, due to the constraints of uncertainty and the costliness of information, these decisions are not perfect. The decision-maker is bounded by the information constraints that he faces. The existence of bounded rationality means that all contracts must necessarily be incomplete (Williamson 1988), since no agent can write a perfect contract - they lack the perfect information to do so.

Opportunism is an assumption about behaviour that postulates people will behave in a self-interested manner even with the intent of guile. When combined with imperfect information, this means that a person will respond to unforeseeable conditions in a way that will benefit himself or herself, expectedly at the cost of another person.

Finally, an asset is said to be specific if its value in its second best use is significantly less than its value in its intended use. This means that if the asset is not employed in the use for which it is intended, one could sell it or use it for some other purpose only at a price much less than what it cost to make or what its value could be (Tirole, Laffont and Tirole). Common examples are speciality dies and mouldings in the manufacturing industry.

For the rail industry, rolling stock is likely to be specific since other than use in rail, it has no value. The track itself is certainly specific since if there are no trains running on it, it is valueless. Asset specificity is important in leading to transactions costs because specific assets compound risks arising from the above three factors. If an asset were not at all specific, effects of uncertainty, bounded rationality and opportunism

would be irrelevant because in the case of a change in circumstances, any asset could be traded without any economic loss to its owner. With asset specificity, a change of circumstances in the future would put the owner of an asset at risk. The risk comes from the fact that if the owner were to trade the asset, the asset would have a value in that trade less than its cost to the owner. In this way, an owner of a specific asset is exposed to a loss.

2.2.4.1 Extensions: the hold up problem

The hold up problem is founded in asset specificity. In order to justify investment in a specific asset, its potential owner expects that the asset will be put to its first best use. Uncertainty dictates that all possible outcomes cannot be anticipated and that people will act opportunistically. These conditions will lead to problems in the future. After the asset is purchased the other party may attempt to renegotiate the contract. When renegotiation occurs, the owner of the specific asset will be in a weak bargaining situation. If the other party refuses to pay what was originally expected, then the asset owner has the option to continue bargaining or to walk away from negotiation and use the asset for its next best value. If the other party knows that this is the case, the other party can ask for terms that are just above the second best value and still have the asset owner agree to continue in the transaction. It is in the asset owner's interest to negotiate since he is still getting more than he would in the second best use. At the time of purchase, the asset owner was expecting more and after the renegotiation may actually be losing money. Since the asset owner will be aware of the risk that he faces by investing in this specific asset, he may decide not to buy the asset at all and avoid the future risks that it entails. In this manner, the investment is "held up", and is a problem since an investment is foregone that would have brought an improvement to society's welfare and a Pareto improving investment would be missed.

2.2.4.2 Monitoring and Enforcement Costs

Ex post of a transaction, monitoring and enforcement costs become important. When a contract is used to complete a transaction, both parties must comply with the terms of the contract. The risk that the other party in the contract will not follow their commitments is related to the possibility of opportunistic behaviour. In order to ensure

that the other party will follow the terms of a contract, costs will need to be incurred in order to monitor the other party's actions and enforce the terms of the contract should they be broken (Shy). These costs can be substantial, especially when it is difficult to monitor the other party's actions. For this reason, contracts often include provisions that are designed to aid in the process of monitoring and enforcing. In many cases, it is all but impossible for these measures to account for all possible future outcomes.

2.2.4.2.1 Regulation as a contract: the theory of regulatory capture

In a regulated industry, as is the case with rail in North America, the regulator is tasked with monitoring firms' behaviour in order to enforce its regulations. Regulatory capture was suggested by Stigler as a situation where regulated firms in an industry actively seek and persuade government to enact regulation that will result in benefits for the existing firms in the industry (Carlton and Perloff, Stigler). This benefit may come from the firms enjoying beneficial price rules, or creating regulatory barriers to entry in order to discourage new firms from entering an industry and increasing competition. In this way the regulatory agency is assisting the firms it is supposed to be regulating.

In addition, the regulator may be at a disadvantage when it comes to monitoring firms behaviour. There are three reasons why a regulator is likely to be captured (Asch and Seneca). First, regulatory commissions may be staffed with industry experts who may have had previous employment in the regulated firms; second, those staff members who have not worked in the industry may expect to use their knowledge to gain future employment with the regulated firms; third, regulatory agencies have limited budgets and are therefore limited in the amount of information they are able to collect, analyse and act on. The firms under regulation can therefore influence what information is communicated to the regulator and will likely have input on how the information is interpreted. Regulatory capture will result in less effective regulation.

2.2.4.2.2 Contract theory and regulation: the principal-agent problem

In instances where one individual or firm hires another individual or firm to perform a task or to provide a service, a contractual relationship is formed. The party doing the hiring is called the principal and the party performing the task is called the agent. Due to uncertainty of future events that impact this relationship, along with

bounded rationality of the principal and the potential for opportunistic behaviour by the agent, the design of the contractual relationship between the principal and agent is contingent on information issues. In particular, the contractual relationship needs to be set up with the goal of inducing the agent to perform in a manner that benefits both principal and agent.

There are two particular information issues that stem from the principal agent problem and these are relevant to a discussion of optimal regulation. The first is the issue of adverse selection and the second is the issue of moral hazard. Tirole (1992) calls adverse selection the hidden knowledge problem, whereas moral hazard is called the hidden action problem.

Adverse selection occurs during the principal's initial choice of agents, where the agent has information about some exogenous variable that the principal does not. One relevant example where informational issues can arise is called the procurement problem. Suppose a government wants to procure and write a contract on some amount of a public good, and only one firm has the knowledge or capacity to supply this good. In addition, the government has imperfect information about the actual costs associated with this project. In this case, exogenous variables refer to such items as the technical requirements for the firm to complete the project as well as its opportunity costs. In those cases when the firm is better informed about these factors than government, government faces an adverse selection problem with respect to procurement (Laffont and Tirole).

Conversely, moral hazard concerns the ability of the firm or agent to privately hold from the principle information about the impact that uncertainty in future states of nature will have on the outcome of the agent's effort (Tirole, Shy). Moral hazard in the procurement problem arises when the firm does not make public private information, in particular concerning endogenous variables such as post-contractual management decisions, which help determine the firm's final production costs. Note that endogenous variables cannot usually be contracted upon ex ante by government because in most cases, they are not verifiable in a legal sense (Laffont and Tirole).

Ultimately, the design of a contract that reduces adverse selection or moral hazard in the procurement problem will be unique under each of these informational situations.

For adverse selection and moral hazard problems respectively, the optimal incentive contracts are known as low - (firm bears a small fraction of its costs) or high- (firm bears a significant fraction of its costs) powered contracts in the regulatory literature (Laffont and Tirole, Shy).

2.3 Regulatory pricing of rail transactions

One possible transactional relationship for a railway that we explore in this work is that of the functional separation of track and rolling stock. In such an open or shared physical network, a critical parameter is obviously the price that operators will pay to use the network. This is called an access price. This section will outline some theoretical aspects of network access pricing. Problems with generating efficient network access prices have led to the development of regulated pricing schemes purported to be more appropriate for the pricing of railway infrastructure. In turn, we discuss the concepts of average cost pricing, Ramsey pricing and the efficient component pricing rule.

2.3.1 Average Cost Pricing

The competitive ideal of marginal cost pricing may be infeasible for industries that have a large portion of total cost that is fixed. As discussed above, rail falls into this situation. As shown in figure 2.2, for an industry that has average total costs declining throughout the relevant range of demand, marginal cost will always be below the average cost. This means that a firm charging marginal cost will not be able to recover the total cost of their operations. In fact, the first best method of pricing in this situation is for the firm to price at marginal cost and use some other mechanism (i.e. subsidy) to cover the fixed costs of operations. The subsidy option is often politically impractical to implement. One method of circumventing this problem is to use average cost pricing.

In practice, average cost prices are calculated by taking the total costs that the firm expects to incur over the relevant period, divided by the expected activity over that period. This results in a charge per unit of activity that will cover the total costs of a firm's operations. However, this idea works only when the firm is producing one product and selling to one type of customer. This allows the costs to be averaged over output (Valletti and Estache). When the firm produces multiple outputs or sells to multiple types of customers, average cost pricing is no longer feasible. Plus, the

deadweight losses of average cost pricing will be higher for multi-output firms than alternate pricing methods.

2.3.2 Ramsey Pricing

Ramsey pricing describes the use of linear price discrimination to reduce societal losses due to the presence of large fixed costs in pricing. This pricing scheme stems from the fact that in a market with differentiated products, different products will have different demands. By charging different products different rates, overall welfare losses in the market can be reduced.

The Ramsey pricing rule is the following: $\frac{P_i - MC_i}{P_i} = \frac{\lambda}{e_i}$ where P_i is the price of good i , MC_i is the marginal cost of good i , e_i is the demand elasticity of good i and λ (the shadow price or Lagrange multiplier) is a constant (Viscusi, Vernon and Harrington, Berg and Tschirhart). The right hand side of the Ramsey pricing equation means that the optimal price charged will be inversely related to the elasticity of demand so that an inelastic demand will produce a higher price. This is intuitively sensible, since charging a higher price to products with inelastic demand will result in a smaller decrease in consumption, thereby reducing dead-weight loss from differential pricing. It is this property that makes Ramsey pricing theoretically attractive to regulatory economists.

While Ramsey pricing is similar to third-degree price discrimination (section 2.2.2.2), there is one fundamental difference between the two pricing regimes. Under third degree price discrimination, the firm reduces output in each market until the marginal cost of production is equal to the marginal revenue from selling. This means that third degree price discrimination is a profit maximising strategy. Conversely, Ramsey pricing implies that the regulated firm should reduce output proportionately in each market until total revenues are just equal to total costs. Thus, Ramsey pricing results in pricing that just covers total costs, with the least deadweight loss to society (Viscusi, Vernon and Harrington).

This chapter first presented a novel model of rail transportation provision. The model illustrates the unique and interesting transactional relationships that currently exist between operational units in all modern railways. This framework will be used to

analyze and compare the very different Canadian and Swedish rail systems. In turn, the regulatory theory presented through the remainder of the chapter is crucial for understanding the difficulties facing the Swedish system as it evolves from a state monopoly to a vertically separated rail system that attempts to foster competition within and across various transactional units of the railway.

The theory of transactions costs helps to clarify the relationships that exist or could exist within the vertically integrated Canadian railway system or vertically separated Swedish system, while regulatory theory provides insight into the policies that have been used to guide railway rates and competition in Canada. Staying mindful of the regulatory approach that has guided rail policy to date in both countries as well as the novel transactions cost approach described here, in the next two chapters I construct detailed case histories of the Canadian and Swedish rail systems. Subsequently in Ch. 5, I utilize the transactions cost approach to analyze and compare the two rail systems. Ultimately, it is my intention to draw upon the Swedish example to help motivate a completely new perspective on future policy discussions about the rail industry in Canada.

CHAPTER 3 A Case Study of the Western Canadian Railway System

3.1 Overview

As of 2003, the Canadian rail system had just over 46,000 kilometres of rail track. Of this total, about 60 per cent was owned by Canadian National Railways (CN), while roughly 35 per cent was owned by Canadian Pacific Railways (CP). Much smaller regional railways own and operate the remainder of the rail track. One Canadian rail operator, VIA Rail, owns no rail track but is still a presence in the Canadian rail market because it is the major provider of rail passenger service, collecting about seven per cent of Canadian railway revenue (Kopiki and Thompson). Of the total track in Canada, over 20,000 km is used for transporting western Canadian grain. The Canadian rail system also has a large number of non-trunk or branch lines. These lines are characterised by low traffic volume and in many cases exist only to service one or a few delivery points (Kopiki and Thompson). But Canada's railways are primarily long-haul operators. The average length of haul in Canada is significant; in 1992, the average length of haul for all commodities was 1,141 kilometres (Kopiki and Thompson).

Even with growing efficiency in the rail sector, rail's relative importance in the Canadian economy has been declining. Rail has lost market share to trucks for freight transportation and to cars for passenger transportation. Rail has also not captured much traffic from non-traditional, high value product industries because these sectors now haul by truck (Kopiki and Thompson). Changes in economic activity are illustrated through the traffic density statistics. Traffic density is uneven in Canada, with the traditional manufacturing areas of Ontario and Quebec having low and declining density, while the natural resource rich Saskatchewan and Alberta have high traffic densities.

3.2 Early History of Western Canadian Rail

The early history of rail in western Canada is dominated by the building of rail lines as part of the nation building process. Private railway firms built early Canadian railways, though often with considerable government assistance. One example of

government help granted to a private firm are the land grants and monetary aid that CP received to assist them in finishing a rail link over the Crows Nest Pass (Bonsor). Part of this deal became famously known as the Crows Nest Pass agreement – this is covered in more detail in section 3.2.2.1. Other railway also built rail lines, some with government assistance, and as a result western Canada ultimately ended up with an overbuilt network of rail lines.

These lines were owned by many different rail companies, and in 1917 many of the smaller rail companies in western Canada faced serious financial difficulty. In response to this, the lines of the Intercolonial, Trans-continental, and Canadian Northern railways were taken over by the government and merged in 1919 into a crown corporation called Canadian National Railways. As a crown corporation, CN was expected to act on a competitive basis though in a way that was consistent with the national interest. At the time, CP suggested that the lines of the new CN be amalgamated with those of CP in order to remove the redundancy that came from having competing lines in the same geographic area (Currie).

CN was initially unprofitable. It had a bloated network of rail lines and very little managerial direction. Under Henry Thornton, CN undertook capital expenditures to modernise its operations and also began to divest unprofitable lines and excess labour. This strategy worked until the great depression of the 1930's. In this period of falling freight traffic, CN's financial performance again deteriorated. These losses contributed to the creation of a federal commission to look at the competitive situation faced by the two railways. A description of government regulation of the rail industry is contained in the next section.

3.2.1 Economic Regulation

The history of Canadian rail has been one of evolution in regulation. Early regulations focused on rail rates and rate setting. Later, rate regulation was eased somewhat to allow railways to collectively price within a region of acceptable prices. A description of the regulatory and political evolution of rail in Canada follows.

3.2.1.1 Initial Rates

At the beginning of Canadian rail history, rail rates were based upon standard mileage tariffs. This standard tariff system gradually evolved into a system of differentiated pricing and by the end of the nineteenth century the rate structure had evolved into differing, publicly available, prices for different “classes” of traffic for four different regions of Canada (Scott). As well, volume discounts were eventually introduced for movements between certain origin-destination points. The railways could also offer special commodity based discounts to respond to different market conditions for those commodities. In theoretical terms, a very flexible system of price discrimination had developed.

3.2.1.2 First and Second Railway Acts

Formal government regulation of the rail sector began in 1888 with the Railway Act, legislation that required “rate reasonableness” from the railways. The fact that the government put rate restricting legislation in place suggests there was a common belief that the railways had market power in transportation and that regulation was necessary to counter this power (Kopiki and Thompson). In 1903 the new Railway Act formalised the rate structure that railways could charge and put in place a system of published rates. This meant that the railways could not readily change their rates or service. This Act also put in place the Board of Railway Commissioners (BRC), who were given the power to adjudicate shipper-railway disputes and mandate resolution of these disputes (Currie).

Regional differences amounted for much of the pressure for more rail regulation in the early 1900’s. The BRC had to define what the railway classes actually meant and by doing so, define what rate reasonableness meant. Since most freight movements happened under the maximum rates decided by the BRC, shippers and the railways closely followed their decisions.

3.2.1.3 Maritime Freight Rate Act (MFRA)

In 1925-7 an inquiry was held looking into freight rates in Canada. This investigation resulted in a federal policy designed to reduce rates by 20 per cent within and into the maritime provinces. To compensate the railways, the federal government

paid the 20 per cent difference directly to the railways. This subsidy remained in place for years, and was not modified until after the National Transportation Act of 1967 (Currie).

3.2.1.4 The Duff Commission

As a response to CP's allegations of unfair competition from CN, in 1932 L. Duff headed a commission to investigate. This commission responded to the competitive pressures that the railways were feeling from the growing motor carrier industry in Canada (Bonsor). The commission proposed that the two railway companies should co-operate in order to end duplication of certain rail facilities. But instead of co-operation in the form of a railway merger or a law requiring specific action, a law was passed that created the so-called Joint Co-operative Committee. The committee had representatives from each of the railways. In reality no real co-operation occurred, and the two railways only ever really co-operated with respect to the provision of passenger service.

The commission's goal to "effect an efficient, co-ordinated operation between the two primary carriers and at the same time allow for effective competition" has never been realised (Kopki and Thompson). In spite of its failings, many of the commission's recommendations were put into the 1938 Transport Act. Included in this act was an allowance for shippers and railways to negotiate a set of freight rates with the provision that all of that shipper's traffic would be run on that one railway. This allowance was clearly a predecessor to formal contracting for freight services.

3.2.1.5 The Rowell-Siroix Commission

The issue of freight rate equalisation across the region of Canada was still not resolved, leading to the Rowell-Siroix Commission of 1938. The commission found that freight rates in the maritime region of Canada were 20 per cent below that of Ontario/Quebec, Saskatchewan rates were 14 per cent above and British Columbia rates were 32 per cent above Ontario/Quebec. The commission concluded that the difference in each market was due to the amount of competition that rail faced from other modes. Their recommended solution to these rate gaps was to have a government agency that could oversee all modes of transportation. Ideally, such an agency would work toward achieving rate equalisation across the regions of Canada.

3.2.1.6 The Turgeon Royal Commission

Unfortunately, the goal of freight rate equalisation across Canada was not achieved with the Rowell-Siroix Commission. After World War II the topic was revisited by the 1951 Turgeon Commission. This commission was tasked to investigate the transportation disadvantages faced by the different regions of Canada. The commission looked at how to amend the Railway Act in order to guarantee “fairer” rates. The Turgeon Commission ended up recommending the implementation of a uniform class rate scale that could be ignored under certain competitive situations. These competitive situations were defined in cases like agreed charges, international rates or point to point rates for certain commodities. The commission also recommended important institutional changes by placing onus upon the railways to prove that the rates that they offered were competitive; railways were expected to provide the data regarding competitive conditions and show that what they were charging was indeed fair. The recommendations of this commission were incorporated in the 1951 Railway Act. This act left the MFRA in place and also attempted to reduce the cross subsidisation of rail rates by requiring that all rates should cover the cost of moving the product (Currie).

3.2.1.7 The McPherson Commission

Faced with rising costs, the railways were being pinched by the regulation that was part of the Turgeon Commission’s legacy. Rail management wanted to increase rates for all classes and commodities to correspond with their rising costs of movement, while shippers and provincial governments opposed rate increases. The BRC could not resolve the dispute and as a result, in 1958, the McPherson Commission was undertaken to end the impasse. McPherson was mostly concerned about the competitiveness of rail compared to other modes of transport. Ultimately, the historical focus of regulating fair rates was replaced by the concept of relative pricing freedom. This would be accomplished by permitting a pricing band of minimum and maximum rates. The minimum rates were intended to prevent predatory pricing and the maximum rates were intended to control the railways’ use of market power to earn economic rent (Kopiki and Thompson). These minimum and maximum rates used the railway’s reported variable cost as the base from which the acceptable rates were calculated (Currie). In addition,

the McPherson Commission also promoted the use of direct subsidies for rail movements rather than using cross subsidisation across classes and commodities.

3.2.1.8 The 1967 National Transportation Act (NTA)

With the McPherson commission's findings in hand, the government passed the NTA in 1967. This act carried through the McPherson commission's theme of allowing the railways more pricing freedom. The act did this by allowing for more flexible freight rates that could be responsive to transportation market conditions. With this freedom, railways began to practice pricing what the market would bear in spite of the fact that government regulations still required that rates be published and that all railways should determine rates collectively. In fact, the NTA did not compel the railways to aggressively compete with each other for traffic. But the act was consistent with the McPherson Commission findings in that it used variable cost as the basis from which to derive maximum rates, while the maximum allowable rate at that time was set at 250 per cent of variable cost (Kopiki and Thompson). Any shippers who desired rate protection had to apply for assistance with the Canadian Transport Commission. The NTA focused on competition from other modes of transportation to keep freight rates down – and rate relief was rarely granted (Bonsor).

3.2.1.9 The 1987 Transportation Act

Further pressure to reform the Canadian system came from the deregulation in the United States (Kopiki and Thompson). In 1980 the Staggers Act was passed, which gave U.S. railroads the right to contract with shippers instead of being restricted to pricing at regulated rates. The act also obligated that the railways price be based on confidential contracted rates instead of published tariffs. It took time but Staggers eventually led to U.S. railways being effective in competing for U.S./Canadian trans-border traffic. The Canadian rail industry took notice. The Canadian Transport Commission began an inquiry into the potential effects of U.S. style rail liberalization in Canada.

After a new Canadian government was formed in 1987, a new transportation act was put into law, the National Transportation Act (NTA). This act removed the public rate requirement and emphasised confidential contracts in order to promote competition

between the railways. On an operational level, this act also extended the area (originally set in 1908) that could qualify for interswitching provisions; the act also introduced competitive line rate (CLR) provisions (Bonsor). CLR's were intended to give shippers more bargaining power when negotiating rates with the railways. In addition, dispute resolution procedures were formed to help shippers in rate negotiations. Finally, the act also made branch line abandonment easier so as to facilitate the railways' desire to reduce excess capacity, especially in Western Canada.

3.2.1.10 The CTA and Current Regulation

The most recent act germane to railway regulation in Canada is the 1996 Canada Transportation Act (CTA). Sections of the CTA important to this analysis are the provisions for encouraging competition between the two railways. Descriptions of these provisions follow.

3.2.1.10.1 Confidential Contracts

The use of confidential contracting for non-grain movements started in the 1987 NTA remained in place in the CTA. Confidential contracts are seen as pro-competitive in that they are intended to prevent railways from colluding through the use of joint rates. Confidential contracts can only be entered into by a shipper and a railway. There are no provisions for contracts between a railway and a party that is not classified as the shipper (Travacon).

3.2.1.10.2 Interswitching.

In Canadian law, trains may run on lines owned by another railway if the two railways mutually assent to this movement. In Canada, there are examples of mutually agreed interswitching. VIA Rail owns no main line track and instead uses operating agreements with CN and CP to operate on their track. In return for the right to move on CN's and CP's track, VIA Rail pays fees to the railways. CN and CP have also made agreements to let each other's trains operate on each other's tracks in situations where it is economically unfeasible to have two competing lines. This would include situations where lines run through major urban areas or where natural geography limits rail building.

Interswitching provisions in the CTA can compel railways to move or switch the traffic of another railway under certain circumstances. Consider a situation where a shipper is served by one railway (referred to as the local railway) and the local railway interchanges with another railway (the connecting railway) that will take the freight to its final destination. The interswitching provisions state that if the point of interchange is within 30 kilometres from the shipper, the shipper can compel the local railway to interswitch cars with the connecting carrier. The Canadian Transportation Agency⁶ sets the rate charged for the local movement. The interswitching provisions are used in the Canadian rail system and are used in about four per cent of carloads (Travacon). In fact, the 30-kilometre limit is probably best suited for densely developed areas where both major railways are present. In western Canada, most rail interchanges lie outside the 30 kilometre limit so most traffic movements cannot benefit from interswitching provisions.

3.2.1.10.3 Competitive Line Rates

Competitive Line Rates (CLRs) are included in the CTA as a method of extending the provisions for interswitching. The use of CLRs is as follows. A shipper must first get a freight rate for a particular movement from a connecting railway.⁷ The shipper must then apply to the Agency to get a CLR. The CLR is the rate that the railway that directly serves the shipper can charge for the movement of the freight from the shipper to the interchange point with the connecting railway. The rate that the Agency would order the shipper to pay for the local part of the movement is based on a formula contained in the CTA. Rate setting considers the interswitching rate and the local carrier's average revenue for similar movements. The CLR provisions have not been widely used, and since 1996, CP and CN have not offered rates for each other's traffic. Cases of successful CLRs in the past have been dominated by Canadian movements connecting to US railways (Travacon).

3.2.1.10.4 Final Offer Arbitration

⁶ From here on in, the Canadian Transportation Agency will be referred to as the "Agency."

⁷ Since a CLR can be considered from either the origin or destination of a movement, the connecting and local railways are interchangeable. The local railway from the movement origin is the connecting railway when considered from the destination point.

Another remedy intended to limit the market power of the railway vis-à-vis the shipper is final offer arbitration (FOA). FOA works as follows. A shipper seeking rate relief must apply to the Agency for FOA. The application can be for a freight rate or it can be for non-rate elements such as service quality. The railway opposing the relief must submit its final offer within ten days of the shipper's offer. The arbitrator is agreed upon by both parties and has the power to ask for additional information from the parties. In addition, the arbitrator is obligated to render a decision within 60 days. FOA has been used in Canada, with 13 applications submitted to arbitration yielding four resulting decisions (Travacon). Most of the undecided cases were withdrawn before the arbitrator's decision was released, presumably because the railway and shipper reached an agreement in the interim.

The procedure for FOA was changed in the most recent Bill C-34.⁸ The major change to FOA is that the sequence of submissions has been altered so that the railways and the shippers now have to submit simultaneously. The parties have the option of using one-person arbitration or three-person arbitration. More importantly, for a dispute concerning any freight charge of less than \$750,000, a summary arbitration process is available. This process has the shipper submit first with the carrier to respond within seven days, and the arbitrator's decision is due 30 days after the initial application for FOA is received. This change to low value disputes is intended to help smaller shippers get rate relief against the larger railways.

3.2.1.10.5 Running Rights

The CTA also includes a provision allowing the Canada Transportation Agency to grant a federally regulated rail operator the right to use the assets (infrastructure) of another railway company to run trains. In turn, the Agency also may impose conditions for access so long as they are in the public interest and the Agency may also set the access fees if the two railways cannot agree on an appropriate fee.

The section of the CTA that describes the use of running rights is brief and leaves considerable discretion to the Agency to determine when access should be given.

⁸ Section 3.5 outlines in more detail the impact of Bill C-34. This point focuses on the changes to the FOA procedure.

It also gives the Agency discretion to set the specifics of running rights, including such items as frequency of access and the access fee that can be charged.

Recent applications for the granting of running rights provisions occurred in 1991 and in 2001. Two applications in 1991 were rejected on jurisdictional grounds and the third was withdrawn before the Agency reached a decision. The Ferroequus Railway Company placed the 2001 application. Ferroequus wanted to run traffic over CN rail lines to the Port of Prince Rupert. The Agency denied the application by stating that it was not in the public interest to grant running rights in this case. It also added that the imposition of running rights would create inefficiencies in the grain handling system and other shippers using the interchange point. The Agency determined that the inefficiencies would not be counterbalanced by any operating efficiency that Ferroequus would potentially create for rail movements to Prince Rupert (Canada Transportation Agency).

3.2.2 Regulation Specific To Western Canadian Grain Transportation

3.2.2.1 The Crow's Nest Pass Agreement

Western Canadian grain movement first received special status with the 1897 Crow's Nest Pass Agreement between the Government of Canada (GOC) and CP. The GOC aided CP with their construction of a rail link from Alberta into the interior of British Columbia. The GOC wanted to have this rail link as an essential part of a complete cross Canada rail system. The government was to provide a one-time cash subsidy amounting to \$3,404,720 to assist CP in finishing the rail line (Bonsor). As part of the agreement, CP was to haul grain out of the grain producing regions of western Canada to port position in the east and backhaul manufactured goods from the east, at rates described in the statute. The agreement also included provisions that forced CP to sell mineral bearing land back to the Government of Canada. Another interesting provision in the agreement is that the government of Canada reserved the right to grant running rights to other firms over the lines of CP and all its branches and connections (Government of Canada).

The rates actually used for grain were often below the rates set out in the Crows Nest Pass Agreement due to competition from other railways (Currie). This lasted until

price pressures from the First World War caused the statutory Crow's Nest rates to be suspended in 1918. The low rates were reinstated in 1922 (Currie). Later, the rates of the Crow's Nest Pass Agreement were applied to all railways that moved grain for export from western Canada.

In 1925 the application of the Crow Rates were applied to all railways by formally passing a statute (Currie). Some have suggested that one reason why the railways agreed to this statute was that the Crow's Nest Pass Agreement institutionalised "value of service" pricing for grain (Baylis). At that time, the railways wanted to charge grain a lower freight rate than that charged to higher valued goods. The Crow's Nest Pass Agreement allowed the railways to charge a low rate on the very price sensitive grain transportation, and was also expected to generate further business for CP because low freight rates on grain would aid economic growth on the Canadian prairies (Currie). Ultimately, the agreement constrained the pricing of higher value commodities into the Canadian west but left other markets unaffected. This pricing principle is consistent with profit maximising price discrimination that was discussed in section 2.2.2.2.

3.2.2.2 The 1967 Amendment

An amendment to the way that the government dealt with grain movement appeared in the 1967 NTA. At this time the Crow rates were still in place but the government implemented a subsidy for the maintenance of branch lines. This subsidy was an attempt to compensate the railways for the losses that they were incurring by moving grain at the Crow rates. Subsidies for branch line maintenance became quite large yet the railways still did not feel that most grain movements covered their cost.

The railways continued to threaten reductions in service for grain movements unless statutory rates were changed. This did not occur and it has been documented that the railways' service levels and infrastructure continued to decline (Currie). Eventually, a partial response to this problem came between 1972 and 1981 as the CWB, federal, and provincial governments collectively invested in the purchase of grain hopper cars (Bonsor). During this time, the federal government also passed legislation that protected 16,000 miles of grain dependant branch lines from abandonment and provided money to repair 4,500 miles of grain dependant branch lines in Western Canada (Vercammen).

The federal grain car fleet was administered by the Grain Transportation Agency.

This agency had the responsibility to allocate, on a weekly basis, cars to be available for moving CWB grains and open market grains (Schmitz and Furtan). The Agency also had to allocate the available cars to each grain company for use in delivering open market grains. Since this time the Grain Transportation Agency has been disbanded and car allocation is now negotiated between the CWB, the grain handling companies and the two major railways.

3.2.2.3 The WGTA

Western Canadian grain moved at the statutory rates until 1984 when the Crow's Nest Pass rate structure was replaced by the Western Grain Transportation Act (WGTA) (Vercammen). The WGTA increased the payments to the railways and ended the fixed rate at which grain would move from western Canada, but the WGTA still subsidised grain movement for Western producers. The federal government paid a so-called "Crow Benefit" of \$658.6 million per year to the railways, supported by a cumulative share of the railways' actual cost increases (Vercammen, Fulton and Gray). At the outset of the WGTA, producers were required to pay less than one third of the total freight rate, while the WGTA was intended to increase the producers' share of the payment over time. Subsidy was expected to decrease because of increased producer payments and efficiency gains that the railways would realise.

Under the WGTA, the total freight cost paid by the government decreased over time. The amount paid by the federal government in 1989 was \$695.1 million, representing 72.3 per cent of the freight charge. By 1994, the government's share of the grain freight rate bill at the end of the WGTA was \$620.7 million, representing 57.2 per cent of the freight charge (Vercammen, Fulton and Gray).

The WGTA used the following rate setting procedure. First, a base set of freight rates was calculated. Next, from this base rate a multiplier was used to compensate for the inflation on the inputs used in grain transportation. Total revenues from grain movement were intended to compensate for the variable cost of moving the grain as well as provide a 20 per cent contribution to fixed costs. The latter percentage was supposed to represent a fair contribution of grain traffic to the railways' revenue (Vercammen, Fulton and Gray).

Under WGTA, every four years a costing review was held to examine the actual cost of moving grain. Any efficiency gains that the railways achieved in this four-year period were split between grain shippers and the railways (Vercammen). In this way, railways would benefit from productivity improvements by keeping high revenues until the next costing review. It has been calculated that if the WGTA had been kept as policy for a period of 30 years or more, that the railways' share of any productivity gains would have been around ten per cent. This is arguably not enough to provide incentive for investment in new rail technology (Vercammen, Fulton and Gray).

The WGTA was eliminated as of August 1995 and was replaced with the Canada Transportation Act. The WGTA was disbanded for trade policy reasons. Due to the WGTA's effect of reducing the marginal cost to move grain to port, some argued that the WGTA was in effect an export subsidy. This was inconsistent with the goals of international trade negotiations under the World Trade Organisation (WTO) and may have resulted in trade action against Canada.

3.2.2.4 The Estey Report

The Estey review illustrates the continued intimate relationship between rail regulation and grain movement in Canada. Released in late 1998, this report was the result of widespread industry consultation by a government-sponsored commission. The head of the commission was Justice Willard Z. Estey, a prominent Canadian judge. The mandate for this commission was to look at methods to improve the grain handling and transportation system through a move toward a more commercially oriented system. The perceived need to change the system came from service complaints launched against the railways and from the need to look at alternatives in an environment where the federal government had changed from its historical role of subsidy provider for western Canadian grain movements (Estey).

The report resulted in fifteen recommendations, designed to achieve the goals set out above. A summary of Estey's relevant recommendations is presented below (number is from the original report).

2. **Management Information System.** The review made the recommendation of no changes to the way management information is collected and disseminated. Estey

does mention that there have been suggestions that the transportation information that is currently collected and held by the various agencies should be made collectively available. This would allow better decision making by giving better information on which to make decisions. This idea was opposed by many in the grain handling and transportation system because such information is seen to be commercially sensitive.

4. **Producer Loaded Cars.** The use of producer cars should be retained in law. Additional laws may be needed in order to allow farmers to get access to rail sidings or other loading sites. These laws would at least provide “a defensive protection for the farmer.” This practice has been useful in the past. It should be noted that unless farmers can put together large spots of rail cars, the benefits that they receive from not using an elevator company would be lost to higher freight rates for small numbers of cars moving at a given time compared to discounts on 50 car spots or higher.
5. **Hopper Car Ownership.** The provision allowing the railways to have the first right to buy the government owned hopper car fleet should be revoked or allowed to expire. The hopper car fleet should then be sold at market value, with the proviso that the fleet should be tied to use for western Canadian grain transportation.
6. **Car Allocation.** The Car Allocation Policy Group (CAPG) should be dismantled. Car allocation should be done based on conditions set out by the railways. If long term reservations of cars are to be carried out then a fee should apply. In the event of car scarcity, a referee should be implemented so that complaints from shippers can be handled. The referee would be able to decide if the shipper’s complaint is valid and then recommend either additional rail cars be supplied or recommend that compensation be paid from the railway to the shipper. Failing an agreement about the damages to be levied, the issue would be subject to Final Offer Arbitration (FOA). The concern is that the use of the present system does not always allow for the most profitable use of rail cars. Since the CAPG decides what cars will be allocated for the transportation of Board grains, concern has rested on whether non-Board grains are getting enough cars. This concern has been especially strong for movements of canola.

7. **The Rail Rate Cap.** Estey recommended that the current freight rate cap be removed and replaced by a railway revenue cap, and the exact proposal to replace the freight rate cap was made by CP. The current rate cap system provides an upper limit on what can be charged for grain movements over 25 miles. Rates would be set below the rate cap if the railways wish, and these lower rates would typically be applied to movements comprised of a “unit train” of 112 rail cars or for movements of other blocks of rail cars. CP believed that more commercial measures can be put in place by tying future freight rates to commodity prices to help share the risk of grain price changes, while CN claimed that they could offer the same level of savings on grain movements as CP.
8. **Competition Between Railways.** The provisions of the CTA should be simplified and clarified so that it will be made easier to interconnect between rail companies and promote competition. The general object of the recommendation is to open up the rail system to all competent railway operators. Legislation should be changed in order to smooth the legal process that needs to be satisfied for a new operator to obtain running rights. The recommendation is to change the condition of being a “railway company” to that of “any person.” This recommendation should facilitate short line railways or other parties in using CN and CP lines.

The use of CN or CP lines would be subject to fair compensation being paid for their use. This would be defined as being a minimum of covering the cost of the railway lines but also ensuring that the rates cannot be so high as to discourage entry. The Agency should consider the public interest when deciding on whether or not running rights will be granted. The consideration should take into account whether or not the overall capacity of a given line will be reduced through the granting of running rights.

Estey mentions that railway competition should not just be thought of as competition between two railway companies. Competition should also be considered in terms of using trucking to move grain from a high throughput elevator in one area to one in an area served by a competing railway. In this way trucking can induce competition in the rail sector. Grain handling companies can also foster competition by moving grain from an elevator serviced by one railway to an elevator serviced by

the other. Farmers could attempt to reap benefits by calling for tenders from competing grain handling companies and in this way capture a lower freight rate.

9. **Final Offer Arbitration.** FOA should be continued with an understanding of the general principles. These processes should remedy the concern that the railways currently receive an advantage in the FOA process by getting to see the shipper's final offer before they make their own.

- i. The arbitrator should be independent, fair and impartial.
- ii. The arbitrator should be selected by consent of the parties involved in the arbitration, or failing consensus, should be appointed by the Agency.
- iii. Each of the contending parties should submit a sealed final offer that they seek to have approved.
- iv. The arbitrator will select the offer that is thought to be more appropriate.
- v. The arbitrator may not take more than seven days past the end of the hearing to make and communicate the selection.
- vi. The arbitrator may set time limits for the submission of offers and may proceed without offers if deemed appropriate.
- vii. There shall be no appeal to the arbitrator's decision.
- viii. The arbitrator may not assess costs to either party.
- ix. The parties shall pay the arbitrator's fee equally.
- x. These terms and conditions can only be changed by mutual consent of the conflicting parties.

A pool of qualified arbitrators should be made available to shippers and railways who may be interested in taking matters to FOA.

10. **Branch Line Abandonment.** The current CTA provisions regarding branch line abandonment should be altered to bind parties to perform to the spirit as well as the letter of the regulation. This change is needed to help facilitate purchase by potential short line operators. CN has been criticised for selling abandoned track in small segments that are either too dispersed or too small to have any chance of successful operations for a shortline railway. The branch line abandonment process should be altered so as to allow communities to buy the branch line and use it at their own cost.

If a branch line is abandoned, then the railway should pay a portion of its expected line closure benefits to the affected communities.

11. **Trucks and Road Repair.** The provincial and federal governments should spend more fuel tax revenues on repair and upkeep of highways in grain producing regions. The roads earmarked for repair and upkeep should be those that are key to getting grain from farm to market.
14. **Principal Role of the Board.** The CWB should take a regulatory and administrative role. The CWB should not have an operational or commercial role in the handling and transportation of grain for export. Once the CWB has contracted for the sale of grain, the right and obligation to collect and transport the grain be auctioned to a grain handling company. The CWB should maintain its role in calling in grain and in price pooling as is currently law.
15. **Review of Efficiency Gains.** At the end of the 2000/2001 crop year, a review should be made of the productivity gains achieved by the railways for the period starting at the beginning of the 1997/1998 crop year. The review should determine the flow through of these gains to farmers and to the other participants in the grain marketing system.

3.2.2.5 The Kroeger Report

Following the release of the Estey report, Arthur Kroeger was charged with the task of consulting with industry stakeholders to recommend changes to the western Canadian grain handling and transportation system consistent with the Estey report.

The process was set up into three working groups with representatives from the various stakeholders in the grain transportation and handling system. Although the working groups were able to reach consensus on some of the issues raised in the Estey report, some of the most important issues went unresolved. For unresolved issues, Kroeger made a recommendation based on his own judgement. The areas where consensus was not reached were on the level of the revenue cap, changes to encourage competition between the railways, changes to the FOA procedures and changes to the role of the CWB in grain transportation.

Disagreement on changes to the revenue cap centred on the amount of the revenue cap. There was concern that the formula set out in the Estey report was too generous in

reducing revenue. The three positions were that the revenue cap should be set at what Estey had proposed, that the revenue cap should be lower than Estey's proposal or that the revenue cap should be higher (Kroeger).

Debate over what changes should be made to encourage competition between the railways centred on two issues. The first issue was the existing level of competition. The railways argued that there was already adequate competition and that the level of competition would increase with a more deregulated system. The second issue was the effectiveness of open access. Concerns were raised as to whether open access would bring any competition and if so, would it threaten the railways' long term ability to operate. These fears resulted in Kroeger recommending that open access, as it would apply in Canada, be studied further.

Contention over changes to the FOA procedure involved the recommendation to have simultaneous submissions. The railways protested that this would disadvantage them and discourage a negotiated settlement. Questions as to what degree the CWB should be removed from the transportation system was another contentious point. The recommendation that started the debate was determining the level of grain movements that the CWB would have to take possession of at port. The CWB felt that reducing its level of control in transportation would threaten its ability to market grain while grain handling companies felt that commercial, contractual relationships in transportation would create efficiency and allocate responsibility to the parties in the system. An alternate system was proposed whereby the CWB would tender for part of their grain movements and allocate the other part to the various grain companies. The portion of grain handling allocated to the various grain companies would change over time based on the performance of those grain companies. A better performing grain company would get a larger allocation of CWB grain.

In the end, the Kroeger report was important in that many of the recommendations in it, both consensus based or controversial, became part of the government bill C-34.

3.2.3 Removal of the Freight Rate Cap (Bill C-34)

On August 1, 2000, the Government of Canada implemented changes to legislation that altered the organisation of the western grain handling system (Government of Canada). These changes originated out of the Estey and Kroeger

reports. The proposed changes will cover the alteration of rail rate controls, the relationship that the CWB has with the rest of the grain transportation industry, shipper/carrier dispute resolution procedures and government monitoring and enforcement. This section describes recent modifications other than the changes to car allocation and FOA.⁹

The reforms will remove the current freight rate cap and replace it with a revenue cap. This means that instead of limiting what the railways can charge for any movement of grain, the railways will now be limited on what they can earn as revenues for the total amount of grain movements. For the crop year 2000-1 the revenue cap was set at \$27.00 per tonne for CN and CP combined. This represents a decrease in the average freight rate of about 18 per cent for annual movements of 30 million tonnes of grain (Transport Canada 2000).

The level of the revenue cap is determined through the use of a formula that takes into account changes in movement volumes, length of haul and the price of railway inputs. The formula is as follows (Riegler).

$$[A/B + ((C-D) \times \$0.022)] \times E \times F$$

where

A is the company's revenues for the movement of grain in the base year;

B is the number of tonnes of grain involved in the company's movement of grain in the base year;

C is the number of miles of the company's average length of haul for the movement of grain in that crop year as determined by the Agency;

D is the number of miles of the company's average length of haul for the movement of grain in the base year;

E is the number of tonnes of grain involved in the company's movement of grain in the crop year as determined by the Agency; and

F is the volume-related composite price index as determined by the Agency.

If the railway collects more revenue than the cap allows, then the railway must pay that excess back. There are some restrictions on the rates that can be charged to rail

⁹ Changes to car allocation are discussed in section 3.3 and changes to FOA are discussed in section 3.2.1.10.4.

traffic on different lines. The charge for movements on a branch line cannot be more than three per cent higher than that that would be charged to the same movement over a main line (Transport Canada 2000). No restrictions are placed on commodity differentiation or on movement size differentiation.

The procedures for the abandonment of grain-dependent branch lines have been changed so that if a railway company wishes to stop providing service on a protected branchline, the Agency may allow another railway to operate on that abandoned line, and possibly on non-abandoned sections as well. A railway cannot take action on discontinuing operations on any line until 12 months after it notifies it wants to do so. If an interested party wants to purchase the discontinued section, the railway must negotiate in good faith with that party. If a line is discontinued, the railway will have to pay \$10,000 per mile of line discontinued each year, for three years.

To help assess the effectiveness of the changes with respect to the performance of the grain transportation system, the Minister of Transport is enabled to collect data from confidential contracts. This data would then be used to determine productivity improvements. This would also provide a way to transfer information to third parties without jeopardising confidentiality. The task of monitoring the performance of the Canadian grain transportation system has been awarded to Quorum Corporation until the end of the 2004-05 crop year.

3.2.4 Canada Transportation Act Review

As part of the 1996 CTA, a provision was included to have the act comprehensively reviewed starting no later than July 1, 2000. The Minister of Transport formed the Canada Transportation Act Review (CTAR) panel to perform this review. The CTAR panel put out their final recommendations in June 2001. One issue where the Minister of Transport requested specific recommendation is the area of competition in the rail sector.

The scope of the panel's review extended beyond rail transport and covered a number of other topics. Of concern to this thesis however is the review of the competitive provisions in the CTA. The recommendations with regard to the competitive provisions of the CTA follow (Minister of Public Works).

1. The first recommendation states that a railway should publish a level of service (timeliness, frequency of service) with published tariffs. This recommendation is intended to put movements that happen under tariff rates on the same level as confidential contracts, where service provisions are common.
2. The Canada Transportation Agency is recommended to continue to have the authority to determine if a railway has breached the level of service provisions and that the Agency should be able to order specific remedies for any level of service problem.
3. The panel recommends leaving the interswitching provisions unchanged.
4. The Agency's power to set interswitching rates should be amended to only allow the Agency to set maximum interswitching rates. This change is intended to allow for the possibility of a negotiated interswitching rate at some level below the maximum.
5. The panel recommends that the Competitive Line Rate provision in the CTA be replaced with what they designate a Competitive Connection Rate (CCR) provision. This new provision would remove the requirement for a shipper to get a rate from a connecting carrier before appealing to the Agency. The Agency would only use a CCR provision for shippers who have no "alternative, effective, adequate and competitive" alternative methods of transportation. What shippers fall into this category is to be determined by the Agency. The CCR also requires that a thirty-day period after the shipper's submission be allowed for a negotiated settlement to be reached between shipper and carrier. Failing a negotiated settlement, after thirty days the Agency will have the power to set a commercially fair and reasonable rate that will last for one year. The panel also recommends that a rate dispute over which a CCR is requested will not be allowed to also request FOA and visa versa. The Governor in Council is recommended to be given the authority to suspend the use of the CCR if the Governor in Council feels that the use of the CCR is seriously affecting railway viability.
6. The substantial commercial harm test should be removed.
7. When the Agency determines interswitching rates and CCRs, these rates should continue to be commercially fair and reasonable.

8. An arbitrator should be required to assess whether a shipper has alternative, effective, adequate and competitive means to move his shipment. This requirement was previously not in place for disputes valued at less than \$750,000.
9. The grain handling and transportation system should be moved to a more commercial basis. Special mention is given to the possibility of removing the revenue cap.
10. The first recommendation dealing with enhanced running rights states that any railway operator, federal or provincial, who meets safety standards, be able to apply for running rights.
11. The second recommendation is for a railway operator to also be able to seek to service shippers on lines which it has running rights.
12. The third recommendation is that the railway operator who is applying for running rights must give sixty days notice to the infrastructure owner before making the application. This recommendation is intended to promote a negotiated settlement between the operator and the infrastructure provider.
13. The panel recommends that as part of the determination as to whether granting running rights is in the public interest, a number of factors be considered. These factors include the adequacy of existing service, the existence of competitive alternatives, impact on all users and shippers on the rail lines over which running rights are sought, impacts on overall system efficiency, financial and operational ability of the running rights applicant, the applicant's willingness to allow reciprocal access and the financial viability of the infrastructure owner.
14. The panel recommends that operators given the right to solicit traffic on a line which it has running rights be subject to the same rights and responsibilities as the host operator. Specifically the panel mentions that the guest operator should have to publish rates and the corresponding service levels at the request of a shipper and have the right to enter into confidential contracts.
15. On rail lines served by an infrastructure owner and one or more guest operators with traffic solicitation rights, the other competitive provisions should be suspended.
16. If a guest operator is to stop service on a line. That operator should be required to give reasonable notice of service discontinuation.

17. The panel prefers that infrastructure access fees be negotiated. To allow for negotiation, a ninety-day period should pass before the Agency should set access fees.
18. In instances where a guest operator has traffic solicitation rights any access fee set by the Agency should compensate for any incremental costs that the host railway incurs as a result of the guest railway's activities. The access fee should also include a contribution to the infrastructure owner's fixed costs. This contribution should be close to what the traffic would contribute if the infrastructure owner were providing the service.
19. In instances where a guest operator does not have traffic solicitation rights any access fee set by the Agency should still compensate for any incremental costs that the host railway incurs as a result of the guest railway's activities. Access fees should be able to differ based on the guest operator's willingness to pay but should not provide a return that is above what the host railway needs to cover its total cost. Any access fee for government owned or government directed passenger rail service should cover incremental cost plus a reasonable return on the book value of the host railway's assets.
20. The panel also makes the recommendation that any legislation on access should comply with all trade law and agreements.
21. The final recommendation addresses concerns about rail discontinuance. The panel recommends that the railways must publish a list of sidings that are in operation and can be used for the purposes of producer car loading. If the railway wishes to close a siding, it must give sixty days public notice before closure.

3.2.5 Implementation of the Canada Transportation Act Review: Bill C-26

Bill C-26, also named the Transportation Amendment Act, was the piece of legislation that arose from the CTAR. The proposed amendments to the rail sections of the act are as follows (Transport Canada 2003).

The substantial commercial harm test would be removed as a precursor to an appeal to the Agency.

As recommended in point 4 of Section 3.2.4, a maximum rate for interswitching would now be determined by the Agency, as opposed to an absolute rate as is currently the case.

The Competitive Line Rate provision described in Section 3.2.1.10.3 would be removed and replaced with a Competitive Connection Rate (CCR). The CCR is in many respects equivalent to the CLR in that a CCR sets the rate that a local carrier can charge for moving traffic to interchange with a connecting railway. As noted in point 5 of the previous section, one significant change under the CCR is that the shipper does not need a prior rate agreement with the connecting railway in order to appeal to the Agency. The CCR can be for a rate but it can also include elements of route designation, the location of the interchange point with the connecting carrier and level of service provisions. If a CCR is given, the tariff structure should also include the accompanying level of service obligations.

There would be limitations to the application of the CCR. One of the most significant is that a CCR can only be given by the Agency if there is no alternative, effective, adequate and competitive means for the movement of the shipper's goods. In this way, the bill assumes that intermodal competition limits the railway's ability to earn economic rent on a particular movement. A CCR could not be granted if the per tonne-kilometre freight rate the shipper is paying to the local railway is below the 75th percentile for similar traffic under similar conditions. A CCR could not be applied for if the shipper already had an interswitching rate for the movement for which the shipper was requesting a CCR. If the shipper has applied for FOA on a particular movement, the shipper could not then request a CCR for that movement until one year and a day has passed from the date of the FOA application.

If a CCR were to be granted, the CCR would have to satisfy certain criteria. The CCR can only apply to 50 per cent of the total movement or 1,200 kilometres, whichever is greater unless the Agency is convinced that there is no nearer interchange. The rate of the CCR must be at least equal to the Agency determined level of the local railway's variable cost. This is to ensure the rate is compensatory. The CCR must also fall into the range of the 75th to the 90th percentile of the local railway's revenue per tonne-kilometre for similar traffic under similar conditions. Finally, when a CCR is granted, it is the

connecting railway that is responsible for providing the shipper adequate cars for the movement.

The bill also allows for the government to rescind a previously granted CCR and remove the CCR provision from future use, if the government is of the opinion that the financial viability of a railway has been seriously affected by the imposition of a CCR.

The bill would allow for VIA rail to apply to the Agency for rate setting if it cannot agree with a host railway for access rates. This gives passenger traffic providers a tool that they could use when negotiating with host railways. The bill sets out that any rate the Agency sets should be based on the host railway's costs.

With respect to line abandonment, the railways still have to maintain a plan of what lines are being considered for abandonment. From this plan, the railways must give 12 months notice before a line may be abandoned. The federal, provincial and municipal levels of government would all have the right of refusal to buy, at salvage value, a line that is to be abandoned. Railway sidings would not be subject to these conditions and could be removed with 60 days notice.

As noted in point 21 in the above section, the final change important to rail in Bill C-26 is the addition of the need to prove a lack of alternate, effective adequate and competitive transportation before a claim valued at less than \$750,000 can go to final offer arbitration. Low value disputes are currently exempt from such a requirement.

Many of the recommendations regarding running rights were not included in Bill C-26.

As of February 2004, the Canadian government changed and the status of Bill C-26 was uncertain. The intent of the new Minister of Transportation and the new government to move forward with this bill was still to be determined.

3.3 Existing Canadian Access Fee Regimes

In Canada, one carrier currently has extensive track access agreements with both CP and CN. This carrier is VIA Rail, a crown corporation that is responsible for handling all inter-provincial passenger traffic and some intra-provincial passenger traffic. Most of the track access agreements are with CN, over whose lines the majority of VIA Rail's traffic run (Bonsor).

CN attempted to merge with Burlington Northern Santa Fe, a large U.S. railway company. This merger was prevented from proceeding by the Surface Transportation Board, a regulatory agency in the United States. In what seems to be an alternative, CN and CP have agreed to more track sharing to increase efficiency in their eastern North American operations (CN). This increase in track sharing will necessitate payments to reimburse the track owner for the use by the other railway (Law, McKay and Nolan).

The structure of the payments in both of these instances offers a further insight into how access pricing could work in Canada. The fees and details of the contracts are commercially confidential and as such are unavailable for more detailed exposition.

Canada's rail history illustrates the continued struggle between regulating rail market power, while allowing the industry to maintain its financial viability. Both the CTAR and Bill C-26's emphasis on railway viability while still recommending keeping modified forms of the competitive provisions in the current CTA are evidence of this struggle. In fact, Bill C-26's introduction of the right for VIA Rail to apply to the Agency for rate relief may signal that the competitive concerns of the freight industry may exist in the government subsidised passenger transport sector.

The CTAR and Bill C-26 also show that Canadian strategies tend to resort to targeted regulations and procedures to modify existing industry practices. The recommendations opt for adjustments rather than fundamental restructuring to address long-standing dilemmas of the industry. A fundamentally different approach has been taken in Sweden's rail system, which attempted to address these issues with large-scale reorganisation: it transferred control of the railway infrastructure from the rail operator to an independent administration. The next chapter outlines the process that established this shift not only in organisation but also in rationale and in scale of focus.

CHAPTER 4 A Case Study of the Swedish Railway System

4.1 Overview

In 1995, the Swedish rail network consisted of 10,083 km of track on all lines (SIKA). This number is not particularly stable, as small country lines are being closed and new lines are being constructed. Passengers travelled 6,364 million passenger kilometres of which almost 75 per cent were on the state railway's main line service. Railways had 13 per cent of long distance travel, measured in passenger kilometres and 3 per cent of short distance travel. For freight transport, 19.4 billion tonne-kilometres were travelled carrying 57.4 million tonnes. Railway accounted for 26 per cent of the 77.4 billion tonne-kilometres of long distance domestic movements. 24 per cent of freight is ore, 21 per cent is iron and steel, 21 per cent for pulp and paper and 13 per cent for round and cut timber (SIKA).

The recent history of Swedish rail has involved broad-based structural change, mainly in the separation of the rail infrastructure from the state-run rail operator, and in reallocating rail networks between state and regional operations. These changes have produced a rail market fundamentally different from the traditional state railway model.

4.2 History of the Swedish Railways Before 1988

4.2.1 Early History and Rail Network Development

The Swedish national rail system was originally created to provide links between regional railways and thereby connect the different regions in Sweden. These regional railways often took goods from their place of origin to an interchange with the national network. The regional railways gradually lost market share and, as the companies failed, their operations were taken over by the state railway, *Statens Järnvägar* (SJ). By 1991 no private operator had rail track operations in Sweden. The trend toward railway failure had started long before then; it is reported that in 1965 privately-owned lines only accounted for 5 per cent of Swedish route kilometres (Nash and Toner).

SJ, as a state railway, had extensive service obligations for both passenger and commercial traffic. The fare structure was not representative of costs and the railway had little power to close lines that were not economically viable (Bruzelius, Jensen and Sjöstedt). The railway usually found itself in a deficit position. SJ was expected to earn a return on the assets it used and to return a surplus to the government treasury. The railway was constantly in a deficit position and was therefore a problem. The government subsequently attempted to make reforms that would enable SJ to operate at a profit.

The social value of public transport was recognised in a 1963 transportation proposition. In this proposition SJ was to be compensated for its provision of unprofitable services by the use of a "collective ticket." This ticket was the government transfer that was to be paid to SJ. Otherwise, as was consistent with the government's assertion that each transport mode should cover its own costs, SJ was to collect revenues that corresponded to the costs to the government arising from these operations (Hansson, Nilsson 1995).

4.2.2 The 1979 Transport Policy

4.2.2.1 Infrastructure

In 1979, a new Swedish transport policy was implemented. This policy changed the cost recovery focus from that of monetary costs to the government to that of the costs to society. Charges levied on different modes of transport were now supposed to represent the marginal costs of the transport instead of charges relating to the total cost of transport. As a way to lessen the burden of excess track and to better enable SJ to operate profitably, the railroad network was divided into two different categories, commercial and non-commercial networks. The commercial network was what was expected to be operated by SJ at a profit and the non-commercial network was that which would not be profitable and would have to be partially paid for by the government. The non-commercial network could also be considered for abandonment. SJ did not want to have the government payments for the non-commercial network seen as a subsidy but rather as the government paying for services which it deemed valuable (Jansson and Cardebring). The 1979 policy also marked the beginning of administrative

changes to the national rail system as the County Transport Authorities (CTAs) came into being (Alexandersson). CTAs are the transportation groups of regional governments who would be responsible for transportation within that county.

4.2.2.2 Pricing

In the summer of 1979, SJ introduced a fare structure for passenger service where peak and non-peak travel times were charged different rates (Jansson and Cardebring). To get the lower price for peak times a traveller had to buy a special low price pass, making the scheme a two-price tariff (Jansson and Cardebring, Nilsson 1995). This pricing policy mimicked one put in place by a Swedish domestic airline and emphasises the competition between the two modes. There is no conclusive evidence to show that the new pricing scheme was successful for SJ in drawing passengers and revenue. The success from the 1979 reform faded perhaps as a result of a decrease in gasoline prices and from an increase in overall fares. Soon SJ's financial performance again worsened. It was felt that SJ needed more freedom to act as a purely financial enterprise if it was to achieve better financial results. The formal two-price policy was phased out toward the end of the 1980's (Jansson and Cardebring).

4.2.3 The 1985 Transport Policy

4.2.3.1 Functional Split

In 1985 the "Guidelines for Railway Policy" was enacted. The most important tenet of this policy was that SJ would be given freedom to set prices. This was not so important for freight movements as 90 per cent of freight traffic moved under negotiated rates, but up until 1985 passenger rate changes had to be approved by the government (Jansson and Cardebring). SJ also tried to reorganise and innovate to have better internal accounting and to create internal organisational structures to meet market needs. SJ was at this time instructed to create separate accounting for infrastructure and operations and use this information to make the operations divisions pay fees to the infrastructure division (Alexandersson). SJ was also asked to sell off divisions that did not add to its rail activities, though SJ was not quick to do this. After this time SJ formed partnerships with German and Danish railways to make use of ferries to form

train links between Sweden and the continent and started to use subsidiary companies to help meet specialised needs (Jansson and Cardebring).

The Swedish government wanted to introduce market discipline and focus to SJ. Past performance had shown that SJ was not doing well as a state monopoly. There was congestion on intercity lines and a lack of new investment in railway infrastructure. There were also problems with competitiveness in terms of intermodal transport. Swedish railways were losing market share to road transportation. Finally, SJ was in need of financial support. It was calling for 1 billion Swedish Krona (SEK) in new money from the government (Hultén).

4.3 Developments in Swedish Deregulation and Increased Access

4.3.1 The 1988 Legislation

The reforms that were to come were an attempt to create a system that would put road transport and rail transport under similar institutional frameworks (Nash and Toner). The need for change came from the desire for economic and cost efficiency in rail itself and also to better allow for transport to be efficiently distributed between road and rail transport. This road/rail distinction is made explicit by the transportation policy of 1988 that infrastructure costs are to be made equal to the marginal cost of wear and tear to the roads, that these costs should include the marginal social costs of running the service and that these cost allocations should be consistent for differing modes of transport (Nilsson 1997). This legislation also contains the elements of environmental policy that have come to play more of a role in Swedish transport policy.

4.3.1.1 Banverket and the New SJ

The first elements of increased access in the Swedish rail industry began with the 1988 parliamentary resolution that the rail track should be organisationally separated from the existing state railway. This would be done through the transfer of the existing state railway's infrastructure assets and staff to form a new organisation. (Nilsson 1995, Hansson and Nilsson) This new organisation was called the Swedish National Rail Administration, or *Banverket* (BV) in Swedish. The operation of the rail track system

was now under control of BV, which in turn was to be the responsibility of the Swedish government.

The remaining parts of SJ were now to be run on commercial terms, meaning that its performance measures would be those similar to a private company. The goals that the government had for SJ were that it should operate as a for profit company, provide a seven per cent return on equity and improve capital structure to a 35 per cent equity/assets ratio (Farrel). The government also continued its commitment to non-interference with SJ operations. There would be no government restrictions on service levels, management practices and prices. But there were some rules about how SJ dealt with its subsidiaries and that SJ would have to pay a fee to BV for the use of the rail track. In addition, SJ was supposed to divest itself of businesses that were not central to its core business of providing railway services. The government did not intend SJ to be exposed to much intra-modal competition at this point. For freight traffic, SJ maintained its monopoly on all rail service in Sweden. With respect to passenger service, SJ maintained a legal monopoly on most passenger services as well. The only potential competition would be for short distance passenger movements within the counties of Sweden. As well, SJ maintained control over its rolling stock and rail terminals. (Olofsson)

Since SJ was freed from some of its social obligations with its new mandate of running on commercial terms, a new system was implemented for the operation of unprofitable but socially or politically desired passenger routes. These routes would be purchased by the state directly from SJ (Olofsson). This transfer would compensate SJ for the unprofitable service provision. SJ was still responsible for timetabling and traffic control on the main network as it was still largely their trains that would be running on the network.

4.3.1.2 The Regional and Trunk Systems

To understand the relationship between SJ and increased access it is useful to refer to the historical construction of the Swedish railway system and to the pre-1988 reforms. As mentioned earlier, the Swedish railway system had historically been one of regional railways that used the state system to transport goods and people between regions. This same structure was maintained in the 1988 reforms. The rail system was

divided into a trunk system and a regional or county system. The trunk system roughly corresponded to the old state system. In the 1988 reform, it was on these main lines that SJ still maintained its legal monopoly for passenger transport.

Passenger transport on the county system was to be delegated to the local government transport authorities as created in 1979. CTAs could auction franchises for the provision of transportation in their region and the length of the franchise period could vary (Alexandersson). The CTAs could choose from any suitable operator, with suitability determined by BV. The CTAs did not have to auction a franchise if so desired and some counties have continued to negotiate exclusively with SJ. The CTAs also were to receive a subsidy for their local rail service provision (Alexandersson and Hultén 1999). The option was also there for the CTAs to be able to forego the rail service money and instead accept a subsidy for the establishment of bus or other transport service. The subsidy given would be equivalent to the last rail subsidy given. The rail operators on county lines were not, however, allowed to run their trains on any trunk lines that went through their county.

4.3.1.3 Infrastructure Investment

The state still controlled BV and through it took on the responsibility for the technical upkeep and all improvements to the railway network. BV's mandate was modelled after that of the Swedish National Road Administration, *Vägverket* (Hansson and Nilsson). *Vägverket* had already developed a system in which it could determine marginal social costs through a system of Cost Benefit Analysis (CBA). BV was therefore supposed to make decisions about what infrastructure improvements should be done on the basis of a project CBA. If an infrastructure project was deemed to be socially beneficial then it could be undertaken.

The criteria that BV uses to look at its investments are intended to take into account a number of factors (Hylén). For example, long-term traffic forecasts are used as a basis for demand prediction and are designed to take into account different national economic scenarios. From there, benefits of different possible investments are computed from reduced journey times, reduced infrastructure maintenance costs, reduced operating costs, increased operator revenues, increased safety, and reduced externalities from transport operations.

The monetary valuations that form the basis for CBA come from willingness to pay estimates and from implicitly revealed public sector preferences. The components included in the assessments and the methods used to compute them are presented in Table 4.1. Monetary values were calculated for the items and these were incorporated into the CBA for infrastructure investment planning. Hansson and Nilsson presents a more thorough description of how the monetary costs are calculated.

Table 4.1 Major components of the Project Analysis model for road investments

Traffic economy and road maintenance	Environmental and land use effects	Regional development, etc.
Traffic safety (*#)	Noise (*#)	Regional balance
Travel time (*)	Air pollution (#)	Effects for trade, industry and
Comfort (#)	Barrier effects (#)	Tourism
Vehicle costs (*)	Water supply	
Maintenance (*)	Vibrations	
	Landscape/scenery	
	Nature conservation	
	Land development (*)	

* Effects evaluated in monetary terms based on willingness to pay.
Effects evaluated in monetary terms based on explicit public preferences.

Source: Hansson and Nilsson

Various possible groups of investments are examined for each transport corridor to find the grouping that will maximise the social net present value of BV's investments. Investment plans were done in consultation with the regional governments of Sweden, as well as with SJ (Farrel). The system still had railway improvements under the control of parliament, not of the market. The parliamentary control was attributable to the fact that BV's budget was allocated from the Swedish state so only if monies were available could new infrastructure work be done.

BV was to undertake its activities with the overall perspective of improving the Swedish rail network, which had fallen into disrepair. Projects to be evaluated by BV were then prepared for implementation through the creation of a long-term work plan.

This work plan would be the basis of the funding proposal to be presented to the Swedish Parliament and, therefore, the basis of BV's funding (Olofsson).

The reconstruction of the Swedish rail network was a large-scale effort. Funding was set at roughly SEK one billion per year throughout the early 1990s. This figure was later increased to SEK 4 billion per year as the perceived need for upgrades increased (Nilsson 1995). Emphasis was placed on the creation of increased capacity that would allow the new high-speed passenger trains and low-speed freight trains to operate together. This necessitated double tracking much of the existing network and installing better passing loops on other sections. Service enhancing improvements were also needed, such as a change of track layout to accommodate high-speed passenger train movement.

Investment in the regional infrastructure was allocated by the county administrations. The funds allocated to the counties would cover all modes of transportation, so the budget for the rail system competed with allocations for road maintenance and other transport infrastructure. Track maintenance was to be done by BV, though financed by county funds. In fact, BV has somewhat limited service obligations for some lines as they are not required to maintain track that has less than five return passenger trips or one freight trip per day (Farrel).

4.3.1.4 Access Pricing

SJ pays access charges to BV for running trains on the rail network. The pricing system that was put in place for the rail track was designed to be similar to charges already in place for the use of the road network. Pricing was intended to reflect marginal social cost with some provision for cost recovery, and was implemented via a two-part tariff. Railway operators pay a fixed element, a rate per vehicle axle, and a variable element, based upon tonne-km and the type of car/good being hauled. The variable charges were based on estimated maintenance costs for running the various types of trains on the various types of tracks. A differential price for differential track quality is not used because most of the poor quality track is in areas with low population densities (Hansson and Nilsson). Regional development policy makes charging the sparsely populated areas more for track use unattractive. Accident fees are calculated from the methodology described in the above section on infrastructure investment. The

marshalling yard charge is intended to compensate for wear and tear on the marshalling yards as well as the cost of accidents at these yards. Another fee charged on electrical locomotives covers the damage done to the electrical lines from use by the locomotives, and a diesel charge for diesel locomotives is intended to cover the environmental impact of their use. The latter fee is consistent with a diesel charge on road transport vehicles (Hansson and Nilsson).

The 1988 charge structure was as follows.

Table 4.2 Swedish Track Charges as of 1988

Track Fees
- Track wear, Varied by train and cargo SEK 0.2 to 0.3 per tonne/km on average ¹⁰
- Marshalling yard fee, SEK 3.5 per wagon
- Accidents, SEK 1.6 per kilometre
- Emissions, SEK 0.27 per litre of fuel consumed
Source: Hansson and Nilsson

Fixed track access fees help cover the cost of the infrastructure and also approximate taxes put on road transport. The fixed fees were set at SEK 250,000 for a standard locomotive, SEK 50,000 for a standard passenger car and SEK 7,500 for a standard rail freight car. These fees are listed on a per year basis. Revenues from access charges only accounted for about one half to one third of the total cost of the rail administration (Jansson and Cardebring, Farrel).

4.3.2 Changes From 1988-1996

The Swedish government continued the process of deregulation and increased track access beyond the 1988 split. The government followed through with reform that was part of the 1988 decision and initiated discussion as to further possible rail reform. Resulting changes increased the potential for competition on the Swedish rail network.

¹⁰ The actual charge varies from SEK 0.03 for empty iron ore cars on the Iron Ore Line to SEK 0.68 for a locomotive car travelling faster than 135km/h. The figure above is given to make a rough comparison with later charges.

In 1990 the actual control over the county lines was handed to the CTAs and the first round of service tenders was held. In this first round, SJ won all except the passenger service tender in one county. BK Tåg, a company that had no experience in the train market, but was already active in the bus transportation market, won this tender. This was the first company, other than SJ, to operate on the Swedish rail system. (Alexandersson and Hultén 1999)

An important development came in 1991 when a directive by the EC council of ministers (Directive 91-440) was released. This directive stated that in order to increase competition and efficiency in the European Union, railway infrastructure should be separated from railway service provision. The directive specifically asks that member states allow increased access to the national rail bed for international groupings of trains and that this access must be non-discriminatory. Access charges should be levied on the users of the rail infrastructure and each country would determine the exact charges. The directive also sets out general criteria for the separation of accounts between the two rail organisations and the need for all EU railway systems to maintain a minimum safety standard. Another EU directive, EC Directive 95/18/EC deals with rail safety laws. Sweden is compliant with this directive. (Alexandersson and Hultén 1999, Farrel)

Another change was introduced when the Swedish government modified the rules for state purchased inter-regional passenger transport. As of 1992, government purchases of rail service were to be done through a process of competitive tendering. For a rail line to become available for tender, SJ must first have declared that the line was unprofitable. If the government deemed there was a social benefit from running the unprofitable passenger service, the government would then tender for the lowest subsidy to the operator to run that service. These negotiations were originally done through a special governmental authority. For a period they were done through a division of BV before being returned to a governmental responsibility (Hellström). The tendered contracts are usually for a short period of time but there are a few examples of five year contracts (Alexandersson). The establishment of this process was important since it eliminated SJ as the only possible bidder for inter-regional contracts and for the first time created the possibility that there could be trains on the main line network from an operator other than SJ.

Investment and maintenance on the Swedish network are guided by ten year plans created by BV. The first plan was for the period 1994-2003 and the plan is updated every four years. The infrastructure investment criteria are the same as those detailed in section 4.3.1.3. Maintenance is included in the planning process in order to ensure that railway maintenance will not suffer due to an undue focus on new infrastructure (Hylén). The maintenance goals were that the average speed for the fastest train category should increase by 26 per cent over the ten year period, that sections of the network be upgraded, that an extension of the 25 tonne axle network be completed and implementation of increased capacity utilisation through double tracking and signalling improvements. As well, traffic disruptions were to be reduced by 40 per cent by introducing more modern control equipment, traffic safety would be improved by eliminating level crossings and transferring passenger traffic to rail. There should also be environmental benefits from the change of passengers from road to rail. Finally, BV's maintenance costs, measured per tonne-km, should decrease by 30 per cent (Hylén).

In 1993 a special situation was created on a section of rail track in the Swedish interior known as "The Inland Rail Line." Control of the distribution of operating rights on this line was given to the municipalities served by the line. Together, the municipalities created a special company, Inlandsbanan AB, to operate on the Inland Rail Line. This line, like the main network, would receive government grants for its operation. Other than Inlandsbanan AB, SJ also uses the line for the transport of timber and peat (SIKA). Another rail line, "The Iron Ore Line, " running through the north of Sweden and into Norway, was similarly transferred to the municipalities through which the line runs. However, exclusive ore transport rights on this line were granted to the mining company Luossavaara-Kiirunavaara AB (LKAB) by the Swedish government. The Iron Ore Line is considered as separate from both the regional and the trunk lines (Alexandersson).

The government tabled a 1994 bill suggesting far reaching reforms for the Swedish railway sector. The most important part of the bill was the recommendation that passenger transport be completely deregulated and that open access for passenger services be implemented. This proposal was very controversial, as it would have meant a

huge change to the politically sensitive area of passenger transport. The bill was tabled near election time and post election, the government ended up withdrawing the bill and the proposed reforms never took place (Alexandersson and Hultén 1999).

4.3.3 Preparation for Open Access: Changes in 1996

Discussions were held looking into methods of increasing the competition within the Swedish railway industry. The ensuing report centred on two main items, timetabling for competing companies, and non-duplicable assets (Coopers & Lybrand). Non-duplicable assets refer to assets that, due to economies of scale and scope, become inefficient for more than one firm to provide and therefore are best provided by one firm. These assets were identified to include rolling stock and locomotives, stations, terminals and depots, marshalling yards, training facilities, electricity and diesel supply, train ferries and terminals, breakdown services and passenger ticketing and reservation systems.

A list of asset types that were eventually included in legislation is found in section 4.3.3.3. Of particular interest were stations and rolling stock. It was recommended that stations be made available by the existing operator, SJ, on competitively neutral grounds (Coopers & Lybrand). This report also noted that there would need to be organisational changes in SJ to accommodate this. Accounting and administrative divisions would have to be created and systems put in place to allow for licensing and contracting with other operators. Keeping these systems within SJ was justified at the time by the desire to avoid drastic restructuring of the railway given that the mode of transport is vying to compete with other modes. The proposed accounting separation for stations is consistent with the idea of evolutionary change championed by the government.

For rolling stock, it was recommended that the successful winners of government franchises were to have rights to the rolling stock needed to perform this service. For commercial competitors for passenger service, they would have to own their own engines and rolling stock. For freight competition, SJ was to be expected to make available surplus engines and rolling stock for competitors. Coopers & Lybrand noted that this system did not provide incentives for SJ to comply. They recommended that another organisation be set up, externally or inside SJ, to create a lease market for rolling

stock that could be accessed by all parties. One aspect that was identified as crucial for the existence of both of these systems was the existence of a powerful regulator. The government was recommended to create a regulatory body that can ensure that SJ is operating in a neutral manner and has the appropriate powers to enforce decisions that the regulator makes.

To promote efficient track possession times, a system of introducing incentives for the infrastructure administrator was suggested. This would be done through the introduction of a system of charges that would have to be paid in order for the administrator to access the track. This would mean that if the administrator wanted to perform maintenance on the network it would have to pay track charges to the operators.

4.3.3.1 Expansion of the Regional Network

In the 1996 changes, the CTAs expanded their right to purchase regional service using the auction process as set out in the 1988 legislation. The CTAs got further powers as the new legislation allowed for the CTAs to run their trains on the main network if those lines were in their county and if the service provided was for regional transportation purposes. The CTAs could also run trains on main lines that crossed county borders if the trains were to be used to support and enhance the operation of their regional passenger services. Any movements across county borders would be subject to special approval.

4.3.3.2 Open Access for Freight Carriers

For freight traffic it was felt that increased intramodal competition would be helpful to rail's market share. The expectation was that competition would force freight carriers to develop a more responsive approach on service provision that would allow them to compete with the convenience of road haulage. Thus, operators other than SJ were allowed to run on the rail network, so long as they are approved by BV. The administration of new entrants into the market is handled by the Railway Inspectorate, an autonomous division inside of BV. The requirements for approval are to follow the Swedish Railway Safety Law (1990:1157). The conditions set out in this law are that the entrant must have appropriate knowledge of the business, conform to the economic and technical demands of the law, be approved for safety and get a train slot from BV

for the movement. BV publishes detailed requirements in a publicly available network statement (Banverket 2002).

The government cited "special conditions facing railway traffic" and did not allow open access for the whole network but rather a sort of partial access (Olofsson). Included in the 1996 reforms is the principle that existing freight traffic would be given priority in the future allocation of timetable slots. This means that existing freight traffic slots used by SJ would receive first priority in allocation and new entrants could not compete for those time slots on the network already allocated. In each yearly train planning period all existing traffic is timetabled first. Any new traffic should not disrupt this existing traffic. The government bill that proposes that the network become open to all freight operators does so not with the intention of opening the network to competition but rather to utilise the services of new entrants to operate as a feeder service to the existing rail operations and also to "develop customised and efficient transport solutions"(MOT). Malmbanan, with the freight transport rights assigned exclusively to one firm, LKAB, is exempt from the requirement that existing traffic receive preferential treatment.

The Swedish government held the view that opening passenger transport to more rigorous competition would decrease the total amount of transportation services that were provided and that this would be contrary to the government's goal of increasing rail's market share. As a result of this opinion no additional deregulation happened for interregional passenger transportation.

4.3.3.3 Common Use Assets

The complete list of items that the bill outlines as being non-duplicable is as follows (Olofsson).

- Stations and station buildings
- Land for railway purposes
- Installations for service and maintenance of railway stock
- Training linked to railway traffic
- Safety inspection of rolling stock
- Rescue and salvage facilities
- Electric power supply for train operation

- Tracks for holding, cleaning and maintenance
- Shunting yards and goods terminals
- Goods tracks to industrial plants and loading areas
- Detectors on the track, e.g. for recording wagon faults
- Telephone and radio services
- Train ferry traffic and train ferry terminals

At the time, it was not considered necessary to take these facilities away from SJ. Instead the government had given instructions that these facilities should be accessed in a competitively neutral manner by entrants. To provide competitively neutral access, SJ should charge any entrant what it internally charges itself for the use of these facilities. SJ put into place accounting measures that allow for pricing of facilities that would be used by all carriers, such as the facilities at train stations. One notable exclusion from the asset list is rolling stock.

This bill also reorganises the need for change to the traffic control sector of the Swedish rail system. BV is acknowledged as the controller of the railway network and is given responsibility for the performance of the railway sector as a whole. Despite this responsibility, the government states that it is contrary to the idea of neutral and non-discriminatory relations between the infrastructure operator and the railway service provider that the infrastructure operator has complete control over train allocation (MOT). This is the case since BV has an interest in when traffic is on the line with regards to when it can do repairs and upgrading. Therefore a new division inside BV was to be created to handle traffic control. This division would be autonomous from BV but would allow for BV and the rail operators to have knowledge of and influence on traffic allocation decisions. BV is still responsible for rail upkeep but also for things such as training and development in the rail sector. It is BV's responsibility to ensure that the system runs smoothly.

4.3.4 The 1998 Legislation

4.3.4.1 Track Pricing

In 1998 Swedish parliament adopted a new bill entitled "A Transport Policy for Sustainable Development." One important item in this bill is that the track usage

charges were greatly reduced. SJ expectations were to spend SEK 250 million on track charges instead of the SEK 700 million it paid previously. The reduced track use charges are expected to make competition with road haulage "more fair."

(Alexandersson and Hultén 1999, Banverket 1999) The new track infrastructure charges are designed to have rail cover all the marginal social costs of its operations. This includes emissions costs, social costs of the accidents that rail traffic creates and the noise and barrier effects of rail operations. It is believed by government and members of the rail industry that rail is a more environmentally friendly means of transport than road haulage and the revised charges provide price incentives to reflect this.

The new tariff structure is as follows (Banverket).

Table 4.3

Track Fees
- Track wear, SEK 0.0028 per gross tonne per kilometre
- Marshalling yard fee, SEK 4 per wagon
- Accidents, SEK 1.10 per kilometre per passenger train
- Accidents, SEK 0.55 per kilometre per freight train
- Emissions, SEK 0.31 per litre of fuel consumed ¹¹

Fixed fees intended to cover fixed costs of the infrastructure that were in place in the old pricing regime have been removed. This reduction in charge is intended to help rail transport to be more competitive with other modes of transport. There are plans to reinstate fixed charges in order to cover one third of the cost of operating the capillary network that was transferred to BV in 1998. This is discussed further below in section 4.3.4.4.

4.3.4.2 Infrastructure

BV extended and revised its long term plan for the construction of new railway infrastructure and the maintenance of the old infrastructure. In 1998 BV adopted railway plans covering the short term period of 1998-2001 and the longer-term period

¹¹ BV has the option of lowering this fee for vehicles with good emission characteristics.

of 1998-2007. The 1998 investment plan is a revision of the original 1994 investment plan. Financing for the operations covered by BV comes largely from appropriations from the government. In 1998 this amounted to SEK 10,096 million of which SEK 6,219 million related to rail investment (Banverket 1999).

BV, as a national rail administration, is participating with the EU in the creation of infrastructure suitable for the eventual unification of the rail systems in the EU countries through the creation of freight highways that would be able to handle international traffic and allow shipments to cross national networks. Further to the creation of this objective, in 1997, BV has received SEK 60 million from the EU for infrastructure work. Other important infrastructure work is the creation of the Öresund bridge and tunnel which provides a fixed rail link to continental Europe through the islands of Denmark (SJ).

4.3.4.3 Changes in BV's Responsibilities

BV, in its role for operating the Rail Traffic Administration, has been given the following responsibilities. (Banverket 1999)

- To offer new and established traffic operators good opportunities for rail traffic, in a competitively neutral way.
- To decide on track allocation, establish timetables, and in certain cases to decide on the right to operate.
- To control the agreed traffic through train control and train dispatching.
- To decide on the administrative, technical and financial conditions for a traffic operator if an agreement has not been reached between BV and the traffic operator.
- To issue regulations within its area of responsibility.
- To be responsible for monitoring and reporting on the punctuality of rail traffic.

BV is also collectively responsible for the safety on the network and a division inside BV, the Railway Inspectorate, is responsible for investigations of accidents. The Railway Inspectorate is administratively different from other sections of BV. It has the responsibility for: (Banverket 1999)

- Safety standards for railways, underground railways, and tramways.
- Monitoring that established safety standards are observed.

- Investigating accidents and other incidents in rail, underground rail, and tramway traffic.
- Names of rail traffic junctions
- Permits under the Railway Safety Act to operate track infrastructure, track traffic or special traffic control activities.
- Approval of vehicles, track infrastructure and training plans.

4.3.4.4 Traffic Control

In the 1998 transport policy decision some of the facilities that were owned by SJ and were to be provided to all operators on competitively neutral terms were transferred to the control of BV. For freight traffic, the most important items transferred were major parts of the capillary network connecting the main system to individual loading locations. Similarly for passenger traffic, the platforms and platform installations were transferred. The responsibility for customer information was transferred to BV as well. (Olofsson, Banverket 1999)

BV has the responsibility for decreasing train delays in the system. BV notes that about 21 per cent of train delays were caused by infrastructure and traffic control problems and that operators caused 37.5 per cent of train delays. To help reduce these delays BV has begun a program with SJ to use better management techniques to reduce delays.

4.3.5 SJ Divestiture

SJ has continued to change. At the end of 1999 SJ was functionally split into six areas. These areas are passenger traffic, freight traffic, real estate, engineering, terminal production and an information technology division. The functional split came about through the 1999/2000 government bill entitled “Amended Business Activities of SJ, etc.” This bill mandated that, at the end of 2000, SJ would be divided into six independent limited companies based on the functional split. The divisions within SJ occurred as planned. The passenger traffic section maintained the name SJ AB with the freight traffic company to be known as SJ Green Cargo AB.

The change in SJ now allows former SJ units to solicit business outside of their former parent company. The new real estate and terminal production companies in

particular will now be dealing with SJ on the same basis as any other rail operator. SJ in turn is free to hire a company other than its old unit to provide its on car food service, for example. SJ also feels that this divestiture will mean that it is less involved with the state and will be better positioned to take advantage of deregulation in other European countries (SJ 2001).

4.3.6 New Entrants in Sweden

The amount of entry into a newly deregulated rail market serves as an indicator as to the extent that barriers to entry have been removed. The Swedish rail system has seen significant amounts of entry since deregulation began.

As mentioned in section 4.3.2. BK Tåg was the first firm to win a tender for regional passenger service. BK Tåg already had bus operations in Sweden and were able to use this experience to their advantage when bidding. They used increased vehicle and personnel utilisation to lower their costs relative to SJ (Nash and Toner). One condition for employment at BK Tåg was that job applicants must be willing to accept more flexible working conditions than at SJ. BK Tåg did not have difficulties finding staff who would accept the work conditions and many of their hires were former employees of SJ.

BK Tåg was very successful in improving the efficiency of existing operations. One case study highlights the fact that BK Tåg used innovations such as installing bus engines in trains as an alternative to the unreliable existing engines. This was something previously suggested to SJ but was dismissed as being impossible (Alexandersson and Hultén 1999). They were able to increase passenger numbers by removing some parallel bus services that they already provided (Farrel).

This first attempt at entry into the regional passenger transportation market was not without problems. SJ reacted with hostility to the change in operator. SJ unilaterally repossessed rolling stock used for the tendered transportation service and used its control over passenger stations to create operating problems for BK Tåg (Alexandersson and Hultén 1999).

BK Tåg's tendering success was short lived, and when the initial contract expired and the next round of bidding began in late 1993 BK Tåg lost its contract to SJ. To win the contract, SJ lowered its bidding price by 30 per cent.

BK Tåg subsequently took SJ to court under accusations of predatory pricing. Using a European court ruling as precedent,¹² SJ was found guilty of predatory pricing in its subsequent bid. The court chastised SJ for acting in such a way and awarded SEK 8 million in damages. The decision allowed BK Tåg to sue SJ for damages relating to the incident. The case was appealed by SJ but was ultimately won by BK Tåg (Alexandersson and Hultén 2003).

SJ's conduct in the case was interesting. One line of defence taken was that BK Tåg was the incumbent firm and that SJ was the entrant, this despite the large discrepancies in firm size and market history. BK Tåg only ran its trains on the lines for a few years and could hardly be considered a rail incumbent. When the verdict went against SJ in 1996, the state railways took action by appealing to the Swedish government to overturn the ruling on a technical point (Alexandersson and Hultén 1999).

After the initial entry by BK Tåg there was no other entrant for five years (Alexandersson). More recently, there has been further entry into the regional transportation market. One example is the winning of the important contract for commuter train services in Stockholm by a consortium, called Citypendeln, consisting of companies from France, the United Kingdom and Sweden. The Swedish company in the consortium is BK Tåg which was the successful bidder in the case above. SJ claims that the consortium was able to win the contract because of their ability to get a higher personnel utilisation than SJ. This consortium was scheduled to take control of operations as of January 1, 2000. Another example is from a new firm, BSM Järnväg, that has won the franchise for operations from a CTA that had BK Tåg providing services. This was a case of an entrant competing with a previous entrant. Early entrants had problems and some of the early companies went bankrupt and had their assets bought by other entrants. There have also been new companies that have started operations since 1988 and they have made inroads into the market (Alexandersson). Perhaps most importantly for long term open access in Sweden is that rail companies from outside the county have started to take an active role. VIA GTI and the Go Ahead

12 The precedent was that pricing was predatory if prices could not be shown to be above average variable cost (OECD).

Group, French and British, have formed an alliance with BK Tåg to win contracts and another French Company, CGEA, has bought out Linjebuss/Linjetåg and is now operating some regional passenger traffic (Alexandersson). The number of lines, both regional and long distance, that have been made available for tender has increased. It is suggested that Sweden may be on a route to a total tender system, with all passenger routes becoming subject to tender (Alexandersson).

Some progress has also been made in the area of interregional government purchased transport. This tender had to be supported by direct government action. On the line connecting Göteborg and Malmö, two large cities, SJ has been making a loss but has not put the line up for tender. Even though SJ was not making a profit on this line, they had reduced the losses on it. SJ did not declare the losses from operating this route assumedly because they expected to make a profit in the near future. The government intervened in this situation and forced the line to be tendered. The winning tender was that of the same consortium that got the Stockholm link. The tender was only for one year but it marked a step forward in getting entrants into the market. Some shippers have begun looking into operating their own rail service. Retailer IKEA now has permission from BV to start running trains between Sweden and Germany to replace traffic that was previously moved by truck (Banverket 2002).

4.4 Summary

The Swedish railway system began as a combination of public and private investment that eventually became entirely state-owned as the smaller, privately owned railways became insolvent. The state railway suffered declining market share in both passenger and freight traffic and required larger and larger government transfers to maintain operations.

This progression is consistent with most other state railways. Where Sweden's course changed from other examples was with the separation of the management of the rail infrastructure from the provision of a rail service. This separation happened gradually, with decisions on what aspects of rail were best served by the infrastructure operator or the rail service operator made over time.

The Swedish government, through BV, now has responsibility for operating, maintaining and possibly expanding the rail network. The state has dramatically reduced

and distanced itself from its former role in rail operations. The former state railway has now been altered so that the former monopoly is now a number of specialised companies with financial goals and governance structures similar to that of privately held companies. Since the infrastructure maintenance has been separated from operations, new rail firms have entered the Swedish system, not all successful, and rail rates have fallen.

CHAPTER 5 Discussion and Analysis

5.1 Comparing the two systems of rail organization

The Canadian rail system has two major railways, Canadian Pacific (CP) and Canadian National (CN). CP has been a major Canadian railway for more than a century and has a rail network that spans western and central Canada as well as lines in the United States. The Canadian government created CN in 1919 as a way of unifying various bankrupt early Canadian railways (Currie). CN was run as a crown corporation until 1992 when it was privatised and it too now has holdings in the U.S. The rail network of western Canada can be generalised as having the CP lines running east-west in the southern portions of the provinces and the CN lines running in the more northern portions. There are a few smaller short line and regional railways in operation in Canada. A complete description of the Canadian system can be found in Chapter 3.

The Swedish system began as a state railway, named *Statens Järnvagar* (SJ), along with various regional private railways that serviced the different regions of the country. As the private railways became bankrupt, the state railway absorbed or purchased their assets eventually becoming a state monopoly. As a prelude to the restructuring of the Swedish rail system the historical division between regional and national rail lines was renewed (Alexandersson and Hultén 1999). The regional systems became the property of the regional governments and the national system became the property of the national government. Regional governments were given responsibility for providing public transport on their lines and are responsible for funding maintenance of those lines (Farrel). The national government is responsible for new maintenance of rail lines and the use of the national system for passenger transport. The regional/national distinction is not important for freight transport. All Swedish rail lines with the exception of two special lines are under the control of a government agency that is responsible for maintaining and administering the physical network and traffic planning (*Banverket*).

5.2 Comparing Institutional Structures

This discussion focuses on the two competing systems of rail organisation. Canada's rail system is a vertically integrated system where each rail service operator controls its own physical rail track network, while Sweden's is a vertically separated rail system, where no single rail operator has control of the physical rail track network. The operation of rail service is separated from the operation of the physical rail track. Network infrastructure, or in this case the physical rail track, is of special importance to the rail system due to all system participants requiring it to provide service.

Traditionally it has been thought that natural monopoly properties applied to all the parts of the rail system. There is a growing understanding that these properties may only hold for the provision of network infrastructure (Joskow). It is the physical rail track that could be subject to monopoly provision, so separating the organisation of the network infrastructure from other parts of the system is one strategy to take advantage of this. This means the contractual relationship of the infrastructure owner and the rest of the system is of special importance to the economic functioning of the rail system.

To analyse the two countries' rail systems, it is necessary to examine what is critical to making each rail system work. This analysis will begin by discussing factors external to rail which dictate or influence the needs of the rail system. Following this, five essential aspects of rail operations, access, maintenance, rolling stock, customer service and new operators will be discussed as well as how each aspect is affected by the organisation of the system. Within the rail system, control over access to the track of a rail network is the first potential barrier to entry that is faced by a potential rail service operator. The importance of the rail network for all rail traffic flows also necessitates that the rail network be properly maintained and that the physical traffic flows on the network are managed in a safe and efficient manner. As well, in certain situations firms may not be able to easily acquire rolling stock for use on the rail network thus limiting their ability to compete. The degree to which operators are responsive to their shipper and what effect rail organisation has on shippers is discussed. Finally I examine how, as new operators access the network, existing operators respond and in turn affect the likelihood of new entry.

5.2.1 Intermodal Competition

Intermodal competition faced by a rail system is a very important factor when looking at the need for institutional change and correspondingly, the options for institutional change. As described in section 2.1.1.1, intermodal competition refers to the competition that a rail operator faces from alternate modes of transportation. For rail, these modes would include trucking, barge hauling, air, bus and personal automobile. It is well understood that intermodal competition, in many cases, acts as an upward bound on the ability of a rail firm to exercise its market power. Since rail is in competition with road haulage and water movement for freight and a variety of modes for personal transport, if a rail firm charges too much for its service, a shipper or passenger will change the transportation mode that he or she will use. For the case of the shipper it may be cheaper for him to hire a truck to move goods than to move them using rail. Through this, competition exists that may not be directly related to the reorganisation of the rail industry.

The impact of intermodal competition is not limited to price. Service level, transport times and other factors also play a role in the decision of which mode to use. For example, the flexibility of timing and range of delivery points may make trucking a more attractive option even when rail is equivalently priced.

In Canada, intermodal competition has been very important in determining the organisation and focus of firms in the industry. In areas such as the highly populated regions of Quebec and Ontario, truck transport has eclipsed rail transportation for freight movements. Competition from trucking has kept certain rates down resulting in the argument for the need for cross subsidisation of rail traffic. For certain products, competition from trucking forces rail rates to be at least as low as comparable trucking rates. Since these competitive rates likely offer low returns to fixed costs, the railways must earn contributions toward fixed costs from other traffic. These fixed costs are earned from traffic that does not face strong intermodal competition.

The freight rail industry in Sweden is in close competition with truck haulage and an increase in competition in that industry can increase competitive pressures on the rail industry. An example of this is the introduction of cabotage into Sweden's truck

market - this deregulation allowing foreign road carriers into Sweden is claimed to have had the effect of squeezing prices for rail freight movements (SJ).

Despite government attempts to enhance rail's competitiveness through deregulation and non-compensatory rail access charges, rail transport has not done well in increasing its market share for freight movements in Sweden. Freight movements by rail have remained stable or increased slightly but at a rate far less than the increase experienced by road transport. It is the contention from BV that rail is paying its full environmental cost whereas road transport it still not. Other documents have supported this claim, though they were released prior to the 1998 rate restructuring (Hansson and Nilsson, Hansson). The government's goal of creating transport systems that fully internalise all costs may not have been realised. It may also be that there are adjustment times and costs for shippers to make the change from road to rail such that a shift will only come slowly or not at all. There is also the possibility that the other problems in the rail network other than the railway costing scheme may be preventing this shift (flexibility, difficulty with door to door service).

Rail transport is somewhat less flexible than road transport and this lack of flexibility has been a priority change in rail. Efforts have been made to develop technically plausible ways of increasing flexibility. Also, track allocation may also be a problem for freight. As freight competes for track space with high value passenger traffic, it may not get the best timetable allocations. BV has suggested that the existence of freight corridors, such as what is proposed for the European Union, can offer a solution. Currently, BV claims it is trying to create and foster these freight corridors with the other Nordic countries (BV).

Intermodal competition is a problem for rail from an international perspective as well. One of the reasons that rail is not competitive with trucking is that trains are cumbersome and slow in marshalling and crossing borders. International efforts must be made to increase standardisation to improve rail's competitiveness with other means of transport. Some argue that Sweden's choice to allow open access weakens SJ and, therefore, weakens Sweden's bargaining power when bargaining for standardisation (Bruzelius, Jensen and Sjöstedt).

With respect to passenger transportation, long distance bus services in Sweden have been deregulated and SJ's bus division, Swebus, has been sold. This has changed the nature of the long distance bus transportation. The buyer of Swebus was a British company called Stagecoach and these new owners have been aggressively competing with rail in the passenger transportation market. There is concern in Sweden as this marks another example of foreign entry into the passenger transportation market. Other rail entrants, such as Linjebuss and BK Tåg, have previously operated bus services and firms with transportation experience in that industry may mean more competition in passenger transport in the future.

5.2.1.1 Product and Source Competition

Product competition also works as an upward bound on what a rail firm with market power can charge. In a product market that is very competitive, an increase in cost for any one producer of that product must be borne by the producer since it cannot be passed on to the consumer. If any one producer increased its price in a competitive market, it would not be able to sell any of its product. This situation is representative for many of the bulky, low-value products that are shipped by rail, as they are traded in a global marketplace where a buyer can relatively easily change the source of the product. If a railway increases its freight rate to get the product to market, the shipper must reduce profits on the sale or else the sale will not be made at all. It is rational to assume that a railway will earn some contribution to fixed costs from any railway movement and as such, it is against the railway's interest to not have that product move on its lines. It is this pressure from the competitive marketplace and the ability of the shipper to absorb freight rate changes that will keep a limit on the railway's ability to exploit its market power.

Product competition implies that a railway may not be exploiting its market power even if the railway is the monopoly provider of freight transportation for a shipper. The degree to which a railway can use its market power then depends upon the existence of rent that the railway can capture from the shipper. If the railway hauls goods which earn a large return for the shipper then the railway can use its market power to extract those returns up to a level where it is better for a shipper to discontinue operations rather than pay the freight rate.

5.2.1.1.1 The Hold Up Problem in a Product or Source Competitive Transportation Market

This last situation leads to the possibility of the hold up problem as described in section 2.2.4.1. Even in an environment of product competition, it is possible for the market power of a railway to hold up investment in the shipper's industry, provided that the shipper has to incur sunk costs to operate (Fulton and Gray). When a potential shipper decides whether or not to invest in operations, they will know that they must invest in assets that are specific to production of the shipper's product. The shipper also knows that the railway serving him has market power.

In this environment, the railway has incentive to set freight rates that will exploit the shipper. This exploitation will mean more than just appropriating excess profits. The railway can set rates so that the shipper will earn less than the normal rate of return on the investment. Despite earning this below normal rate of return, the sunk nature of the shipper's investments will mean that it would be better to continue shipping than to cease operations. Anticipating this situation, the shipper will not invest in the production of the product. Thus, even in a product competitive transportation market, railway market power can hold up investment by shippers.

5.2.2 Infrastructure Access

Access to a rail network is essential for rail operation. Infrastructure access involves transactions between operators and the rail administration and between operators and the physical railtrack itself. There are two ways that access to infrastructure may work as a barrier to entry. The first is by restricting the right to access the infrastructure. This refers to the legal right for a railway operator to access a stretch of rail track. The second way is to make it uneconomic to access the infrastructure. This occurs when the cost of accessing the infrastructure is skewed so that the incumbent railway is in a favourable position thereby disadvantaging any potential entrants. This could be accomplished through large fixed fees for entering the rail market.

Designing what the optimum charge should be for the use of a section of a railway network at a given point in time is a difficult process. Railway infrastructure is used by all passenger and freight traffic and, under a system of open access, by many railways. The fixed cost of the rail infrastructure is common to all of these types of

traffic and to all the rail operators which use the infrastructure. Differences in track condition and train type cause problems for determining what the marginal cost for any particular train is of using any particular section of track. To this is added the problem of assigning a portion of joint costs if the infrastructure is to be self-financing.

Congestion is also an issue. On a rail network, sections of track where there is inadequate capacity to handle traffic demand are called bottlenecks. In times of scarce rail capacity at bottlenecks, the costing situation is further complicated if access pricing is intended to include a scarcity cost for using the bottleneck. Clearly a fair, economic pricing scheme for rail access would be a difficult goal to achieve.

5.2.2.1 Vertically Integrated System

In the Canadian system access to the infrastructure is granted by the infrastructure owner, a railway company. This access can be granted willingly or the railway company can be forced to grant access by the Canada Transport Agency. Accordingly, the main method of getting access to railway infrastructure has been by agreement between railway companies. The power a vertically integrated railway has to exclude any other railway company from using track it owns has been recognised in Canadian rail policy. The CTA currently has two provisions designed to simulate access to the infrastructure, interswitching and competitive line rates (CLRs) (Travacon). Interswitching allows a shipper to compel a connecting railway to move cars along its lines to interconnect with another railway. Interswitching provisions only work when the distance from the shipper to the interconnection point is 30 kilometres or less. CLRs are effectively interswitching provisions for distances over the 30 kilometre limit (Travacon). These provisions are outlined in more detail in section 3.2.1.10.

5.2.2.1.1 Incentives for Competition

There are few incentives for CN and CP to competitively interswitch because they have no incentive to compete against each other. The two major railways, CN and CP, have been operating in Canada since the early part of the 1900s and there is no firm with the resources to enter the industry as a vertically integrated firm in a substantial way in the near or foreseeable future. Canada's rail market is effectively a duopoly, and Canada's current provisions for intra rail competition are ineffectual because there must

already be competition in the rail market in order for legal incentives for competition to work.

A fair characterisation of the matter of pricing rail traffic in any given market is as a repeated game. CN and CP know that they will face each other in competition for traffic in more than any particular case. CN and CP know that any pricing decision they take will affect the other firm. The above game is one where the two rail firms in the market are the only two that can compete for this traffic. This means that inter modal competition from trucking, maritime or air transport are not viable options for moving the goods.

Canadian railways have weak incentives to compete with each other. Let us assume that there is a shipper whose shipping point falls within the geographical limits of the interswitching provision of the CTA and wants to tender for offers for a freight movement. This is a situation where a railway without a direct rail line to the shipper would want to get the shipper's business, presumably by offering a lower rate. When the non-connected railway won the contract from the shipper, it would have to bargain with the connected railway for use of the interswitch or, failing that, use the provisions of the CTA to get interswitching rights. If the interswitching provisions are used, that would represent a loss to the connected railway of the profits made from the shipper. The railway that would get the contract would get a benefit of the profit that it made from the contract. The shipper would get the benefit of the difference between the two prices. Society is better off. Under this scenario a Bertrand equilibrium is expected with the result that the contract is priced at marginal cost.

The situation is not so clear as that, however, as the railways do not just compete for one shipper at one time. The railways could compete for many different shippers each at multiple points in time so the assumptions of a single period game in one market do not hold, so a Bertrand equilibrium should not be assumed to hold (Carlton and Perloff). Instead any railway would suspect that actively competing with the other will be likely to draw a response. This response could take the form of price cutting on another source or for this source in another time period. If this sort of price war happens than both railways could be expected to be moving the same amount of traffic, at lower prices. This does not benefit either railway. In this case, the only time the railways

would interline is when they agree to do so between themselves. The shipper would not be able to get a beneficial offer from a railway that would interswitch with the shipper's current carrier.

5.2.2.1.2 Shortline Railways

In the case where the party looking to interswitch is a new entrant or small scale shortline the same situation occurs. To understand this, consider the shortline as the de facto shipper. To interswitch, or use competitive line rates, the short line will have to get an offer from one of the major carriers to move the product at favourable rates. It is certainly possible for this to happen, but it would be against both major railways interest to make such an offer. Although the example of a short line implies one delivery point, there will be many shipments over time and competing for the traffic will mean that both of the major railways will lose. Until the short line can move the traffic all the way to its final destination, there is no threat of the competitive provisions working.

The failure of the competitive provisions is seen in their failure to be used so far. In the duration of their existence there have been eight applications to the CTA for interswitching. Of these eight, only one was decided in favour of the shipper. This case was then appealed and subsequently withdrawn (Travacon).

5.2.2.2 Vertically Separated System

5.2.2.2.1 Safety Laws

The present Swedish system of rail organisation addresses the first potential barrier to entry through the laws that determine which railway operators have the right to access the rail infrastructure. The laws are determined and applied by an independent department inside the rail administration and state that any operator can operate on the infrastructure so long as that they are deemed competent by the rail administration and so long as they can get a rail slot in the train traffic planning process (Alexandersson and Hultén 1999).

Obtaining approval on safety issues from the rail administration to operate on the Swedish rail system has not been a barrier to entry. When the first new entrants entered the Swedish system, the new company was able to get former SJ staff who were able to

help get through the regulatory system. Friction in obtaining the right of access came from navigating the government's regulatory requirements, not from a lack of qualified staff (Ehrling). In an effort to improve the ease of entry, the agency responsible for granting access produces information packages for potential entrants (Alexandersson and Hultén 1999). Since that first entrant, there have been many other companies who have been able to access the rail track. Further discussion about acquiring a train slot from the rail administration can be found in section 5.2.4.2.

5.2.2.2.2 Access Fee System

The second condition of economic access fees is dealt with by the government. The Swedish government uses a model of railway operations that is based on the Swedish model for road charges. This system is very stylised and requires government support to operate. Problems of designing infrastructure charges are transferred from the rail infrastructure operator to the government. The Swedish system uses a legislated, fixed rate structure for all trains that run on the system. This rate structure is designed to charge for the marginal social cost of using the railway track (Banverket 1999, Hansson and Nilsson). This charge is intended to compensate for the wear and tear on the rail track, the environmental cost of the energy used in the transportation and the cost of the safety risks that rail operations pose to society (Farrel, Banverket 1999).

The other main determinant of the charges for rail is the perceived need for equity between rail transportation and road transportation. The charge structure that was originally in place was replaced in the mid 1990s when it was felt that rail was not as competitive with road transport as it should be. More specifically, the fact that road transportation was not paying its full marginal social cost and rail was paying its full cost (Hansson and Nilsson) caused the government to reduce the charges that rail carriers would pay to use the infrastructure.

A new fare structure was put in place in 1999. The access charges were not designed to recover the total cost of providing the rail administration and infrastructure upkeep. Revenues from access charges only have accounted for about one half to one third of the total cost of the rail administration (Jansson and Cardebring, Farrel). And after more recent changes, the level of cost recovery declined to less than 10-20 per cent

of maintenance costs alone (Nilsson).¹³ The remainder of the cost is effectively transferred from the general revenues of the national government.

This system imposes costs on the general revenues of the government but it does avoid many of the problems of attempting to design a rate structure for the rail system. A barrier to entry is eliminated by the use of the legislated variable cost system of fees. There is no disadvantage to small entrants from the structure of fees favouring large operators, such as by the use of large initial fixed access charges. The charges are not unreasonably high as the access charges are far below the yearly cost of running and maintaining the infrastructure.

Since the 1998 bill the track charges for the use of Sweden's rail infrastructure have been drastically reduced to "marginal social cost." This has created a situation where the rail use charges in Sweden are much lower than the EU countries that they are connected to. SJ reports that the charges in Sweden are SEK 3.5/train km while in Denmark they are SEK 31.5/train km and in Germany they are 48/train km. SJ views this as a threat and a constraint to international operations for freight movements.

5.2.2.2.3 Criticisms

The Swedish track charge system is criticised extensively by Farrel (1999). To start, the track charges are legislated and as such are difficult to alter, and to do so would necessitate getting political approval. Although initially there were plans to index the charges to inflation, these measures were not implemented. In addition, there is no way for economic productivity or quality to be reflected by changes in the charges, so track charges offer no strong incentives for improvements. The system of BV running on government funds also provides weak incentives for efficient decisions. All track receipts go to the government treasury so there is no direct feedback to BV from track revenue.

There were also some inconsistencies with the government's claim that rail access fees were consistent with road haulage fees. The fuel charge for rail, for example, was never adjusted when the fuel tax was adjusted for road transport (Farrel). The accident fee is believed to be unfairly levied since all costs from accidents between rail

¹³ This figure was given by Prof. Nilsson as part of comments made on an earlier version of this analysis.

and road are automatically attributed to rail. As is the case for the fixed fees, the revenue from accident charges is placed into general government revenues instead of into accident prevention programs and other areas related to accidents (Farrel).

These examples demonstrate that the goal of road and rail equality has not been achieved. This fact is supported by Hansson and Nilsson who report that before the 1998 changes rail was paying its marginal social cost whereas road transport was not. These authors also assumed that rail charging is flexible and acknowledge the existence of a second best optimisation problem in rail pricing. Is it better to have rail underused because of the relative under pricing of road or is it better to have rail pay less than social cost in order to have fees that are appropriate relative to road transportation?

The motivations for the charges came from a desire to have the cost of hauling goods by rail equal to the cost of moving the equivalent amount of goods by road. The charges were not intended to represent total cost coverage for the wear and tear on the tracks (Farrel). The actual charges adopted this principle, but modified it for four different reasons. The fixed portion of the charges was set to achieve some acceptable level of cost coverage. With the pricing scheme of marginal social cost it was always known that track charges could not cover the whole cost of running and administering the infrastructure. Additional funding would have to come from the state and therefore would have to be politically acceptable. At the same time SJ needed to have a chance at meeting its revised financial targets. Lower track charges would help to make this happen. There were also provisions set out for providing incentives to eliminate excess rolling stock. Ultimately, the state's receipts from track access fees were never as high as expected, as SJ did not use as much rolling stock as was initially predicted.

The Swedish government seems to have agreed with Farrel's point of view that rail is being charged more than marginal social cost and that something needed to be done. In the 1998 reductions, the new charges are computed as equivalent to marginal social cost. The new charge structure is still legislated and does not allow for a dynamic pricing system other than BV's ability to reduce the environmental charge for vehicles that exhibit favourable emission characteristics.

Unlike the Canadian interswitching provisions, the Swedish system of infrastructure access provides incentives for rail competition. The procedure for gaining

legal status is relatively transparent, and existing operators have no power to oppose the entry of another firm. In this way possibilities for strategic behaviour by the incumbent firms are limited. The charge system is also neutral as to the size of the rail operator, and the use of marginal cost pricing without the fixed fee means that there are no economies of size. And since the collected railway access charges are treated as general government revenue, there is no direct effect on the rail system from the legislated charges and BV's operating income. I conclude that Sweden's legislated access charge system is effective in its simplicity but weak in its lack of flexibility to respond to market conditions.

5.2.3 Infrastructure Maintenance and New Investment

Infrastructure maintenance and new investment influences rail organisation, as the maintenance of the system will affect service quality parameters such as train speed and on time performance. Investment decisions will determine the overall capacity of the rail system.

Infrastructure maintenance and investment deals with transactions that involve the physical railtrack. These transactions would be between the railtrack and the operators, the railtrack and the rail administration and the railtrack and the construction and maintenance agents. It is important that the rail infrastructure change to meet changing economic conditions. Certain uneconomic segments of track should be abandoned but there will also be demand for new investment. The rail system needs to be able to expand where it is economic to do so.

5.2.3.1 Vertically Integrated System

The Canadian regulatory system has done a poor job of dealing with infrastructure maintenance on grain dependent lines. Under the Crow's Nest Pass statutory rates, the rail companies did not obtain adequate revenues to cover the total cost of moving grain. As a result, railways did not have incentives to reinvest in grain dependent infrastructure. Car numbers and track quality suffered over time as a result of the regulatory regime.

On the non-grain dependent branch lines, the ability to alter freight rates on the other commodities that did not have as restrictive regulation provided an incentive to keep the level of maintenance higher than on the purely grain dependent sections. With

regulated rates and weak restrictions on the level of service for grain transportation, the grain dependent infrastructure deteriorated. This infrastructure could only be repaired through the federal and provincial governments investing substantial amounts of money into the system to purchase grain cars and repair branch lines (Vercammen).

5.2.3.1.1 Branchline Abandonment

From deteriorating infrastructure comes another source of uncertainty in the Canadian system. That question concerns those parts of the existing infrastructure for which it is economic to simply shut down. In a vertically integrated system railways can maximise profit by eliminating lines that are of a high cost to operate and that will not mean a significant reduction in the amount of grain that they move. If a railway can close a high cost line and move the grain from the high cost line to a lower cost line without greatly reducing the total amount of grain moved, then the railways can realize profitability. The railways face this situation in much of western Canada since there is no real inter-modal competition from trucking to move grain long distances.

Since government deregulation in the Canada Transportation Act made it easier to abandon uneconomic sections of rail track (Schmitz and Furtan), both railways have been ceasing service to sections of grain dependent rail. The interesting transportation issue comes from the fact that by closing branch lines, the railways are moving traffic on to a publicly funded road system. Any damage to the road network that comes from the decision to close a rail line is not included in the financial process of the railway (Vercammen).

The incentive to abandon rail lines and shift grain movement from private transportation infrastructure to public infrastructure has been offset by recent legislation. Today, legislation forces an abandoning railway to pay a fixed sum to the rural municipality when a section of rail line is abandoned (Estey). However, this fee is not proportional to road use and does not reflect road damage done to other rural municipalities as a result of a line closure in an adjoining rural municipality.

5.2.3.1.2 Shortline Railways

A vertically integrated system hinders the use of short line railways. One such reason is the specificity of owning the portion of rail track and, to a lesser extent, the

rolling stock. Fulton and Gray (1997) have identified the hold up problem as affecting investment in assets whose value is affected by freight rates. This could include an outside firm purchasing a stretch of track and beginning operations as a short line railway. The potential purchaser of a short line railway would know that the rail industry is comprised of two main firms. For the short line to work it will have to contract with one of the incumbent railways in order to complete a movement of grain to its final destination. Before the potential buyer will make the investment in rail line, he will want to know that he can at least break even on the investment. Once the purchase is complete, the short line can begin operations.

When the time comes to contract with the railways, the railways will have a strong position when bargaining for the interswitching rate as the short line needs the mainline railway in order to make a movement. Furthermore the short line owner has just made an investment in a specific asset. It is specific because the alternate use of a short section of branch line is of significantly less value than its primary one. The short line operator can only bargain with the one railway, or potentially two if the interswitching limits are met. As a result the mainline railway can offer a rate that would be slightly above the value of the alternate use of the short line but less than what is necessary for the owner to earn a break even economic return.

With two railways and the presence of interswitching limits, the specificity of a short line railway is somewhat reduced. For the case of the duopoly in western Canada without competition between the two railways, the specificity is not much reduced. As described when discussing the interswitching provisions themselves, having the ability to bargain with two railways is not an advantage if the two railways will not compete with each other.

5.2.3.2 Vertically Separated System

In the case of a vertically separated system, investment and maintenance may be a problem. The problem stems from the property rights of the track ownership. In a situation where common access exists for a rail track network that is owned by a railway that is also running on the network, that “landlord” railway has incentives to use its position as owner for its benefit. If, for example, the landlord railway was not getting rail traffic on a certain section of rail line, the landlord railway may let the infrastructure

deteriorate on that line to the detriment of the railway that is using that track. This action would mean that the landlord railway would still receive payment for the use of the track and not have to reinvest in maintenance. Another result may be that the tenant railway would have to reduce train speed or reduce axle weights in order to run on the deteriorated track. If the shipper's service quality is reduced, the landlord railway may use its ability to repair the track to its advantage when competing with the tenant railway for the shipper's business. The landlord railway's power not only disadvantages current competing railways but also potential entrants. The entrants know of the landlord railway's power and may not enter due to concerns about poor infrastructure upon entry.

5.2.3.2.1 Government Financing

The Swedes have dealt with investment and maintenance by using government funds to finance infrastructure. New investment in rail infrastructure is funded out of the budget of the rail administration. This budget is approved by the Swedish parliament. As official policy, new investments are made as part of a 10-year plan that is altered every five years (Farrel).

The basis of the decision is the use of a positive social net present value decision rule. In practice this is done by the rail administration running various scenarios of rail infrastructure investment with various assumptions on rail usage and the state of the Swedish economy. The infrastructure investment plan that yields the highest net present value to the country is the basis of future infrastructure investment. As vertical separation was the catalyst to this increased government spending, the separation of the railway operations changed the perspective of legislators from one of funding an inefficient railway to that of investing in the nation's infrastructure (Hellström).

In practice the rail administration's links to the Swedish parliament have led to deviations from this rule. Lobbying from regional governments and from regional representatives have meant that infrastructure renewal has not followed the theoretical guidelines in place. Regional governments have also been able to affect infrastructure decisions through the use of joint funding for improvements (Farrel). There have been numerous cases where rail improvements have "jumped the queue" when regional governments have agreed to share the cost with the federal government.

SJ, the dominant rail operator, has been dissatisfied with this system. This system uses the net social present value as a guide for investment not the net benefit to the rail system or to the rail operator. Investments that are being made are not those that the rail operators would most like to see and the benefits to be captured by a private firm may be different than that of the society as a whole.

There are opportunity losses to the private firm when investment does not go to where the private firm would most benefit. In the Swedish system, rail operators only have indirect input as to where they would like to see rail investment. Nilsson notes that the effect of the public sector influence means that all interest groups, including SJ can lobby the government. This system may advantage SJ, since it has a history of working with the government and as a large organisation compared with its competitors in Sweden, has more resources that can be devoted to lobby efforts. As such, the claim that SJ has no influence is false.

There should also be concern as to the long-term stability of the Swedish system of infrastructure management. One major factor that motivated the 1988 change was the deficit that SJ was incurring. This was a burden to the national treasury and caused problems for the continuation of the status quo rail service and infrastructure was deteriorating. With the new transactional system, it was made clear that the government's money was being spent on the repair or improvement of the rail infrastructure rather than as a subsidy for a public company.

Another problem is that the infrastructure is a large burden on the national treasury, as revenues from fee collection are far too low to recoup a significant amount of total costs. Thus Swedish rail infrastructure stands the risk of being allowed to decay in the event of a change in government priorities or of government financial difficulties. Rail operators have no direct commercial access to influence government (Farrel).

This problem was highlighted by the conflict between LKAB and the Norwegian government. LKAB runs freight traffic on the Iron Ore Line that runs from the Swedish coast to the Norwegian town of Narvik. LKAB was requesting that the Norwegian government pay for upgrading of the Norwegian section of the rail line in order to run trains with increased axle weights. The Norwegian government refused, despite participating in a committee that recommended the upgrade. There is no option for

LKAB but to continue to lobby for change or get permission to undertake the expansion at its own cost.

Another cost of this system is that it puts infrastructure investment on grounds that are not necessarily economically efficient. Building decisions are made by the rail administration and it, in turn, will be made the target of lobbying by regional governments and other interested parties. This may result in new investment that is not the best use for capital and may result in the building of excess capacity that has long been a traditional hallmark of rail systems. Then Swedish system also introduces incentives for rail operators to skew or refuse to provide information to the rail authority (Farrel). Since rail operators cannot affect infrastructure building directly, they may try to do so by influencing which data are given to the rail authority for use in their infrastructure plans. These incentives could result in long term problems for the relations between rail operators and the rail administration.

The Swedish government claimed that despite these disadvantages, the creation of SJ as a commercial entity and the focus on BV of social welfare maximisation were addressed with the total separation of operations and infrastructure. Open access has had political implications in that the separation of track from other operations has created the will for new public investment in infrastructure. Furthermore, it has been established that the money for infrastructure improvements will not get lost as operational subsidies for SJ, and the removal of this money also forced SJ to become more efficient. The government still rejects the notion that it is subsidising the railways - it is making long term investments.

5.2.3.2.2 Maintenance Integrated into BV

The actual work on the railways is done by the rail administration itself. This arrangement does not provide incentives for efficiency in construction and maintenance. The rail administration is funded directly by the Swedish government and the performance targets for the rail administration are not based on a monetary measure (Banverket 1999). Infrastructure decisions are, as mentioned above, made on the basis of social cost benefit analysis. BV prepares a long term infrastructure improvement plan that forms that basis of its funding request to the government. This leaves the administration wanting to do the best job at a cost that is under budget.

One issue that the government has been concerned about is social over-investment in rail infrastructure compared to that of road infrastructure. The basis for this issue is that road projects tend to have higher social values than rail projects, yet there are still large funds devoted to new rail projects (Hylén). BV believes that the social benefit criteria work well to balance road and rail construction and offers that rail is disadvantaged because of administrative differences. BV has also argued that a project which shows a positive social value will certainly also show a positive business one.

The difference in the economic lives of rail infrastructure and other rail assets makes the planning process more difficult. Passenger forecasts are accurate but economic changes will happen quickly and overall business forecasts are difficult. BV acknowledges that other groups will lobby government directly to get low rated projects done. SJ reports that the investment program has caused day to day disruptions in their operations but they are happy that the benefits are beginning to be seen. Ultimately, SJ would like to see more investment than what was allocated by the government (Hylén).

Without doubt, the Swedish government is the key to the Swedish rail infrastructure system. The government has taken almost complete responsibility for the maintenance and improvement of the rail system. This commitment means that the market will not be able to dictate changes in the infrastructure system so that government takes on the roles of the market. The government, through BV, will need to deal with the agency relationships with the rail operators on the network, and is also responsible for bargaining between the interested parties to determine where new investment will go. In the Swedish system these interested parties are the multiple rail operators - SJ the most important, along with the various regional county and municipal governments and lobby groups that have an interest in where the government funding goes.

SJ still complains that maintenance should be the operator's responsibility, in order to allow for the "natural link" from inspections to planned maintenance. BV may very well act in a way that does not suit SJ's business. Rolling stock improvements should be the SJ's responsibility since they have the experience and expertise. Maintenance accountability is also a concern because it is difficult for SJ to attribute maintenance costs to the condition of the rail track, which is BV's responsibility.

BV's objective is to undertake projects to maximise social welfare, but divergent objectives among different parties in the transportation system still exist and there are now conflicts emerging. An example of the diverging incentives that received public attention (Farrel) was that of track maintenance.

As an example, BV prefers to do track maintenance work during the daytime in order to save on labour costs and correspondingly costs to the public purse. SJ on the other hand wants to run high value passenger trains during the day, arguing that it is costing them customer satisfaction as well as lost revenue when the work is done in the day. With legislated track rates, there can be no way of the market adjusting for this. SJ cannot, for example offer to pay more for the use of the line in the day in order to offset the cost to BV of paying maintenance workers for night work or the extra costs that may be incurred for working at night. The only method for resolving the conflict will come through negotiation of some sort of non-monetary agreement. For SJ, influencing BV may not be difficult but as discussed above, new, smaller operators may have greater difficulty.

In Sweden, the rail administration is left as the monopoly provider of construction and maintenance services and there is no incentive for the work to be done at a least cost basis for the whole system (Hellström). An interesting suggestion in the Coopers and Lybrand (1993) report is the suggestion that charges should be levied on the infrastructure operator when it takes possession of the railway track for repair, the notion being that this will promote efficiency in track repair.

This idea is probably not feasible under current legislation as the opportunity cost for the railways in lost profit would probably be higher than the track fees received. Perhaps this suggestion would be more useful with the possibility of variable or peak load pricing. The government is aware of the risk of BV underperforming and there is concern about performance. BV risks losing its efficiency goals in the large infrastructure works projects (Hylén).

With regard to infrastructure cost sharing, Sweden has seen instances where there has been successful co-operation between regional and national jurisdictions. With the separation of the county lines from the main lines, county governments are responsible for the regional track network. There are also a number of projects where the

county or municipal governments have co-financed new track or track upgrades alongside BV. Some of these projects have allegedly been moved up in the priority list and thus can be considered successful examples of intergovernmental co-operation resulting in infrastructure improvements (Farrel).

5.2.3.2.3 System problems: the Arlanda project

The central role of the national government in the Swedish rail network, along with some of its advantages and setbacks, was evident in the creation of the new rail line running from Stockholm's central train station to Stockholm's central airport. This project was intended to be financed primarily by non-governmental money, though BV would supposed to invest as well because of the need for more rail lines into Stockholm to handle increased traffic. Government wanted foreign investors and put constraints on SJ and the Stockholm local transport authority in terms of how large a share they could form in any consortia. The private company was supposed to build the new rail line and then transfer the property to BV, who, in return, they would get the right to operate the commercial traffic along this line. This strategy was also taken to prevent political influence or indirect subsidisation. Of interest in this case is that BV upgraded the lines in the north of Stockholm to help facilitate this project.

In the end, this project faced difficulties. The winning consortium did not have SJ as a member and SJ's political power in the Swedish system caused problems for the winning consortium. Since the line was to go to Stockholm's central station, operated by SJ, the consortium had difficulty in getting space and rail slots to get into the central station. The line also connects longer distance services and there existed excess rail slots on this privately financed track. When the rail slots along this line that were not used by the winning company were auctioned, the slots were bought up cheaply by SJ at little more than marginal cost.

The airport construction project is a good example of a near hold up situation. The winner of the government bid was supposed to build a rail line (a specific asset) and after it would be constructed, there would be opportunity for ex-post negotiation (auctioning off excess capacity). However, SJ got its train paths at the minimum acceptable price, so at this point, the government had to intervene to avoid a hold up. They did this by putting regulations on when and where the SJ purchased slots could

connect. Without these regulations, SJ could have run its own airport express trains using the slots it had purchased.

If the bidders did not feel certain that the government would regulate the use of excess rail slots, bidders may not have even tried to win the initial contract knowing that there would be no profitable opportunity and the project could not have been completed using private money. Were it not for government regulation about what the type of services could be offered and other general government financial incentives such as an interest free loan and freedom to set rates, this project may never have been completed (Farrel).

5.2.4 Comparing Rail Traffic and Congestion Management

The nature of a rail network is that all traffic is interrelated and each train running on the system has the potential to affect any other train on the system. In particular, there are two basic problems that need to be addressed on any rail network. The first is that it is difficult for trains of different speeds to run on the same rail line (Bruzelius, Jensen and Sjöstedt). This is due to the “degrees of freedom” that a train possesses. A train can either go one direction down a rail line or it can go in the reverse direction. The only way for one train to overtake or meet another train on a rail network is for there to be separate lines for them to be on at the moment of encounter. This usually means that rail right of ways have two lines on them, one going one way and another going another. There may also be “passing loops” where a train may move onto a rail siding and wait to be overtaken by a faster train travelling in the same direction before continuing its journey, but under the above scenario with two rail lines and passing loops, it takes accurate planning and traffic control to ensure that the many trains that run on the lines run smoothly and without delay. On a rail network less able to accommodate traffic, the task of organising train movements becomes more complex because trains will be moving in opposite directions and there will be less time to react to problems. As a result of this the capacity of one track section of rail line is significantly lower than one line on a two track section.

The second problem stems from the first. In a rail system, there are often points on the network that due to geographic limitations or lack of built infrastructure cannot allow all the desired rail traffic through. As discussed in Ch. 2, this section of track is

known as a bottleneck. For rail infrastructure management, bottlenecks pose a real problem since any rail traffic that passes through the bottleneck section may prevent another train from using that section, especially from using it in a timely manner. Rail traffic control difficulties involve transactions that centre on the rail administration. These include transactions between the rail administration and operators, the rail administration and the physical railtrack and even to some extent the rail administration and the maintenance agents.

5.2.4.1 Vertically Integrated System

In the Canadian situation, administration of the bottleneck areas of track is handled by the rail company that owns the track and trains. Because of this, decisions about which trains should be let through the bottlenecks first are made inside the rail company and all aspects of the traffic flow are felt by the rail company. Thus the company can send through the most profitable rail traffic first. The internalisation of the traffic allocation within the rail company prevents conflict about allocating traffic through the bottleneck.

5.2.4.1.1 Decision Internalisation

This system does not always function very well. The internalisation of the rail allocation within the rail company may not be efficient when there are stakeholders other than the railway company who are affected by rail traffic allocation. In the Canadian grain transportation system grain producers are affected by rail allocation through vessel demurrage charges levied at port. If a certain amount of grain is to be delivered for transfer to a ship and the grain is not delivered on time, then charges are levied against the shipper, often the CWB. The demurrage charges end up being transferred to the grain producer, either through higher freight deductions at elevator or through a lower price from the CWB's pool accounts.

Due to the regulation in place on grain transportation, there is little recourse for the shippers or the producers against the railways. A complaint was filed against CN and CP but this was done by the CWB who is designated a shipper and has power under the CTA to file a complaint (Schmitz and Furtan). The complaint procedure was cumbersome and lengthy. The result of this is that the railways do not have the incentive

to move the grain through the bottleneck as quickly as products that are moving under contract with more specific level of service requirements. The rail companies do not take into account the demurrage charges that get passed on to the producers when allocating scarce rail capacity. In this way there is an externality present in the railways' decision making. This externality means that rail traffic in the Canadian system will not go to its best allocation.

5.2.4.1.2 Interconnection Problems

In Canada's system, rail cars can be transferred between the two railways either through the competitive provisions in the CTA or, more commonly, by commercial agreements between the railways. Canada's current provisions for intramodal competition allow for interswitching and for the use of competitive line rates, but railways have incentives not to use these provisions. They are not used extensively when measured in terms of volume (Travacon) and certainly not in a large number of geographic areas (Kopiki and Thompson). One reason is the result of rent capturing strategic behaviour (described in section 6.2.2.1.1) and the other of cost and system inefficiency.

In a situation where competitive line rates or interswitching are used one railway must haul the freight cars from the shipper's location to an interchange point. The freight cars must then physically be switched between railways. The physical switching of rail cars is a high cost component of rail movement (Travacon). The extensive use of interswitching is not a least cost method of rail transportation and seems counter to the movement of grain handling facilities to high volume lines, designed to decrease the cost of transportation. Interswitching would also entail longer freight transit times due to the time it takes the freight to be transferred.

5.2.4.2 Vertically Separated System

5.2.4.2.1 Administered Traffic Planning

In the case of Sweden, with vertical separation they have kept a version of the traffic planning system they used while still vertically integrated. Whereas Canada's rail traffic planning is privately established, Sweden's is an administered system where train

plans are done by consulting with the rail administration and all of the train operators. It is run on a yearly overall basis with minor monthly adjustments to it. Each railway is initially allocated the train runs that it had the previous year and then allocation of new runs and other changes are negotiated by the rail administration and the interested railway operators. Potential bottleneck problems are to be identified by the rail administration and dealt with by negotiation (Hellström).

Unlike Canada's system, the Swedish system's bottlenecks are usually in the major urban areas. This is because in urban areas there are significantly more passenger trains, with different speeds, as well as more freight trains and a lack of space for track expansion. As a result of this the rail administration has a list of traffic class priority for allocating bottleneck problems. This priority list directs that various classes of passenger traffic get priority in bottleneck situations with freight to be moved last. The high use of passenger traffic means that bottleneck sections are an extreme problem for passenger service trains. In Sweden, peak traffic is at certain times of the day rather than certain times of the year. The bottleneck times in the Swedish system usually clear throughout the day rather than the long hold ups that have been seen in the Canadian mountain passes.

It is important to note that the administered situation has not seemed to cause much friction between the various railways operating in the Swedish marketplace. There are three reasons for this. The first reason is that much of the rail traffic is passenger traffic. Passenger traffic operation works on a franchise basis with the trains usually running regularly on a clock face fashion. This makes passenger traffic very predictable and quite frequent. The second reason is that for freight traffic, an area where there is open access to the rail track, the situation so far has been that the train run has been transferred with the freight itself (Ehrling, Hellsvik). This means that if a shipper were to change the carrier that transports the freight, practice has been that the train run that was previously held by the losing railway would be transferred to the winning railway. The third factor in the success has been that most freight traffic is still run by the former state railway. This limits the amount of negotiations that have to happen between competing railways and leaves an established organisation negotiating with the rail administration.

Most of the pre-1996 capacity allocation problems were handled with co-operation and compromise. Infrastructure improvements were a source of conflict between BV and SJ. This was partially caused by the large amount of infrastructure work done since the split. This increases the potential for conflict. SJ recognises that it is on a different planning schedule than BV but is not concerned. Timetable work is dealt with by administrative rules rather than economic incentives. Agreements in place usually do not have penalty clauses. There is an element of trust and common purpose that drives the process. "...An agreement is always an incentive or "carrot" even if there is no stick." At the time of these interviews traffic control was done jointly by SJ and BV. In the 1996 changes a new division of BV was created for traffic control (Hylén).

Co-operation regarding infrastructure standards has worked very well but mixing high speed passenger trains and slow freight trains is believed to be unworkable due to the impossibility of timetabling. SJ is also constrained by the international railway standards and by its partnership agreements with German and Nordic railways (Hylén). BV reports that there have been some small conflicts between SJ and BV but these are considered to be no more than what would have happened between the divisions at SJ. BV is responsible for new infrastructure technology and operators are consulted about the process. New rail technology is less difficult for operators to adjust to than differences between rail condition in summer and winter. Short line operators work with older, slower, train systems and do not pose a problem for co-ordination (Hylén).

Despite the reasons for success, it was discussed early in the plans for allowing more competition that the system of informal co-operation between BV and SJ was not going to work well in the presence of many operators (Coopers & Lybrand). It was also acknowledged that the use of administrative rules for the allocation of train slots is inefficient as it cannot reflect market values of train movements. One overriding problem with allocating slots through an auction based system involved the passenger-based nature of rail transport in Sweden. The need for co-ordination and the purchase of complete train paths usually at "clock face" times makes auction very difficult to work out. Also, since passenger traffic may be purchased by the government in the case of county traffic and certain mainline traffic, there can be no economic valuation of this traffic. The traffic, by its nature, is not commercially viable (Coopers and Lybrand).

The main problems with train planning have been between the rail administration itself and the state railway. These problems have been a result of the massive infrastructure investment that has taken place since the vertical separation began. The rail administration has wanted to take control of the rail track in order to repair or upgrade the track at the same time as the state railway wants to run service on the track (Farrel, Hellsvik). Since the rail administration wants to save money and use its workers during the day, this is the same time of the heaviest passenger train use. The administered system gives no recourse to the state railway when the rail administration wants to do work. Suggestions have been made that a system of payments between rail operators and the rail administration should be implemented to guide the parties into better use of rail track (Farrel).

The government's involvement in infrastructure work also allows for the track pricing to be legislated and simple. The simple track pricing has the benefit of making it easier for parties to run on the line as the pricing system is simpler and easier and does not require transactions costs for auctioning and bargaining. The down side of legislated pricing has been discussed above. There is still some bargaining in the fact that the yearly train plan must be made with different players trying to get access to train slots that are abandoned or newly created. Grandfather rights will control the rest of the train allocation.

5.2.5 Comparing Access to Rolling Stock

An integral part of providing rail service is of course having rolling stock with which to run the service. Rolling stock is not as specific an asset as rail track. Rolling stock is mobile and can be used by any railway company on track that is of an appropriate gauge. Most rail track in the EU is of a consistent gauge (the exception is Spain) and the railtrack of North America is of the same gauge. This means that rolling stock from Sweden could be used in almost any part of Europe and rolling stock from Canada could be used in any part of North America. In this way rolling stock is less specific in nature and poses less transaction costs to use. Rolling stock primarily affects transactions between operators but also may affect transactions between operators and the physical railtrack when track gauge compatibility or power source compatibility are issues.

5.2.5.1 Vertically Integrated System

In Canada rolling stock is relatively easy to come by. Leasing markets exist for freight cars and there are a number of rail firms that own their own locomotive power or who could be approached to lease locomotive power. Due to the effects of rate regulation in the Canadian system, a large portion of the total available grain hopper car fleet is currently in the hands of the federal government, provincial government and the CWB (Bonsor). This hopper car fleet is allocated through a system agreed to by grain transportation's major players; the CWB, the grain handling companies and the railways.

The current system has rail cars allocated between non-CWB and CWB marketed grains. Of the CWB marketed grain, twenty percent of each crop year's movement is to be allocated to the various grain handling companies as determined by the results of tendering. Grain handling companies offer to pay a rebate or accept the lowest premium for shipping the grain. The grain handling companies can then determine which country elevator, and also which railway, the actual movement will come from. For the non-tendered portion of CWB grain movement, cars are accessible through the use of car pre-ordering systems administered by CN and CP or through the use of general car allocation. The determination of which grain handling companies will get rail cars is determined through an equal weighting of farmer deliveries over the course of the past eighteen weeks and producers' delivery intentions. The CWB believes that this system allows individual producers more clout when negotiating with grain handling companies, since the grain handling facility's car supply, and therefore the ability to ship grain, is affected by farmer deliveries. The cars that are spotted as a result of this calculation are taken out of both pre-ordered cars and general allocation. For non-CWB marketed grains, each shipper has to obtain car supply from the railway.

The portion of the grain movement done under tender had been as high as 50 per cent in the 2002-03 crop year. The tender system reduced the short-term cost to the producer of moving grain to export position though tender premiums paid by the grain handling companies. In this way producers were able to capture some economic rent. The high amount of tendered grain dissatisfied some producers in that in certain cases, producers were forced to deliver to the handling companies that had won tenders and therefore had car supply. Not all grain companies were positive toward a high

percentage of total movement arranged through tenders due to the fact that grain handling companies who did not have terminal facilities were unable to offer as aggressive tender premiums and therefore did not get tendered movement. There was a risk that, if tendering for a high percentage of movement continued, grain companies that were not able to win tenders would be forced out of business due to low grain handle volumes.

5.2.5.2 Vertically Separated System

In Sweden access to rolling stock has been an issue (Ehrling, Hellsvik). Access to passenger cars has been a problem for entrants. Motorised passenger cars and electric engines are specific to Sweden. This is because Sweden's rail network is electric with a voltage that is different from continental Europe. With the structure of Sweden's environmental based train fees, diesel engines are comparatively more expensive to operate than electric motor trains. As a result, accessing locomotive power is difficult for new entrants to the Swedish market.

SJ runs a rolling stock facility and maintains a large fleet for its own purposes. SJ has also become active in providing the rolling stock for lease to other handlers. It is unsure if they have a large market share and market power in the leasing and repair of rolling stock. This area is identified as an area for growth for SJ.

The long distance transportation market does not have ease of exit and entry because no rolling stock is guaranteed when the franchise is won. In the case of the long distance passenger transport the standards for service are higher and this leaves little allowance for the use of slower or outdated passenger cars. The firm that entered into the tender for the Malmö – Gothenburg line was able to reach agreement with SJ for the use of some of SJ's passenger car fleet. Nonetheless, this remains an area of future problems for entry into the long distance passenger sector. Entrants cannot rely on the goodwill of SJ to ensure that agreements for the use of rolling stock will always be available. Developments in passenger car technology, specifically the production of passenger cars that can handle different voltage lines, should offer larger markets for rolling stock and reduce the hold up problems that could happen with passenger cars.

For freight transport a similar problem exists with obtaining electric locomotive power. Access to freight cars is not a problem as they can be drawn from anywhere in

Europe, but finding electric locomotive power is a potential problem for entry into the Swedish system. Again the solution to this problem is the expansion of the market for locomotive power. The results look good so far and as the pool of firms with the necessary rolling stock grows, so should the ease with which locomotives could be transferred and reduce the potential for firms not to enter the Swedish rail market due to the risk of not being able to economically acquire or sell locomotive power.

Sunk costs also may be present in the need to acquire other specialised assets for operation. Rail transportation also requires that rolling stock, locomotives and cars, be acquired for use by the firm. If the rolling stock is not already owned, or easily rented by the potential entrant then the entrant will need to make another investment in rolling stock.

The regional transport markets are more readily accessible as most rolling stock is owned and controlled by the regional governments. This has the implication of completely removing the asset specificity from the rolling stock. This is because no rail operator ever takes ownership of the rolling stock. It is maintained by the government and use of the rolling stock is transferred with the contract to provide service. With less specific assets, the risk of losing a franchise before the assets are paid for is less than in a situation with specific assets (Harstad and Crew). Any firm that vies for a regional franchise will not risk being unfairly undercut in the tendering in the next round because any entrant will have the same costs as the incumbent will. In this way transfer of the franchise has been easy and there has been significant entry into the regional transport market.

The success that entrants have had may be idiosyncratic for the county case because the barriers to entry are lower in this market than those in the long distance passenger or freight markets. This viewpoint is held because the Swedish county transport authorities all own their own passenger cars or have the right to lease rolling stock from SJ (Farrel). This means that an entrant has less need to invest in, or find other sources for, rolling stock. As well, train allocation is less of a problem as there is not much need to move on the busy main lines. These decreased barriers were not available in the mainline or freight markets.

For new entrants, there is said to be a lack of an efficient second hand market or lease opportunities for rolling stock (Banverket 1999). As well, one of the most important producers of rolling stock is half owned by SJ.

5.2.6 Comparing Customer Service Provision

5.2.6.1 Vertically Integrated System

Since the relationship between the two major railway companies and western Canadian grain shippers has been regulated from early in the industry's history, the Canadian system has not allowed free market transactions between shipper and railway but over time has increased shippers' exposure to freight rate changes. Regulations have been in place on both pricing and service requirements. The regulation began with the Crows Nest Pass Agreement of 1897. This agreement set the rates at which CP, and later the other railway operating in western Canada, would move grain out of the western Canadian region and the inbound rates on "settlers' effects." This legislated rate structure was left unchanged until the 1983 passage of the Western Grain Transportation Act increased grain shippers' exposure to the cost of transporting their grain to port. The WGTA also changed the relationship by allowing freight rates to change based upon an audit of railway costs. Shippers were further exposed to the cost of shipping grain when the WGTA was replaced by the Canada Transportation Act. This act ended the government subsidy on grain movements but kept the cap mechanism for freight rates (Vercammen, Fulton and Gray).

Restrictions on free market transactions have the effect of reducing railway's market power but they also have the effect of preventing price differentials as method of information transfer. Rate regulation prevents the railways from charging differential rates based on the cost of service. Up until 1984, the railways were prevented from charging lower rates for movements from low cost origins and higher rates from high cost origins. The WGTA allowed the use of rates that were below the legislated maximum. Rates lower than the maximum were not widely charged suggesting that the benefit from the increase in freight from the low cost point was less than the lost revenue from charging lower rates (Vercammen, Fulton and Gray).

5.2.6.2 Vertically Separated System

In the Swedish system, various levels of government administer a segment of the passenger train traffic with the rest offered by the state railway. SJ offers long distance passenger service where it can make a profit doing so. Since the vertical separation the government has committed itself to interfere with fares, service levels and other operating issues. The government also removed SJ's responsibility for infrastructure maintenance, allowing it to focus on providing rail service (Alexandersson and Hultén 1999). It is now at SJ's discretion to discontinue passenger service. If SJ is not making money servicing a route then it has the option of announcing to the government that it will be ceasing service on that route for the upcoming year. If SJ announces that it will not provide service then the government can decide whether or not the service should be offered with public money. If the government decides to run the service then the government tenders with potential train operators for the right to operate the service with government subsidy. The bidding process is for a subsidy level (Alexandersson and Hultén 1999). The winning tender will be the one with the lowest amount of subsidy required given that the operator must run trains at a specific frequency over the route. Things such as fares and other service options are up to the successful bidder to determine. This method leaves it up to the operator to increase its profits by stimulating demand or by lowering operating costs.

Some Swedish regional and local governments are also responsible for providing regional and local transportation. To provide rail service these governments tender for a railway firm to provide these services. The regional governments also have the option of discontinuing rail service and providing bus service instead, however, the national government of Sweden put incentives in place so that regional governments would not do this. The regional and local governments who have aggressively tendered for transportation services have had success using the tendering process (Alexandersson and Hultén 1999). New firms have been able to win some of these tenders and through their actions, fares have gone down and service levels have gone up. The initiative that came from entrant firms is further described in the section on operators. Some regional governments have not been as aggressive in tendering and entered into long term franchise agreements with SJ.

Open access is permitted for freight transport in Sweden. With this system each shipper can negotiate with the railways to contract for freight movements by rail. Contracting has taken the form of one rail firm moving most of the traffic from any destination point because Swedish freight traffic originates at relatively few points compared to Canada. The nature of the commodities shipped are not dissimilar to Canada with forest products and iron ore comprising a large part of movements (SIKA). As well, SJ has been attempting to attract some manufactured goods back on to rail. SJ still maintains much of the market share for freight movements. This market share dominance has been attributed to SJ's traditional position as Sweden's railway and also because of the fact that SJ has extensive experience as a logistics co-ordinator and can do the job well. This is not to say that open access has had no effect on freight movements in Sweden as rail rates have decreased since the implementation of open access. The rate decline is attributed to increased competition in the bidding for contracts (Ehrling).

5.2.7 New Operators

In situations of competition on the railway lines, the question of what will happen to the railway system when new operators attempt to enter becomes important. There are a number of ways in which an incumbent can react to a new entrant in the market. For the rail industry the possibilities include influencing rail traffic allocation in a way that disadvantages the entrant, influencing track maintenance so that the entrant's quality of service is decreased or simply by using predatory pricing to keep the entrant out of key markets. In practice, the possibilities for an incumbent to use its influence to disadvantage an entrant are very diverse. Examples from the vertically separated system bear this out. This area focuses on transactions that involve the rail operators. This includes operator and customers and operators and the railway administration. Operators and the physical railtrack is not important for this section. The most important transactions here may be between operators.

5.2.7.1 Vertically Integrated System

In a vertically integrated system new operators that wish to compete with incumbents would probably have to build or buy their own rail infrastructure. These

new operators would be expected to have relatively limited interaction with the operations of the incumbent. In Canada, to enter would require a very large investment in rail infrastructure in order to effectively compete with CN or CP. A new, vertically integrated operator in Canada would therefore be unlikely.

It is possible that a railway that does not compete with the incumbent railway would be able to enter the rail industry and use the incumbent's network. In Canada such an example is VIA Rail, a government owned passenger railway. In exchange for paying a negotiated access fee, VIA Rail operates over the networks of CN, CP and a shortline railway, OMNITrax. There is relatively little incentive for the incumbent to attempt to drive this new operator out of business since it is assumed that the access fee paid by the operator includes a contribution to the fixed cost of operating the infrastructure. If this is the case then the incumbent is better to have the new operator on its line than not on its line.

5.2.7.2 Vertically Separated System

One facet of the Swedish system is that the state railway lost its monopoly in stages. This was motivated partly by political trepidation as to any negative consequences that the vertical separation may have on the performance of SJ and partly by the philosophy of the government (Alexandersson and Hultén 1999). As part of the reregulation, SJ initially had control over some non-rail aspects of the infrastructure. This included control of marshalling yards and joint control over traffic planning and allocation, but more importantly over the passenger stations. SJ had a mandate from the government to use these facilities in a non-discriminatory way, but SJ did not have the incentive to do so. This was illustrated when the first new entrant began operations (Alexandersson and Hultén 1999).

The first new entrant won the tender for a regional rail service. This was the first time that SJ faced competition on home soil. SJ did not react well to the new entrant. SJ attempted to withhold rolling stock from the entrant company and when that was resolved, used its control of the regional passenger stations to remove signs and station boarding slots. This had the effect of causing confusion at the passenger stations with the resulting disruption in service reflecting badly on the entrant.

During the next round of bargaining SJ won the regional contract back from the entrant. The entrant later took SJ to court under predatory pricing and won. SJ appealed the decision in the Swedish courts and to the Swedish government. The appeals failed and SJ was deemed liable for damages.

There is evidence that SJ has since changed its attitude when it comes to dealing with entrants. This seems to be a shift in ideas that it does not need to be the state railway anymore. By taking the approach that through operating profitable sections of line, developing cost cutting measures and attempting to create new demand it can compete in an open access environment (Alexandersson and Hultén 1999).

Further entry has come into the Swedish rail market. The main threats have come from outside companies. SJ was mandated to sell its non-rail complementary assets. An important sale was the sale of SJ bus operations to the UK rail/bus firm Stagecoach. On the rail front SJ lost the lucrative Stockholm local transport franchise to a consortium of UK, Swedish and French companies. SJ also lost the franchise of another passenger service connecting Malmö and Gothenburg, the second and third largest cities in Sweden. This action signals an increase in government willingness to remove SJ's special powers. SJ was losing money on this route but did not want it to go to tender since they were continually improving their financial result. The government forced this to go to tender and it was won by another firm. The government decision to force a route that was not officially abandoned by SJ has raised the possibility of altering the limits of the tendering process. If the government is going to take the action of forcing a line to go to tender then why not just leave all passenger traffic to be tendered?

If the learning curve effects are significant and if non-existent markets for leasing rolling stock necessitate entrants to acquire sunk assets to expand, then the Swedish market will continue to be dominated by SJ. The best lesson to be learned and perhaps the best opportunity for effective competition in the rail transport sector may be established companies from the rest of Europe. With many large, experienced operators already established it could be a shorter step than in other jurisdictions to having effective competition. Entry by firms outside of Sweden has started to be realised with French and British companies beginning operations.

SJ's opinion about new entrants is also said to have changed. When the BK Tåg began operations on a regional line, SJ reacted in a hostile manner. More recently though, the two companies have not been as hostile and even have agreed on sharing the use of some rolling stock. Another entrant has a subcontracting agreement with SJ on a route. However, Farrel's description of the Arlanda link project and recent events (Hultén) shows that SJ will not always be considerate to its competitors.

It is important to note that the winning of a franchise for regional transportation is not a true test of open access on a rail network. The regional system is horizontally separated from the rest of the network and in some ways can be thought of as a regional monopoly. The entrant did not have to fully deal with problems of competitive timetabling against another rail carrier. The regional networks are characterised as small and relatively simple. This leaves the question open as to how the entry would work in a full network.

CHAPTER 6 Conclusions

6.1 Discussion

As an industry traditionally viewed as a natural monopoly, facilitation of competition in the rail industry has proven to be a challenging transportation policy problem in many countries. Worldwide, regulatory policy in the rail industry has recently undergone a major transition towards the development of inter-railway competition. In contrast in North America, and particularly in Canada, a policy of supporting vertically integrated rail systems has resulted in just two major railways serving many large transportation markets.

There are still many situations where competition to rail cannot be realized through competition from other transportation modes or from product/source competition. In these cases, shippers have few options to keep rates away from monopolistic levels. One option is direct rate regulation, which has been the chosen policy in important Canadian grain transportation markets. However, the recent instability of Canadian regulatory policy in rail leaves the long-term sustainability of rate regulation in question.

Another option is to develop policies designed to maintain a threat that other railways could enter and compete in markets if profitable opportunities (like near-monopoly pricing in certain markets) are available. Yet maintaining this threat in rail means potential competitors must either build their own or else be permitted to use existing rail infrastructure. Another major barrier to the former is that rail infrastructure is costly; very little actual expansion has taken place anywhere in recent years. So it does not appear to be feasible to fund and build a complete system of new rail infrastructure in order to pose a competitive threat in this industry. Thus, in this thesis I formulate a new perspective on this old, yet complex industry using a well-established paradigm for analyzing industrial policy. Transactions cost analysis permits development of a clear and insightful comparison between the very different modern rail organizations in Canada and Sweden.

In Chapter 2, I present a transactional model of a rail firm divided into the components of customer service provision, rail operators, rail administration,

construction and maintenance and the physical railtrack itself. The case studies in subsequent chapters suggest that the ability to access the rail infrastructure, the maintenance of and investment in rail infrastructure, management of rail traffic on the infrastructure, access to rolling stock, customer service provision and success of new operators on the system greatly impact rail markets and the organisational responses of government and rail firms to new levels of competition.

Entry in rail means that the entrant needs some mechanism to access the infrastructure and must be charged an economically fair access fee. Incumbent firms with market power will want to maintain the profits that market power brings and therefore it should be expected that the incumbent would try to prevent entry. Legal, technical or price related barriers to entry could be used to restrict entrants' rights to use rail infrastructure. To ensure the possibility of new entry and the sustainability of the rail network, Chapter 2 shows that an access fee should be non-discriminatory between rail operators, not be so high as to discourage efficient firms from entering the industry, yet must not be too low so as to not cover the cost of operating the rail system. Access fees that do not meet these criteria will impair competition by preserving barriers to entry, or else impair sustainability through the long-term deterioration of infrastructure.

Finally, I discuss other factors that affect rail competition, but are external to the rail system itself. These are the concepts of product and source competition. Product and source competition impact a shipper's willingness to pay for rail service and therefore represent a theoretical upward bound on rail prices. A railway's ability to exploit its market power in an environment of product or source competition can limit investment in the shipper's industry if the investment involves specific assets.

After introducing the theoretical lens of this thesis, I argue that the Canadian rail system is built on a tradition of the regulated vertically integrated railway. Canadian regulation has evolved, but the Canadian system still does not provide strong incentives for competition between the incumbent railways, nor does it foster new entry. With respect to grain transportation, where intermodal competition is not a major competitive factor, fostering competition between railways remains a stated policy goal (Minister of Public Works). The challenge for Canada is to introduce competition to a market that is

currently imperfectly competitive in a way that will maintain or improve rail's performance.

There is currently little incentive for railways to compete in Canada's industry, especially in the large grain transportation market. It is this lack of competition that prevents the current competitive provisions in the Canada Transportation Act from working as envisioned. One reason could be that Canada's current competitive provisions would, in most cases, not provide an efficient freight routing. Thus, the use of interswitching or competitive line rates would mean added time and cost to freight movements. As such, there have been no significant examples of competitive entry in Canada's rail system (VIA rail used to be run by the two railways and offers a non-competing rail service) and the Canadian access debate has not yet begun to focus on the potential use of administrative/technical barriers to entry.

Intermodal competition plays an important role in rail policy regardless of the organisation of the rail system. In Canada, intermodal competition has been used to justify differential pricing of commodities in different freight markets. Differential pricing allows the integrated railway to maximise the contribution to fixed costs and, beyond that, profit.

The vertically integrated railway internalises infrastructure maintenance and new investment decisions resulting in investment decisions that benefit the railway. Railways do not account for costs external to their own operations and may invest where society is made worse off. In addition, railways may not account for benefits that accrue outside their own operations and may disinvest, making society worse off. This may be the case for branch line abandonment in western Canada.

The vertically integrated railway may use shippers' access to rolling stock as a way of varying service levels. If the railway possesses market power then it can price discriminate based on the shipper's willingness to pay for service. This can result in higher prices for equivalent service. In an environment of rate regulation the railway can limit access to rolling stock to certain shippers thereby providing poorer service for the same price. Administrative systems have been used to allocate grain cars to prevent the Canadian railways from using rolling stock to price discriminate or service discriminate. These systems do not foster competition between the two railways and do not allow

rolling stock to be allocated through market mechanisms. That the administered system limits competition between the two railways is likely irrelevant, as the Canadian railways inherently do not have incentives to compete.

There is little or no incentive for a vertically integrated railway to allow entrants to access any rail market already served by the incumbent. Therefore the likeliest threat of entry in a vertically integrated railway comes from a railway that owns its own rail network. Entry in this manner would be very costly due to the amount of infrastructure that would need to be built and would likely be economically inefficient due to the duplication of rail infrastructure.

In sum, Canada's rail system has strengths through its efficient handling of investment, infrastructure maintenance and network congestion. Yet these advantages may be outweighed by the conflict between overall social benefit and the firm's own interest, particularly when shippers are captive. For decades the problem of market power and monopoly pricing has persisted despite the various regulations intended to alleviate it.

Sweden's state railway has progressed through an accounting and functional split into a rail operations company and a rail administration and maintenance company. Regulation has continued to evolve in Sweden. Legislative and regulatory structures have adapted to the challenges that came with the vertical separation. The Swedish model has traded off cost recovery for competition. The results of these changes look positive when compared with some of Sweden's European neighbours who have initiated regulatory change in the rail sector.

A vertically separated railway may face the problem of inadequate funding for the rail infrastructure. This problem is rooted in the fact that the rail infrastructure has become a common resource and each operator will want to free ride on the other firms' investment. In Sweden, rail infrastructure funding is handled through the maintenance and investment monies originating from the Swedish government. Proposals for new investment and maintenance are evaluated on a social cost/benefit basis with the highest ratio given the highest priority. Some maintenance and investment projects have been advanced because of funding assistance from regional or municipal levels of government. Political lobbying can also influence what projects are undertaken.

The Swedish model does not force rail to cover all costs as the government subsidizes, all or in part, infrastructure and some passenger services. This is seen as justifiable on the grounds that it puts rail on an equal competitive level with road transport. The Swedish case has also yielded examples of the incumbent innovating to reduce cost. Ultimately, cost reduction and service improvement should help rail better compete with other modes.

Sweden has attempted to diminish the barriers to entry in its rail market with greater success. Sweden addressed the legal requirement for access through the use of an independent government body to certify that the technical requirements for railway access are in place. Sweden has avoided problems of uneconomic rail access fees through the use of marginal social cost pricing. To fund infrastructure maintenance and investment, transfers are given from government to the rail administration. The tradeoff made to get a functional access fee system has been that the government does not require rail infrastructure to be self-funding and does not rely on market determined access fees based on demand conditions.

An area of concern in a vertically separated railway is that the infrastructure administrator may not treat all rail operators fairly. The possibility for unfair treatment is more acute if the infrastructure administrator is also a rail operator. Sweden has avoided problems of this type of unfair treatment through the use of an infrastructure administrator that is independent from any rail operator. However, since the former state railway is still the major user of Sweden's rail network, regulatory capture is an issue.

Network congestion can be another problem as many operators vie for the use of the infrastructure. To monitor rail congestion and the use of bottleneck sections of track, Sweden uses an administered train plan. This plan is created by the rail administration with the consultation of the operators and is updated regularly. Where conflicts over allocation occur, they are resolved through the use of negotiation with the operator. The administered system has not yet been tested in the face of many entrants, as the state railway is still the dominant operator.

In the vertically separated system there is a risk of inefficient allocation of track time for repair work. The Swedish system of track maintenance does not allow the use of price as a tool to determine the timing of track maintenance. Instead, operators have

to negotiate with the rail administrator over non-price issues in the event of conflicts over track maintenance.

Access to rolling stock is important for entry in a vertically separated railway. Poor resale or leasing markets for rolling stock increase the specificity of the rolling stock and will result in a barrier to entry. The Swedish state railway has used its control over rolling stock to disadvantage entrants. Furthermore, due to the technical nature of Sweden's electric powered rail network, locomotive power from other European countries cannot be used. On the Swedish regional passenger network, the rolling stock is owned by the regional governments and has therefore not been a competitive issue.

As for pricing rail service, the Swedish government has removed itself from regulating prices on rail operations. Freight traffic rates are arrived at through negotiations between rail operators and shippers. For passenger traffic that cannot cover the cost of operations from fare revenue alone, the government sets minimum service requirements and then tenders out the route to the bidder who requires the smallest subsidy. Price setting to passengers is completely in the hands of the rail operator.

Sweden's system gradually allowed entry and new firms entered the rail markets where there was opportunity. As might be expected, SJ, the incumbent railway, used a variety of different methods to try to prevent entry. The strategies used to prevent entry included unfair treatment of common use assets that were not controlled by the rail administrator, control of rolling stock, predatory pricing, and political lobbying. As time and the regulatory environment progressed, the amount of entry into the Swedish rail market has increased. A number of companies have gained access to, and have run operations on, portions of the Swedish rail network. The Swedish system has succeeded to a large extent in dealing with the sources of market power from a practical level. Their continued success will hang in the balance over the inherent weaknesses of the system, including the need for funding, negotiation and administrative fairness.

6.2 Lessons for Canada

What specific aspects of Swedish rail regulation can Canadian policy makers take into consideration? There are four main issues to consider. First, it does not appear to be necessary to completely deregulate the entire rail system at one time or, in fact, to deregulate the entire system. Sweden's history of deregulation offers us an example of

gradual deregulation. The deregulation started with government mandating an accounting separation of the SJ operations and infrastructure divisions and a few years later operationally separating the infrastructure from operations. It was not until eight years later that increased access was allowed for freight transport though some competition was allowed earlier for the more lucrative passenger transport market.

The speed of the deregulation allowed SJ to take its time with changing its practices to respond to the new competitive environment. Regulated access may be the most feasible starting point to introduce competition in Canada. It could be possible to deregulate the Canadian rail industry in stages to help allay concerns from both the incumbent rail companies and the political decision makers.

Second, Sweden's method of separating main lines from regional lines could be applied to the problems in the western Canadian rail system. One issue of concern in Canadian rail has been the problem of low volume, grain dependent lines being economically unviable. In Sweden, lines of this nature were made the responsibility of the local governments. This is a potential model for Canada when dealing with the problems of branch line abandonment. By separating the rail system and allowing control of the lines to go to regional governments, it may be possible for infrastructure to be maintained in such a way as to minimise damage to the roads or direct government money to producers. For instance, if a lump sum subsidy is used, this transfer could be done in a way that would be more likely to be trade regulation compliant.

Third, a significant problem raised by critics of rail deregulation in Sweden was that the technical nature of a railway makes it costly and difficult to implement open access. Criticism focused on the fact that, in Sweden, high-speed passenger trains would be running on the same lines as slow freight trains. There would be a need for increased double tracking or the creation of overtaking loops in the train network to help accommodate this. Sweden addressed this concern with a massive infrastructure investment campaign as a result of deregulation. In western Canada, most rail traffic is freight traffic and no high-speed passenger trains currently run on the lines. The issue of the need for infrastructure improvement to allow for more complex rail operations is still one that needs to be answered for Canada. There may be a need for a future

infrastructure investment in order to make the largely single-track lines suitable for a more complex, multi-operator system.

Fourth, an issue that is often discussed in the context of rail deregulation is how to deal with captive shippers. In Canada, most grain and mineral production is assumed to be captive to rail due to the lack of effective inter modal competition for long distance movement of low value, bulk commodities. In Sweden, rail is subject to considerably more intermodal competition, which comes from road haulage and marine transport for freight and from air and bus for passengers. The level of this intermodal competition is assumed to be high. Even with the high degree of intermodal competition, there were cost savings gained by allowing competition in the rail industry. This may promise larger rewards for deregulation on lines with captive shippers.

Overall, the Swedish experience seems to be one that has been successful in areas that are important to Canada. Examples of entry in the passenger industry are starting to emerge in greater number and force, and these have shown that there were benefits to competition on the railway lines. Regional authorities that have put their rail operations to tender often have been able to reduce their costs. Examples of new entrants being innovative to enable them to achieve lower cost can also be found. These three areas - new entry, lower cost and innovation - are very important to the Canadian industry. For the incumbent railway in Sweden, it too has lowered its costs and achieved cutbacks that were seen as necessary to become a competitive firm. The former state railway's results have not been entirely consistent, however, and the company has incurred losses in some years.

The vertically integrated rail system creates market power for the railway companies, while concerns over use of this market power have resulted in rate regulation for specific commodities. Particularly in Canadian grain movement, the regulatory controls have regularly constricted the railways' freedom of action. Through protecting freight rate levels, the regulation has resulted in railways allowing infrastructure quality and service level to deteriorate to maximise profit. Administered systems for allocating rolling stock combined with government investment in rolling stock and rail infrastructure maintenance has been used to compensate for reduced service levels. Considerable effort has been expended by all sectors of grain transportation toward

altering the existing regulation instead of broad based changes aimed at improving rail transportation for grain.

Canadian rail regulators need to at least consider the alternate approach to regulation offered through the Swedish example. By separating the state's railway operations from its control of the rail infrastructure in Sweden, the groundwork was laid for competition in rail service provision and also for infrastructure renewal. Competition is fostered through legislated conditions for entry and access pricing that is non-discriminatory. Infrastructure renewal has been provided by the government, as they are now freed from having to transfer funds as an operating subsidy to the state railway. This benefit is tempered with concern over the monopoly nature of the state enterprise that does the actual construction work on the rail track and the long-term sustainability of state funded rail infrastructure.

By contrasting the Canadian system with that of Sweden, this thesis highlights the benefits and costs of vertical separation within the rail industry. I am not suggesting a complete and workable model for the future of Canada's troubled rail system. I attempt to gain insight by couching the problem of rail competition in terms of the incentives for the various stakeholders in each system. This novel approach provides a different perspective on the efficacy of the each system and the economic tradeoffs that have been made to make each regulatory system sustainable.

6.3 *Suggestions for Further Study*

Further research will be needed in order to apply the lessons of open access in other countries to the Canadian situation. Research might be directed at proposing a method to introduce competitive access, starting with a limited scope, in Canadian rail as well as recommending specific measures and policies to solve other problems that are endemic to vertically integrated rail systems.

Ultimately, Sweden's rail system depends on government expenditures to finance the rail infrastructure. Additional analysis will be useful to determine if, due to transactional issues such as the holdup problem, along with policy uncertainty and price uncertainty, government investment may in fact bring us closer to a social optimum in the transportation sector than does private investment.

Appendix A – List of Abbreviations

BRC – Board of Railway Commissioners

BV – Banverket

CAPG – Car Allocation Policy Group

CBA – Cost Benefit Analysis

CCR – Competitive Connection Rate

CLR – Competitive Line Rate

CN – Canadian National Railways

CP – Canadian Pacific Railways

CTA (1) – Canada Transportation Act

CTA (2) – (Swedish) County Transport Authority

CTAR – Canada Transportation Act Review

ECPR – Efficient Component Pricing Rule

FOA – Final Offer Arbitration

GOC – Government Of Canada

LKAB – Luossavaara-Kiirunavaara AB

M – ECPR – Market Determined Efficient Component Pricing Rule

NTA – National Transportation Act

SEK – Swedish Krona

SIKA – Swedish Institute for Transport and Communications Analysis

SJ – Statens Järnvägar

WGTA – Western Grain Transportation Agreement

WTO – World Trade Organisation

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