A COMPARATIVE INVESTIGATION OF REGULATORY REFORM IN THE ONTARIO FOR-HIRE TRUCKING INDUSTRY

By

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ABSTRACT

This thesis examines the reform of economic regulation as it applies to the for-hire trucking industry in Ontario through a comparative analysis of industry structure and performance before and after the introduction of the Truck Transportation Act (Dec. 15,1988). The analysis employs intra-provincial shipment level data obtained from Statistics Canada as well as aggregate indicators of industry structure (firm size and numbers) and finances (costs).

With respect to industry structure, the findings suggest that the Ontario for-hire industry may have become more concentrated following reform. However, it is difficult to identify specific industry segments with the data employed. Financial data suggests that while Ontario firms spent more on brokers and rental equipment following reform, their expenditure on taxes and licenses did not change.

With respect to industry performance, there is no apparent widespread decline in average rate levels although certain industry segments do exhibit significant rate declines in the years following reform. This is particularly evident in the truckload segment. The rates for service involving small, less accessible communities do not appear to be affected by regulatory reform. Introducing more sensitive measures into the revenue model to capture the influence of community size (market conditions) has

not provided further insight into this question. Price-discrimination based on commodity type is similarly not affected by reform.

In general, the findings in this thesis suggest that in the case of Ontario, the reform of trucking regulation has not had a substantial impact on the for-hire trucking industry as a whole. This result contradicts the predictions of both the proponents and opponents of regulatory reform.

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PREFACE

This thesis is presented as a compendium of papers, the content of which is as follows:

Chapter 2	Woudsma, C.G. and P.S. Kanaroglou (1994). "Deregulation of the Motor Carrier Industry: A Canadian Example". *Environment and Planning A 26,* 343-360
Chapter 3	Kanaroglou, P.S. and C.G. Woudsma (1994). "Regulatory Reform and the Structure of For-Hire Motor Carrier Revenues in Ontario: 1987-1989", *Geographical Analysis* , 23 No. 3, 246-260
Chapter 4	Woudsma, C.G. and P.S. Kanaroglou (1994, accepted). "Motor Carrier Policy Evolution and Rate Issues in Ontario, 1983-1991", *The Journal of Transport Geography*
Chapter 5	Kanaroglou, P.S. and C.G. Woudsma (1994). "Motor Carrier Regulation, A Market Specific Analysis", in preparation for *Transport Policy*

The content, analysis, and writing of each paper was the sole responsibility of the dissertation author. This involved all aspects of literature review, data collection and organization as well as generation and selection of modelling results. The first draft of each paper was prepared by the dissertation author and submitted to the supervisor as the first step in the revision process. The supervisor's contribution included critique and editorial advice on subsequent versions of each paper. Discussions as to the interpretation of the results in each paper were also part of this process. In this respect,

his contribution to these papers is no different than if the traditional thesis format had been followed. The author ordering was dictated by an a priori agreement between the student and the supervisor and therefore is not meant to act as a reflection of the student's contribution to the work.

Chapter One

Introduction

1.1 Introduction

The movement of people and resources is the fundamental role of any transportation system. The geography of a nation can be a powerful influence on the structure and operation of this system (Hoyle, 1993). This is particularly true in the Canadian context. The vast distances, uneven population distribution, and harsh physical and climatic conditions all serve to accentuate the importance of transportation in Canada. This relative importance may account for the high degree of government involvement in transportation related matters.

Both the federal and provincial governments in Canada have played a key role in the structure and function of transportation. The federal government has been in the awkward position of being both owner and regulator of railways and airlines. Policy initiatives such as taxation and subsidy have been employed along side economic regulation which has generally involved entry and exit control as well as service prescription. The highway system and related regulations are under the control of each province, as is the regulation of truck transport.

The role of government in Canadian transport, although essential, has undergone a significant change in direction in the past decade. It is this change which provides the impetus for the research presented in this dissertation. The area of specific concern is the reform of economic regulation or deregulation in relation to the for-hire trucking industry[1].

At the federal level the Motor Vehicle Transportation Act (MVTA) (1987) was introduced as part of the National Transportation Act (NTA) (1987), the first national transportation policy change in nearly twenty years, . Provincial control over both extra and intra-provincial trucking had created a mosaic of regulations across Canada which increased the difficulty of providing cross-Canada trucking service. Hence, one of the main reasons for the MVTA (1987) was to create a consistent set of regulations with respect to extra-provincial trucking.

The MVTA (1987) required a special agreement between the federal and provincial governments. Although the majority of provinces have altered their regulatory structure to comply with the MVTA (Chow,1991), the Province of Ontario is the first to introduce its own major legislative response. The Truck Transportation Act (TTA) (1988) outlines a reform of economic regulation at both the extra and intra-provincial levels. It is Ontario's experience with this policy change which is examined in detail in this dissertation. The essential focus is on determining the impact of this policy change within Ontario (intraprovincial trucking).

1.1.1 Rationale

There are numerous reasons why the research contained in this dissertation is relevant. Although there have been numerous books written on the general subject of economic regulation (Kaplan, 1989; Spulber, 1989; Boyer, 1990) and on its reform (Button and Swann, 1989; Klaskowsky, 1990; Block and Lermer, 1991; Button and Pitfield, 1991) the following factors identify not only the importance of studying the Ontario experience, but the originality of this work.

The for-hire trucking industry has grown to be the dominant freight transportation mode. In Ontario, the percentage of freight revenues earned by the for-hire trucking industry has grown from 2 % in 1930 to 61 % in 1985 (OMTC, 1991). More importantly, the Ontario for-hire industry represents 40 % of the national industry in terms of the number of firms and is the leader in term of the number of shipments, overall tonnage, and revenue (Statistics Canada, 1994). The implication of these statistics is that the Ontario industry is the one which sets the tone for the rest of Canada. Therefore, Ontario's experience with regulatory reform should be of interest beyond its borders.

The bulk of Canadian literature dealing with this issue has relied on provincial comparisons in order to assess the influence of regulation (Sloss, 1970; Palmer, 1973; Maister, 1978; Lord and Shaw, 1980; McRae and Prescott, 1982; Chow, 1982). The provinces were classified on the basis of their regulatory environment and compared

against the Province of Alberta which has had no economic regulation of trucking. One of the major criticisms of this body of work concerns the difficulty of attempting jurisdictional comparisons (Chow and Button, 1982). The situation in Ontario presents a new opportunity to compare the same jurisdiction before and after the introduction of regulatory reforms. The problem of jurisdictional comparisons is thereby avoided. This dissertation capitalizes on this opportunity and, although not the first to address the issue in Ontario (OMTC, 1991), provides a solid, empirical investigation.

The following quotation suggests the importance of the empirical nature of this dissertation.

> Transportation policy is in a flux throughout North America, especially as a result of the deregulation activities in the United States. To complicate matters further, there is very little statistical and factual data available on the industry, and a surplus of rhetoric and mythology. (OMTC, 1983a, p.2).

Furthermore, the need to investigate the current wave of regulatory reform in Canada has also been expressed.

> The implications of deregulation, and of the North American Free Trade Agreement, require further attention. The identification and analysis of issues and trends over the longer and shorter periods is a highly significant task in terms of anticipating future transport needs. (Hoyle, 1993, p.149)

There has also been the suggestion that the assessment of regulation is often biased by the specific orientation of the assessor. Commenting on the fact that economists who played a role in promoting regulatory change also do the post change analysis, Boyer suggests that " although the analyses are generally of scholarly quality, they cannot be

considered to be disinterested " (Boyer, 1986, p. 329). The research presented here addresses these concerns by providing an objective and timely investigation of regulatory reform in Ontario.

Finally, part of the emphasis of this dissertation is on the spatial dimension of regulatory reform, particularly with respect to pricing. This aspect of reform is important in Ontario given the variations in regional socio-economic character. There exists a distinct heartland/hinterland relationship between the southern and northern regions of the province. In the hinterland regions the highway network is often the only transportation link for many communities. Subsequently, trucking has been referred to as " the life-line of small towns and communities " in Ontario (OMTC, 1991 p. i). It is important, therefore, to determine to what extent regulatory reform has had an impact on these communities.

1.1.2 Ontario's Regulatory Reform

The for-hire trucking industry in Ontario came into being following the First World War. The number of licensed commercial vehicles in Ontario rose from 2,618 in 1916 to 107,458 in 1937 (Bonsor, 1978). During that period there was significant pressure on the Ontario government from both railway and trucking organizations to initiate some type of regulatory control over the industry. The railways were concerned because they were losing their virtual monopoly on intercity transport, and the trucking organizations were worried because their numbers were increasing well

beyond the available demand at the time. The level of competition was described as being 'destructive' with severe price cutting the norm. The Public Commercial Vehicles Act (PCV) was introduced in 1927 and amended in 1934.

The 1934 amendment was significant because it officially introduced control over entry into the for-hire trucking industry through the issuance of certificates of Public Necessity and Convenience. The power to issue these licenses (or certificates) was initially given to the Ontario Municipal Board. Subsequently, the Ontario Highway Transport Board (OHTB) was established in 1955 to oversee enforcement of the PCV Act. Strict control over the setting of rates for trucking services, although aggressively sought after at the time (1934) (Kaplan, 1989), never became part of trucking regulations in Ontario. Rate regulation in Ontario consisted of the filing of rates before the Ontario Highway Transport Board.

The OHTB processed all applications for trucking service in Ontario with minor exceptions (e.g. dump trucks). If a firm sought a license, they had to apply before the board and pass a test of Public Necessity and Convenience which typically involved a hearing. The hearing was a quasi-judicial process where entering firms had to prove before the Board that their entry was necessary.

In addition to entry control, the OHTB also had power to prescribe conditions of service with respect to operating licenses. They could place restrictions as to which commodities were carried by firms and between which points. In terms of a mandate,

the following description indicates the position of the OHTB.

> The Board views its objectives as:
>
> To regulate the transportation of people and goods in such a manner as to ensure a competitive balance but to avoid a destructive over-supply of carriers.
>
> or
>
> To provide a reasonable level of transportation and continuous and dependable service to small centres, to regulate the use of public commercial vehicles having regard to public interest, public convenience and safety (Bonsor, 1978, p.112).

The provision of service to small centres is related to an 'obligation to serve' clause which was part of trucking licenses. Firms were obliged to provide service if it fell within the jurisdiction of their license.

This description of trucking regulation in Ontario since its inception in 1927 remained virtually unchanged until the introduction of the Truck Transportation Act (TTA) (1988). The TTA (1988) came into being as the result of numerous factors. While some of these influences were not exclusive to the situation in Ontario, they are still considered relevant.

1) *General Status of the Economy*: The high level of U.S. inflation of the early 70's and the recession of the early 80's in the case of Canada have been identified as factors which contributed to the reform of transport regulation in their respective jurisdictions. Policy-makers in particular were ready for a change from the status quo in order to address these problems (Chow,1991).

2) *Research Evidence*: In the U.S., economists provided evidence which was influential in changing policy opinion. The view that regulation no longer served the general public but served the interests of those under its control became popular. In Canada a similar situation occurred: "Economic evidence was instrumental in rallying popular support, convincing reluctant policy-makers for change, and justifying policy change (Chow, 1991 p.154)".

3) *Industry Dynamics*: Stanbury (1989) indicates that an industry may develop to the point where it is large enough to sustain competition or it may integrate with another industry (intermodal transport). In the case of Ontario, the trucking industry had grown rapidly in the post-war period because of technological and infrastructure advancements. A government review of the PCV Act recognized that the existing, complex regulation no longer matched the diverse and sophisticated reality of modern trucking (OMTC, 1983a).

4) *Shrinking World*: Advances in technology and communication coupled with a more open view towards international trade have also influenced regulatory change. The new mantra of 'global competitiveness' requires that economic restrictions on competitiveness be alleviated. Regulation of certain industries is often thought to inhibit competition and, therefore, reform occurs. Swann (1989) contends that this is among the most important reasons for reform.

5) *International Knock Down Effect* (Swann, 1989): This is most relevant to the

situation in Canada and Ontario because of the close economic ties with the United States. The idea is that where economies are geographically contiguous, the competitive effects of deregulation are likely to divert traffic from one country to the other unless the other country also reforms. Stanbury (1989) and Chow (1991) agree that the U.S. experience with deregulation was probably the most instrumental in determining Canadian policy action. The reasons include major Canadian cross-border shippers being able to compare directly between the two regimes, and the evidence provided by analysis of reform in the U.S..

6) *Politics*: Waterson (1988) suggests that politics may have more to say about the actual extent of regulation than does economics. Media reports tend to lump deregulation, privatisation, and the decline in socialism together, suggesting that they are part of a global fascination with the powers of the free market economy typified by the policies of governments led by Thatcher, Reagan, and to a lesser extent, Mulroney (Windsor, 1994).

7) *Interest Groups*: Lobby groups such as the Canadian and Ontario Trucking Associations on the one hand and the Canadian Industrial Transport League on the other have played a role in influencing the scale of regulatory reform. In particular, Chow (1991) suggests that since the trucking industry is not of great concern to the majority of the general public, the actions of these groups take on a greater role.

The overall objective of the TTA is expressed in the following excerpt from the

Act.

> The system will:
>
> a) foster productive, fair and innovative competition and the existence of a dependable and viable trucking industry in the furtherance of the public interest and
>
> b) be of benefit to the users of transportation services and not for the protection from competition of individual providers of such services (Government of Ontario, 1989, p. 4)

In comparison to the PCV Act, there is more emphasis on competition and a recognition that the regulatory Board had lost its objective orientation in terms of enforcing the previous Act.

The general legislative changes in the TTA involve an opening of entry into the industry and a removal of restrictions on operations. The Public Interest and Convenience test was changed to place the onus on existing firms to prove that the entrance of a new firm was not in the interest of the public. This is a significant change which by all accounts resulted in a substantial increase in the number of applications (OMTC, 1991). This test was to be phased out over a 5 year period and replaced by a fitness test. The fitness test requires firms to prove financial stability and knowledge of the general regulations of for-hire transport. In general, the powers of the Board were severely reduced, including the power to place restrictions on what firms could carry and where they could operate. The Ontario Highway Transport Board currently no longer deals with trucking licenses. However, they still were in

control during the period of time covered in this study.

1.1.3 Summary

Thus far in this chapter, the research topic has been introduced along with a brief discussion concerning its relevance. What is involved in Ontario's regulatory reform has been reviewed through a look at the prior regulatory regime and the Truck Transport Act (1988). Consideration has also been given to the forces which led to the introduction of the TTA.

The most important changes are the opening of entry and the removal of operating restrictions. The basic research question is, what is the impact of this regulatory reform? General objectives would include investigating the impact of regulatory reform on the industry and on the users of the industry. However, before the specific objectives of this dissertation can be presented, there is a need to establish some context.

The next section of this introductory chapter seeks to establish this context beginning with a review of the theoretical basis for regulation. The literature review attempts to provide further direction for the presentation of the specific research objectives which are outlined at the end of the next section.

1.2 Economic Regulation

Government influence on the economics and functioning of markets takes on many forms of which economic regulation is but one. This type of regulation usually involves control over entry into and exit from markets, pricing control, prescription of service, and an obligation to serve (Kahn, 1970). Elements of this description can be identified as being part of Ontario's previous regulatory regime. Additionally, this description of economic regulation can be related to traditional views in the field of Industrial Organization.

In this field the mainstream paradigm is that the level of effective competition in any market is conditioned by the structure/behaviour/performance of firms in that market (Shepherd, 1990). Pure competition and pure monopoly are the extreme market types, while between lie dominant firm, tight oligopoly, loose oligopoly, and monopolistic competition. Pure competition is not to be confused with the theoretical ideal of perfect competition. Pure competition implies that there are more than 50 competitors in a given market, each without a significant share of the market (Shepherd, 1990).

Market structure is concerned with the size and number of firms, their respective market share, the level of concentration, and barriers to entry. In any market this structure is influenced by the level of demand and supply, the elasticity of

demand, and the level of scale economies. Behaviour considers the level of collusive activity among firms and their various business strategies. Performance is usually assessed through analysis of price, cost, profits, and allocative efficiency.

The purpose for including this brief look at Industrial Organization is that it provides a basis for examining theories of regulation and the literature on the impacts of regulation/deregulation. The level of effective competition is one of the central elements in regulatory discussions, and hence in discussions concerning the impact of its reform or removal.

1.2.1 Theories of Regulation

It is not possible to present a thorough examination of the numerous regulatory theories within the confines of this chapter[2]. Furthermore, the purpose is not to determine which theory is more appropriate. Different regulatory theories lead to different predictions about the merits and effectiveness of regulation and are important in a predictive sense (Joskow and Rose, 1989). The research presented here does not attempt to predict the influence of regulatory reform in Ontario but to describe the impact of this change. The discussion of theory is however important for establishing a basis for the arguments as to the expected impact of regulatory reform.

Two main theoretical directions will be reviewed; 1) Public Interest Theory and the 2) Chicago School Economic Theory of Regulation. The first has been described as 'old style' regulation and is illustrated in Kahn's (1970) classic work. Noted economist

George Stigler is one of the leaders of the famed 'Chicago School' of economists who were fundamental in influencing regulatory reform in the U.S. (Swann, 1989). He is subsequently most often associated with the Chicago School Economic Theory of Regulation[3].

In theory, a well functioning economic system usually involves a competitive market where numerous well-informed buyers and sellers (structure) are unable to influence the terms of trading (behaviour). The end result is productive efficiency, little waste, and a happy system full of innovation (performance). However, the world is far from perfect, and often the gap between theory and reality widens. In cases where the economic system is not functioning well (referred to as market failure), there may be need for government intervention, often in the form of economic regulation. Regulation may be warranted in order to 1) contain monopolistic behaviour, 2) limit competition, or 3) promote competition (Kay and Vickers, 1990)

Kay and Vickers (1990) suggest that the primary rationale for regulation is to remedy various kinds of market failure which result in welfare losses for the overall economy. The theory associated with this notion of market failure is known as the Public Interest Theory of Regulation and is stated as follows:

> If free markets cannot produce an acceptable performance in terms of efficient resource allocation and the satisfaction of consumer demands, then the government should regulate those markets so as to correct the situation (Utton, 1986 p.13).

Utton (1986) describes this theory as the normative response to the positive analysis of

market failures which fall into the following categories: 1) natural monopolies 2) artificial monopolies[4] 3) externalities 4) incomplete or defective information.

The Chicago School Economic Theory of Regulation has a number of variations: the Political Theory of Interest Groups, Special Interests Theory and Simple Capture Theory to name a few. The common theme running through these is that regulation itself is viewed as being subject to economic laws. The government is the supplier while industries who perceive a benefit from regulation demand it (Waterson, 1988). Regulation is used by interest groups to extract wealth from other societal groups through the political process. Firms or their lobby groups act together to try and force legislation which can give them the ability to transfer some advantage into a form of economic rent. A small tightly knit group of firms will have the upper hand in terms of extracting rents from a diffuse majority. In the end it is the interests of the most politically effective groups rather than socially desirable interests that triumph (Noll, 1989). Reference to this theory can be noticed in the objectives of the TTA (1988) outlined previously in this chapter. Specifically noted is the idea that regulation should not protect the industry from competition but be of benefit to the public.

The main difference between the two theories is that Public Interest is concerned with correcting market failure while the Chicago School Economic Theory is concerned with the redistribution of incomes. Both theories have been employed in studies of trucking regulation, especially studies containing positive economic analysis of market

failure as related to the Public Interest theory. Joskow and Rose (1989) offer the following comprehensive listing of the various indicators of firm and/or market behaviour which have been considered in regulatory research. The relationship with the traditional Industrial Organization paradigm is apparent.

> 1) average level and structure of prices (non-linear pricing, non-uniform pricing).
>
> 2) static costs of production including a) input distortions, b) x-inefficiency (also referred to as sloppy management), c) direct regulatory costs, and d) input prices.
>
> 3) direct efficiency, including the rate and direction of innovation and productivity.
>
> 4) product quality and variety
>
> 5) distribution of income and rents including a) profitability of regulated firms, b) rent-sharing with factors of production, c) income transfers among customer groups, and d) income transfers among producer groups.

Public Interest theory has evolved on the basis of empirical analysis of prices, profits, and structure. Chicago School Economic Theory has been invoked to examine the interplay among groups that stand to win or lose with respect to regulation. Shepherd (1990) suggests that the ideas associated with this theory were advanced without substantial evidence. One of the major difficulties with providing this evidence is that data on elements such as voting among board members and the value of transfers is either difficult to obtain, or difficult to determine (Noll, 1989).

Public Interest Theory has been criticized because it does not accurately reflect

the modern realities of the marketplace (Stigler, 1988). However, market failure is still employed as a basis for establishing hypotheses concerning the influence of regulation. With respect to Ontario, the desire to limit competition was apparent in the creation of the PCV Act as was the intention to act in the best interest of the public. This latter element has been carried over as one of the objectives of the TTA (1988). It would therefore seem appropriate to employ this theory to establish a framework for investigating the impact of reform in Ontario.

1.2.2 Regulatory Reform; The Debate

In order to determine the possible impacts of regulatory reform in Ontario, it is necessary to consider the proposed impacts which have been forwarded as part of the debate concerning reform. The previous section has given a general sense of how these proposed impacts are related to particular views of the structure, conduct and performance of the trucking industry and the level of competition. They are also dependent on the view of economic regulation in terms of its ability to influence the industry. Next, three different views of the industry and regulation are considered.

1.2.2.1 Status Quo

The main interest groups in this lobby are the major trucking organizations and organized labour. Their arguments are based on a view of the industry as being inherently unstable. It follows that without some form of control over entry, competition will become destructive. Bonsor (1984) describes this destructive

competition as a state of persistent excess capacity leading to rate levels below those required to allow a normal rate of return on capital stock. The argument follows that open entry would lead to price cutting in the more profitable portions of existing markets as new firms would be drawn to them. Established firms would be forced to raise their rates in other less-lucrative markets (small communities) in order to remain in business.

It is also argued by this group that economies of scale are present in the industry and that regulation is needed to maintain a competitive balance. If destructive competition is allowed to persist, only larger firms will eventually survive and their market dominance would lead to monopolistic pricing behaviour. The industry structure will become more concentrated in that fewer firms will have a greater share of the market.

Other reasons forwarded by this group include the position that destructive competition will lead to a reduction in safety standards as pricing wars force firms to cut costs including those on maintenance. The final reason for continued regulation concerns the 'common carrier' or 'obligation to serve' part of trucking licenses. It is argued that this clause insures service to locationally disadvantaged or small-volume shippers at a fair rate. This notion of a fair rate introduces the possibility of cross-subsidy or non-compensatory pricing. These disadvantaged markets are more costly to serve because of low load factors and capacity under-utilization. Firms may charge

rates below the marginal cost of providing this service, thereby, incurring a loss. However, they can recoup these losses by charging rates in excess of marginal cost in markets in which they enjoy a degree of monopoly power through protection from competition. Opponents of reform maintain that without this power, small outlying areas would suffer a drastic reduction or elimination of service coupled with severe rate increases.

1.2.2.2 Pro-reform

The pro-reformists are led by large volume shippers and business organizations who have complained for years that regulation has caused rates to be above those expected under normal competitive circumstances. These higher rates are not necessarily the result of excess profits procured by oligopolistic firms enjoying regulatory protection. Bonsor (1984) suggests that costs have been inflated because of inefficient resource allocation. These inefficiencies include a high rate of empty backhauls and a general state of capacity under-utilization. The restrictions on what firms can carry and where they can operate leads to these inefficiencies.

Regulation is seen as being used to protect the interests of existing firms and reducing competitive pressure. This is thought to lead to x-inefficiency or sloppy management and productivity levels which are not at the optimum (Shepherd, 1990). The direct costs of regulatory compliance are also viewed as being unnecessary. They dismiss the destructive competition argument suggesting that economies of scale are not

present in the industry.

The proponents of reform recognize that certain markets are more costly to serve and that competition under reform would likely focus on more lucrative markets (Lord and Shaw, 1980). They suggest the increased competition associated with regulatory reform will insure service to disadvantaged markets if they are willing to pay rates which reflect the true cost of providing that service.

1.2.2.3 Non-debate

The opposing descriptions of the trucking industry and the influence of economic regulation given thus far have been advanced with respect to deregulation in the United States. There is some question as to the validity of these descriptions in the Canadian context. Kaplan (1989) has taken the position that the debate concerning regulatory reform in Ontario has essentially been a facade.

According to Kaplan, the debate was borrowed from the U.S. and was based on the view of regulation in Ontario as being a strictly enforced set of rules which controlled entry and operations within the for-hire trucking industry. Kaplan offers the following view of regulation in Ontario.

> Trucking regulation in Ontario has been a frail, porous, minimal system that achieved almost none of the objectives attributed to it in the deregulation debate; in fact, it achieved very few identifiable objectives of any sort (Kaplan, 1989 p. 101).

He argues that the debate was a ritual which Ontario (government and industry) felt it had to be engaged in because of its dominant position in Canadian trucking and the fact

that it was the first province to introduce (and reform) regulation. Both sides of the debate had to justify their commitment to their position and did so by exaggerating the impact of regulation on the market place.

Kaplan's strongest argument is that regulation was introduced and justified based on a view of the industry which was never proven. Rather than being a homogeneous industry characterized by low capital requirements, easy entry, small firm dominance, chronic oversupply, and intensive often destructive competition, Kaplan suggests that the trucking industry is not an industry at all. Instead, he argues that trucking is characterized as an unintegrated collection of separate, non-competing sub-industries. The sub-industries are specified on the basis of differences in commodity characteristics, length of haul, shipment size, and operating jurisdictions. He argues that there are few firms offering similar services, carrying the same commodities, and operating in the same market. This view of the trucking industry tends to nullify any arguments related to destructive competition or the need for more competition.

1.2.3 Regulatory Studies

The review of literature presented in the proceeding pages is not intended to cover all the areas listed previously in this section. Furthermore, the remaining chapters in this dissertation contain literature reviews as well. The goal at this point is to summarize and deal with the most pertinent examples of research into regulation and

regulatory reform, especially those dealing with Canada or Ontario. This review provides a basis for the presentation of the specific research objectives to be outlined in the next main section.

1.2.3.1 U.S. Research

Studies conducted in the U.S. (since 1980) investigate aspects of the trucking industry's structure and performance before regulatory reform and compare it to the case following reform. While most of the studies have been on interstate trucking, Allen, Maze, and Walter, (1993) provide a review of those concerned with intrastate trucking. The majority of states still regulate intrastate trucking, with the exceptions being Florida, Arizona, Maine, Wisconsin, and Maryland.

Numerous studies contain cost analyses (McMullen, 1987; Rakowski, 1988; Kling, 1990; Harmatuck, 1991) aimed at determining industry efficiency and productivity (Ying,1990) as well as addressing questions concerning the existence of economies of scale. Other studies have dealt with rate analysis (Blair et al., 1986; Beilock and Freeman, 1987), which is viewed as an overall net indicator of technical and allocative efficiency. There has been research into the question of safety (Traynor and McCarthy, 1991), as well as the question of service to small communities (Beilock and Freeman, 1984; Athearn Jr., 1991). The final group of studies has relied on survey information to explore the more qualitative impacts of reform (Williamson et al., 1985; Smith et al., 1990).

Harper and Johnson (1987) offer a detailed review of the arguments and predictions made by proponents of reform in the U.S. They found that generally there were positive results such as lower rates and greater managerial initiative. Other studies have reported a reduction in rates for some services (Beilock and Freeman, 1987) and an overall improvement in industry efficiency and productivity (Ying, 1990; Corsi and Stowers, 1991). Much of the concern has been with specific segments of the industry, most notably the less-than-truckload (LTL) common carrier segment which is showing signs of growing concentration (Rakowski, 1988; Kling, 1990). Traynor and McCarthy (1991) indicate that deregulation may have actually improved trucking safety while Beilock and Freeman (1984) conclude that deregulation has had at best a neutral effect on small community service. Studies have also suggested that billions of dollars of savings to the overall economy have occurred as a result of deregulation (Delaney, 1992).

In contrast to this rather positive review, consider this quotation on the topic:

> In the United States, unlimited entry and rate deregulation has created excessive capacity, declining productivity, destructive competition, discriminatory pricing, predatory behaviour, inadequate returns on investment, a deterioration in safety, a decline in wages, a deterioration in labour-management relations, an enhanced number of bankruptcies, mergers, and acquisitions and, in the long term, unprecedented concentration (Dempsey et al., 1990 p.180).

Dempsey's research (Dempsey et. al, 1990; Dempsey, 1992) is thorough and provides evidence to back up each of these conclusions. Harper and Johnson (1987) have also suggested that the trucking industry has suffered under the competitive pressure and

Athearn Jr. (1991) contends that service to small communities has declined.

Although a significant period of time has elapsed since deregulation in the U.S., there is obviously no clear consensus on the results of this change. Given the amount of empirical work in this area, this result is somewhat troubling. This is especially true given that this type of research has contributed as a force in regulatory change in other jurisdictions. However, considering the different views of the industry described earlier, these type of conflicting results are not that surprising.

1.2.3.2 Canadian Research

The majority of studies conducted in Canada deal with the effect of government regulation on rates. The goal is to determine if rates in the regulated trucking sector are higher than those in the non-regulated, more competitive sector (Sloss, 1970; Mclachlan, 1972; Palmer, 1973; Maister, 1978; McRae and Prescott, 1982). Cost analysis has also been conducted exclusively (Lord and Shaw 1980) and in conjunction with rate analysis (Chow, 1982; Klymchuk, 1983). There has been some study of industry structure (Chow and Caravan, 1991), behaviour (Boucher, 1990; 1993), and efficiency (OMTC, 1989).

In contrast to U.S. studies, Canadian research has been based on comparisons of industry structure and performance between provinces. This is possible because of provincial control over regulation which has resulted in a less than homogeneous situation across the country. Therefore, a province like Ontario, which was regulated,

could be compared to a province like Alberta, which has never been subject to economic regulation.

Sloss (1970) presented the first attempt to empirically determine the impact of regulation on rate levels. In his analysis he utilized a linear regression equation in which the rate was regressed against various cost determinants. It was hypothesized that once cost differentials between provinces had been properly accounted for, it would be possible to determine to what extent rate differentials existed between provinces based on their regulatory structure. Subsequent studies have essentially followed this approach with minor changes. They all indicate that there is evidence suggesting that rates for trucking service in Ontario are relatively higher than elsewhere in Canada, and that industry performance is relatively less efficient (Chow 1982).

The earlier studies have been criticized for their reliance on aggregate data and for their narrow classifications of regulation (Chow, 1982). Later studies (McRae and Prescott, 1982; Chow, 1982) have made use of disaggregate shipment level data provided by Statistics Canada. However, despite improved data sources, problems with these studies were reported as well. One main shortcoming reported by McRae and Prescott (1982) was the lack of demand considerations included in their rate model. The rate for service is dependent upon the cost of production, the level of demand in a market, and the level of competition. They suggest that including these components in the model would likely enhance its performance.

Questions related to the level and price for service to small markets have not received extensive attention in the literature. Empirical studies have investigated the argument that cross-subsidization is prevalent in the industry whereby small markets receive service at a rate below the marginal cost of providing this service. This argument is applied to commodity type as well. There is some question whether rate differentials based on commodity type reflect the actual cost of shipment, or are instead based on the elasticity of demand for service and the presence (or absence) of competition (Beilock and Freeman, 1987). This is also referred to as price-discrimination, or value-for-service pricing. McRae and Prescott (1982) concluded that Saskatchewan and Quebec had influenced rate levels for service to small communities. They did, however, indicate a lack of confidence in their results, which were not based on a comprehensive model. Chow (1983) confirmed their result for Saskatchewan while a similar study found little evidence to support the existence of cross-subsidy in Ontario (Woudsma, 1990).

The Ontario government (OMTC,1983b) conducted a study of the question of service to small markets, based on subjective information gathered through a survey of industry participants and users in selected small communities. One of the more strongly voiced conclusions was that regulation and the common carrier obligation to serve had no influence on service to small communities. While this study has been referenced in arguments regarding regulatory reform, others have indicated that caution

should be taken in accepting the results of studies which rely heavily on the perceptions and attitudes of respondents (Chow 1983).

In summary, research into the question of the impact of regulation and its reform in Canada has produced consistent results in reference to the rate question. The results with respect to the question of service to small communities has been varied. Chow and Caravan (1991) conclude that there has been concentration in the Canadian less-than-truckload market while surveys have suggested that the industry is suffering under the burden of deregulation (Collins and Bowland, 1989). In Ontario evidence suggests that millions of dollars would be saved following reform through more efficient use of equipment typified by a reduction in empty backhauls (OMTC,1989).

1.2.3.3 Discussion

The main methodological difference between the U.S. and Canadian studies concerns what is being compared. Studies in the U.S. have compared the situation before and after reform while Canadian studies have compared different jurisdictions. The difficulty with jurisdictional comparisons is unique in the Canadian context but the two bodies of research share some common difficulties.

The definition of the trucking industry can present a problem because of the industry's characteristic heterogeneity. As an example, in 1991 the Canadian industry was composed of 1,427 firms who earned over $1,000,000 in revenue annually, and 41,268 firms that earned below that figure (Statistics Canada, 1994). Firms may

engage in inter-regional, intra-regional, national, and international trucking and carry thousands of different commodities. There are further distinctions in terms of the length of haul and the size of shipments handled by firms (truckload, less-than-truckload).

One of the foremost difficulties with research into economic regulation is distinguishing between the influence of general economic factors and the influence of the regulatory change under examination. In the U.S. and Canada the respective national economies were mired in recession in the years following a major reform initiative which has exacerbated the difficulties of determining the impact of reforms (Chow, 1991; Harper and Johnson, 1987). Transport is a service industry and a recession implies a reduction in demand for service. The related impacts tend to be excess capacity and heightened competition which are also impacts associated with regulatory reform. Another influence which is difficult to separate from that of regulatory reform is the influence of other government policies. These may include taxation, subsidy, health and safety legislation, and in the case of transportation, legislation on vehicle weights and dimensions.

The timing of regulatory change presents another problem. The precise dates of the various legislative reforms coming into effect gives the misleading impression that it is a very sudden change. However, there is a distinction between a policy being de jure and de facto. In the Canadian case, it has been suggested that firms and regulatory

agencies were acting as if reform had occurred long before the law was passed (Boucher, 1990). For studies of regulatory reform, it is important that this be taken into consideration, especially when undertaking comparative analysis (before and after). If the time frame is not sufficient, it may be impossible to account for these premature changes.

A related concern is the question of short-term and long-term impacts and the existence of some kind of equilibrium. A criticism of numerous studies of impacts in the years immediately following reform in the U.S. was that what was being observed may have been transitory impacts (Harper and Johnson, 1987). Presently there is still concern that in the U.S. they are still adjusting to the last round of deregulation (Joskow and Rose, 1989). It is difficult to isolate the specific impacts of deregulation since each passing year complicates the situation further.

A methodological difficulty with a good deal of the empirical research is that it tends to be dominated by partial-equilibrium econometric studies. The aim of these studies is to describe some aspect of the influence of reform. There is not much in the way of general equilibrium analysis[5], which is surprising given that economic regulation of transport is supposed to balance the social goals of the government with the efficient functioning of the transport system. This suggests a need to understand the impacts of regulation beyond the specific industries involved. Spady and Freidlaender (1981) stress the need for general equilibrium analysis of transport markets, noting that

changes in one transport market affect other transport markets and eventually initial markets that demand transport service in the first place.

A final difficulty that can be associated with research into regulation is the problem of who is doing the assessing (Boyer, 1986). The range of results indicated in the survey of the U.S. literature provides some evidence to substantiate this problem. A related difficulty is that some of the studies of regulatory reform (e.g. Williamson et al., 1985, Bowland, 1993) are based on surveys of industry participants. There is some question as to how much stock should be put into studies which rely on the perceptions and attitudes of people who obviously have a vested interest in seeing either more or less regulation depending on what they stand to gain or lose.

This discussion tends to place the results of empirical research into regulatory reform in a rather dim light. Some of the problems, for example taking into account various other government actions, are related to policy research in general. The question of the validity of survey-based research extends beyond this area alone. The research presented in this dissertation addresses a number, but not all of the difficulties discussed above.

1.3 Research Objectives

The literature review of Canadian research has suggested that although there is a

relative consensus on the question of the influence of regulation on rates in general, the same cannot be said for the question of service to small communities. Difficulties related to previous research which are of interest at this point include the lack of demand considerations in rate modelling efforts and the reliance on jurisdictional comparisons. There has been no systematic empirical investigation of the reform issue in Ontario which has employed a before and after comparison, thereby avoiding this latter difficulty.

The objectives of this research intend to address some of the shortcomings observed in previous research. They are based on the assumption that economic regulation prior to reform had some influence on the structure and performance of the for-hire trucking industry in Ontario. Entry control and prescriptions of service have been targeted as factors which have altered the competitive level in the trucking industry. Collusive behaviour in the form of collective rate-making has been an accepted fact under the previous regulatory structure (Chow and Button, 1982). Subsequently the change in regulation embodied in the TTA (1988), which was intended to alter these circumstances, should have some impact on the for-hire trucking industry. The specific objectives are as follows.

Objective 1

Investigate the general status of the industry, focusing on structure and activity within Ontario.

Objective 2

Empirically analyze the rate effects associated with regulatory reform, examining three specific hypotheses.
1) Average rate levels decline because of increased competition and improved industry efficiency.
2) Commodity rate differentials decline because firms lose the possibility to exercise monopoly powers.
3) Average rates for service to small communities increase for similar reason as 2.

Objective 3

Further the evolution of the revenue (rate) model developed in previous work, providing a more rigorous treatment of demand/supply conditions and establish a framework for use in other jurisdictions.

1.4 Organization of Dissertation

The research objectives are addressed in a series of papers, either published or prepared for publication, which comprise the bulk of this dissertation. As such, Chapters 2 through 5 contain a more specific explanation of the overall research objectives presented in the previous section, as well as the methodology and data employed. The last section in this chapter provides a more detailed presentation of the model of analysis because it has not been possible to do so within the confines of a journal length paper.

Chapter 2 (Woudsma and Kanaroglou, 1994a) deals with the first objective,

examining industry structure, but primarily provides a detailed look at trucking activity in small communities within Ontario. The comparison of shipment rates involving these communities before and after reform is undertaken with data from the 1987-1989 period.

Chapters 3 through 5 deal with rate-related hypotheses and employ a variety of model modifications. The basic structure of each chapter is one of examining the data for rate changes and then attempting to model rates and assess the role of regulatory reform with respect to any changes in rate levels and structure. The chapters differ with respect to the time frame considered, the model employed, and the classification of the data employed.

Chapter 3 (Kanaroglou and Woudsma, 1994a) considers the year immediately following reform (1989) in comparison to the two years preceding. The shipment level data employed is classified on the basis of commodity groupings defined by Statistics Canada. Chapter 4 (Woudsma and Kanaroglou, 1994b) deals with the question of the timing of regulatory change through a comparison of 1983, 1987-1989, and 1991 shipment data. Chapter 5 provides a market specific analysis of the rate hypotheses, focusing in on specific commodities and traffic corridors in the five years of data employed. The use of Geographic Information Systems (GIS) is highlighted in Chapters 4 and 5, with the introduction of accessibility measures directed at capturing the influence of market conditions (demand/supply).

The final chapter in this dissertation (6) provides a review of the more important findings selected from the core chapters. A final discussion of the research objectives and findings will be presented along with suggestions for future research. There is a certain degree of repetition inherent in presenting a dissertation in this fashion and it is hoped that this does not provide substantial aggravation for the reader.

1.5 Model of Analysis

The review of the literature provides some indication that the investigation of rates for trucking service is an important part of the overall determination of the impact of regulatory reform. The rate level or price for service is viewed as an overall indicator of efficiency within the industry (Chow, 1982). It is also important as a key element in the functioning of the market for trucking services. The concepts of perfect competition and pure monopoly are central to discussions concerning the rates for service and the impacts of regulatory reform. Firm behaviour is thought to be neoclassical in nature at the conceptual level with the marketplace characterized by numerous firms that are profit maximizers (or cost minimizers). Therefore, as mentioned, firms set the rates for service on the basis of the costs of providing the service and also the demand and level of competition. If there were no competition, then the firm would be able to dictate the price, whereas with many firms (approaching

the perfect competition ideal) the firm would be a price taker. The use of mathematical models to attempt explanation of the variation in rate levels is an accepted research method. The specific model to be utilized in this research is explained in detail elsewhere (Woudsma and Kanaroglou, 1992). The important features of this model and its underlying structure and basis are presented here.

Although the rate for service is of prime concern, the following model is developed as revenue model. The revenue earned for transporting a commodity of type i between two points in a market j is given by:

$$R_{ij} = \Pi_{ij} + C_{ij} \qquad (1)$$

$$i = 1,2,...I \quad j = 1,2,...J$$

where Π_{ij} is excess profit and C_{ij} is cost. C_{ij} includes a 'normal profit' which is defined as the minimum profit a firm must acquire in order to remain in operation. In a perfectly competitive market, excess profit Π_{ij} is zero, leaving revenue equivalent to cost.

Direct production costs to individual firms include labour of handling, labour of driving, maintenance, terminal facility costs, equipment, insurance, and administration. Bonsor (1984) indicates that fuel, labour, and maintenance combine to make up to 80 percent of the total shipment cost, with labour alone accounting for 41 percent of the total. Unfortunately shipment level data does not usually include information on these

costs. They do, however, include information on the distance (D) and weight (W) of a shipment. Distance is generally regarded as a gross surrogate for fuel consumption, labour of driving, and vehicle maintenance with longer distances causing increases in these factors. Similarly shipment weight would correlate positively with the rate of fuel consumption, labour of handling, and maintenance costs related to increased wear and tear. Thus, shipment distance and weight, while uncorrelated with one another, are expected to account for a large proportion of the variability in shipment costs. It has been suggested that, because of the typically high operating ratios in the trucking industry, shipment revenue is a reasonable proxy for total shipment costs (Jones, 1991).

In general, cost C_{ij} is a monotonically increasing function of distance (D) and weight (W) as follows

$$\frac{\partial C_{ij}}{\partial D} > 0 \quad , \quad \frac{\partial C_{ij}}{\partial W} > 0$$

Although some of the costs increase linearly with distance (for example labour of driving) others, such as maintenance, do not. It is therefore argued that cost C_{ij} is increasing at a decreasing rate with distance.

$$\frac{\partial^2 C_{ij}}{\partial D^2} < 0$$

A similar argument can be made for the weight, W.

$$\frac{\partial^2 C_{ij}}{\partial W^2} < 0$$

For example, a truck carrying 10000 kgs at half capacity can carry 10000 kgs. more. However, this does not imply a doubling of the cost since factors such as labour of driving would remain relatively the same.

A suitable functional form for shipment cost with respect to distance and weight is:

$$C_{ij} = k_{ij} D^{\beta_{Dij}} W^{\beta_{Wij}} \qquad (2)$$

$$0 < \beta_{Dij}\ ,\ \beta_{Wij} \leq 1$$

$$i = 1,2,\ldots I \quad j = 1,2,\ldots J$$

Others have either advocated or utilized this functional form (Bonsor 1984, Blair et al. 1986, Chow 1983). Parameter k_{ij}, apart from reconciling the units of measurement between the left and right hand side, is also affected by costs unrelated to distance and weight.

Any excess profit Π_{ij}, can be treated as a proportion of cost:

$$\Pi_{ij} = m_{ij} C_{ij} \qquad (3)$$

where m_{ij} is a dimensionless, non-negative number ($m_{ij} \geq 0$). Since the cost of a shipment is positive ($C_{ij} > 0$), $m_{ij} = 0$ is equivalent to $\Pi_{ij} = 0$. Thus, market j for

commodity i is perfectly competitive if and only if $m_{ij} = 0$. Furthermore, increasing values of m_{ij} are associated with increasing excess profits Π_{ij}.

Combining (1), (2), and (3) we obtain the following:

$$R_{ij} = (m_{ij}+1)\, k_{ij} D^{\beta_{Dij}} W^{\beta_{Wij}} \qquad (4)$$

This equation can be used as a general model for revenue comparisons across markets and commodities. Such comparisons can be facilitated by contrasting the values of estimated model parameters under various case scenarios. In this case, the comparison between a jurisdiction under regulatory reform and under traditional regulation will be made. For estimation purposes through linear regression, equation (4) is linearized as follows:

$$\ln R_{ij} = a_{ij} + \beta_{Dij} \ln D + \beta_{Wij} \ln W \qquad (5)$$

with $0 < \beta_{Dij}, \beta_{Wij} \leq 1$ and

$$a_{ij} = \ln [(m_{ij}+1)\, k_{ij}] \qquad (6)$$

Additional variables $x_1, x_2, \ldots x_t$, characterizing the origin and destination of a shipment or other relevant information can be introduced into equation (5) as follows:

$$\ln R_{ij} = a_{ij} + \beta_{Dij} \ln D + \beta_{Wij} \ln W + \beta_{1ij} x_1 + \beta_{2ij} x_2 + \ldots . \beta_{tij} x_t \qquad (7)$$

$$0 < \beta_{Dij}, \beta_{Wij} \leq 1$$

$$i = 1,2,...I \quad j = 1,2,...J$$

Algebraically, any real value[6] for the constant term a_{ij} is possible. This value (in equation (7)) is expected to be affected by the value of the commodity being shipped (through $k_{i.}$), the level of administration introduced by any regulation (through k_{j}) and the excess profit possible in the market (through m_{j}). Parameters β_{Dij} and β_{Wij} can also be interpreted as elasticities of revenue with respect to distance and weight (respectively)[7]. Equation (7) represents the general form of a revenue model that permits comparison of revenues charged on shipments across markets and commodities in the for-hire motor carrier industry.

This model forms the basis of the analysis to be conducted with respect to objectives two and three. It can be argued that changes in parameter values and the performance of the model can be linked to changes in the regulation of the trucking industry. This topic is expanded on in each of the following chapters and is also covered in some detail in Woudsma and Kanaroglou (1992).

1.5.1 Revenue vs. Rate Models

The model introduced in the previous section makes use of shipment revenue as the dependent variable. Studies of regulatory reform in the trucking industry, however, have traditionally made use of shipment rates instead of shipment revenues. This

practice was initiated with the work of Sloss (1970) whose objective was to compare the regulatory environment among various Canadian provinces. Although limitations with his study have been discussed, virtually all of the subsequent studies have followed his example using some kind of shipment rate as a dependent variable. In this section, the relative merits of revenue and rate models are explored.

Dependent variables that have been used in rate models are defined as:

$$a) \quad P_{\bullet} = \frac{R}{W} \qquad or \qquad b) \quad P = \frac{R}{D \times W} \tag{8}$$

where $P_{\bullet}$ and P are shipment rates (prices). The model employed by Sargious and Tam (1985) is an example that uses $P_{\bullet}$:

$$\ln P_{\bullet} = \alpha + \beta_1 \ln D + \beta_2 \ln W + \beta_3 \ln (val) + \beta_4 O_W + \beta_5 O_E$$

where *val* represents the dollar value for specific commodities and O_W and O_E are dummy variables related to traffic direction. Another recent example which makes use of P is presented in Chow and Caravan (1991):

$$\ln P = \alpha + \beta_1 \ln D + \beta_2 \ln W + \beta_3 REGION + \beta_4 COMxx + \beta_5 YEAR$$

where *REGION*, *COMxx*, and *YEAR* are dummy variables related to the geographic market, commodity type, and year[8]. Rate models have also been employed by Blair, Kaserman, and McLave, (1986) and Beilock and Freeman, (1987).

In Canada, the Transportation Origin-Destination survey (TOD) is the most common data source for the majority of studies of this kind including the one presented here. The TOD survey is conducted annually by Statistics Canada with the observed unit of collection being the shipment. In addition to shipment revenue, other variables reported include shipment distance, weight, commodity type, and origin and destination. The shipment rate is not reported but may be calculated from revenue, distance, and weight. Other studies rely on surveys of trucking firms for their data. This type of rate information is often unreliable because of the common practice of rate discounting, which implies that quoted rates may be considerably different than the actual rate charged (Dempsey, 1992). In this respect, rates calculated from Statistics Canada data reflect the actual rate charged.

The similarity between model (7) and those used by Sargious and Tam (1985) and Chow and Caravan (1991) is obvious. The rate model used in this research to compare with (7) is derived by combining (8b) with (7):

$$P = e^{\alpha} D^{\beta_D - 1} W^{\beta_W - 1} e^{\beta_1 x_1 + \cdots \beta_i x_i} \qquad (9)$$

In a rate equation, the estimated parameters of D and W are expected to be exactly 1 less than their corresponding parameters in a revenue equation, while the constant term and parameters $\beta_1, \beta_2, \ldots \beta_i$ are identical in the two models. Observations of the dependent variable P, however, as calculated by (8b), are related to the independent

variables D and W. It is therefore important to examine whether the spurious correlation between P and D,W will have any effect on the statistics used to assess the significance of the parameters β_D , β_W and the overall goodness-of-fit of the model. Research on this topic suggests that the use of rate as the dependent variable as in (9) tends to inflate the overall r-squared of the model with spurious correlation identified as being the reason (Kanaroglou and Woudsma, 1994b).

This possibility of spurious correlation combined with the unreliability of rate data obtained from individual firms are the main reasons why the revenue model is used in this research. There is no difference with respect to the objectives of this research. Any variation in revenues is through definition, a variation in rates. Subsequently, the main argument that economic regulation has lead to higher than expected rate levels can be rephrased as follows: economic regulation has lead to higher than expected revenue levels.

Endnotes

1. For the remainder of this dissertation, unless indicated otherwise, regulation refers to economic regulation and not general regulations such as driver licensing and hours of work, vehicle weight and dimensions, and general safety. Similarly, any reference to the trucking industry refers to the for-hire segment of the trucking industry. For-hire implies that these firms provide a service for remuneration and is not to be confused with private trucking interests which are usually the transportation division of a non-trucking firm. For-hire firms include contract carriers and owner-operators.

2. For a more thorough review of regulatory theories see Utton (1986), Stigler (1988), Waterson (1988), Spulber (1989), Swann (1989), Noll (1989) and McFetridge and Lall (1991).

3. His version of that theory, referred to as the Capture Theory, suggests that regulatory agencies become 'captured' by the industries they regulate and serve their interests rather than the interests of the public.

4. Another affiliated theory in this case is the Contestable Market Theory which is relevant to markets where there are few players in an industry. It was developed with air transport in mind but may be applied to rail. The theory suggests that it is possible to have a competitive outcome even with a small number of (or even one) firms provided that the pricing is controlled either through actual competition or potential competition.

5. Exceptions to this include Allen et. al. (1990) U.S., Lubulwa (1988), Australia

6. Equation (8) is equivalent to:

$$R_{ij} = e^{a_{ij}} D^{\beta_{Dij}} W^{\beta_{Wij}} e^{\beta_{1ij}x_1 + \cdots \beta_{kij}x_k}$$

Any real value for a_{ij} will always yield a positive value for e^{aij} and the calculated revenue value will always be non-negative.

7. The elasticity of Revenue R_{ij} with respect to distance D is:

$$\varepsilon_{Dij} = \frac{\frac{\partial R_{ij}}{\partial D}}{\frac{R_{ij}}{D}}$$

where:

$$\frac{\partial R_{ij}}{\partial D} = e^{\alpha_{ij}} \beta_{Dij} D^{\beta_{Dij}-1} W^{\beta_{Wij}} e^{\beta_{1ij}x_1 + \cdots \beta_{kij}x_k}$$

$$= \beta_{Dij} \frac{R_{ij}}{D}$$

hence

$$\varepsilon_{Dij} = \beta_{Dij}$$

8. Chow and Caravan (1991) employed additional independent variables in their specification that are not shown here.

References

Allen, W.B., F.J. Berardino, J. Phillips, A. Preechametta, and G. Shao (1990). "Measuring the Impact of Intrastate Deregulation of Motor Carriage on the States." *Journal of the Transportation Research Forum* 30. 406-421.

Allen, B.J., Maze, T.H., and C.K. Walter (1993) "Intrastate Trucking Deregulation: Have Both The Negative and Positive Impacts Been Overstated?" *Transport Journal* 33, 30-39

Athearn Jr., F. (1991). "Availability of Less-Than-Truckload Service Since Deregulation in the Ten States Bordering Canada." *Proceedings of the 26th Annual Meeting of the Canadian Transportation Research Forum*, University of Saskatchewan Press, Saskatoon, 69-83.

Beilock, R., and J. Freeman (1984). "Deregulated Motor Carrier Service to Small Communities." *Transportation Journal* 23, 71-82.

Beilock, R., and J. Freeman (1987). "The Effect on Rate Levels and Structures of Removing Entry and Rate Controls on Motor Carriers." *Journal of Transport Economics and Policy* 21, 167-188.

Blair R.D.,D.L. Kaserman, and J.T. Mclave (1986). "Motor Carrier Deregulation:The Florida Experiment." *The Review of Economics and Statistics* 68. 159-164

Block, W., and Lermer, G. (1991) *Breaking the Shackles: Deregulating Canadian Industry*, Vancouver, B.C., The Frasier Institute

Bonsor, N.C. (1978). "The Development of Regulation in the Highway Trucking Industry in Ontario." in *Government Regulation: Issues and Alternatives*. Toronto: Ontario Economic Council.

Bonsor, N.C. (1984). *Transportation Economics; Theory and Canadian Policy*. Toronto: Butterworth & Co..

Boucher, M. (1990). "The Impact of Deregulation on the Quebec Trucking Industry: A Preliminary Assessment." *Proceedings of the 25th Annual Meeting of the Canadian Transportation Research Forum*, University of Saskatchewan Press, Saskatoon, 123-133.

Boucher, M. (1993) "The Behaviour of Quebec Trucking Firms Since the 1988 Regulatory Reform", in *Proceedings of the 28th Annual Meeting of the Canadian Transportation Research Forum*, B.G. Bisson ed., University of Saskatchewan Press, Saskatoon, 282-295.

Bowland, J.M. (1993). "Competing in the North American Marketplace: Emerging Trends in Truck and Rail Transportation". in *Proceedings of the 28th Annual Meeting of the Canadian Transportation Research Forum*, B.G. Bisson ed., University of Saskatchewan Press, Saskatoon, 363-376.

Boyer, K.D., (1986). "What do we Understand About the Economics of Regulation: The Effects of U.S. Transport Deregulation". in *Mainstreams in Industrial Organization, Book II*, Kluwer Academic Publishers, Boston, p.315-347

Boyer, R. (1990). *The Regulation School: A Critical Introduction*. New York: Columbia University Press

Button, K., and Swann D. (1989) *The Age of Regulatory Reform*, Oxford: Clarendon Press

Button, K, and Pitfield, D. (1991) *Transportation Deregulation: An International Movement*, London: MacMillan Academic and Professional Ltd.

Chow, G. (1982). *Rate and Cost Analysis of For-Hire Trucking: Provincial Comparisons*. Toronto: Research Branch; Bureau of Competition Policy, Consumer and Corporate Affairs Canada, Research Monograph 13.

Chow, G. (1983). "An Evaluation of Less-than-Truckload Transport in Small Rural Communities of Western Canada." *The Logistics and Transportation Review* 19, 225-244.

Chow, G. (1991). "U.S. and Canadian Trucking Policy" in *Transprt Deregulation: An International Movement*, K.Button and D. Pitfield eds., Macmillan Academic and Professional Ltd, London UK p. 141-170

Chow G., and K. Button (1982). "The Economic Regulation of Road Haulage (Trucking) in Canada and the United Kingdom." *Proceedings of the Transportation Research Forum*, 23. 642-652.

Chow, G, and J. Caravan (1991). *Concentration, Market Share, and Rates in Canadian LTL Trucking*. Vancouver, Policy and Coordination, Economic Analysis, Transport Canada, Report TP 11068-E

Collins, F.E., and J.M. Bowland, (1989). "The Early Results of Transportation Regulatory Reform in Canada: Revisited." *Proceedings of the 24th Annual Meeting of the Canadian Transportation Research Forum*, University of Saskatchewan Press, Saskatoon, 21-29.

Corsi, T.M., and J.R. Stowers (1991). "Effects of a Deregulated Environment on Motor Carriers: A Systematic, Multi-Segment Analysis." *Transportation Journal* 30. No. 3 4-28.

Delaney, R.V. (1992). "The North American Scene: A Macro-Economic View." *Transportation Quarterly* 46. 19-35.

Dempsey, P.S. (1992). "Interstate Trucking: The Collision of Textbook Theory and Empirical Reality". *Transportation Law Journal* 20, 185-254

Dempsey, P.T., Thoms, W.E., and S. Clapp (1990). "Canadian Transportation Liberalization: Planes, Trains, Trucks & Buses Rolling Across the Great White North". *Transportation Law Journal* 19, 113-190

Glaskowsky Jr., N.A. (1990). *Effects of Deregulation on Motor Carriers*, Eno Transportation Foundation Inc., Westport Conn.

Government of Ontario (1989). "Bill 88, The Truck Transportation Act (1988); An Act to Regulate Truck Transportation." *1st Session, 34th Legislature Ontario*. Toronto: Queens Printer for Ontario.

Harmatuck, D.J. (1991). "Economies of Scale and Scope in the Motor Carrier Industry." *Journal of Transport Economics and Policy* 25. 135-151.

Harper, D.V., and J.C. Johnson (1987). "The Potential Consequences of Deregulation of Transportation Revisited." *Land Economics* 63, 137-146.

Hoyle, B.S. (1993). "Transport in Canada: Patterns, Issues, and Trends", *Journal of Transport Geography* 1, 147-149.

Jones, J., (1991). "All Roads Lead To Rome? A Comparison of For-Hire Trucking Productivity in Canada and the United States, 1978-1988." *Proceedings of the 26th Annual Meeting of the Canadian Transportation Research Forum*, University of Saskatchewan Press, Saskatoon, 451-463.

Joskow, P.L. and N.L. Rose (1989). "The Effects of Economic Regulation" in the *Handbook of Industrial Organization Vol. II*, Schmalensee, R., and Willig, R.D. eds., North-Holland Publishers, Amsterdam, p.1449-1506

Kahn, A.E. (1970). *The Economics of Regulation: Principles and Institutions, Volume 1: Economic Principles*. New York: John Wiley and Son.

Kanaroglou, P.S. and C.G. Woudsma (1994a). "Regulatory Reform and the Structure of For-Hire Motor Carrier Revenues in Ontario: 1987-1989", *Geographical Analysis* , 23 No. 3, 246-260

Kanaroglou, P.S. and C.G. Woudsma (1994b). "A Model for Comparative Analysis of For-hire Motor Carrier Revenues and Rates", Submitted to the *The Canadian Geographer*, June 1994

Kaplan, H. (1989). *Policy and Rationality: The Regulation of Canadian Trucking*. Toronto: University of Toronto Press.

Kay, J., and J. Vickers (1990). "Regulatory Reform: An Appraisal." in *Deregulation or Re-regulation: Regulatory Reform in the U.S. and Europe*. G. Majone editor. New York: St. Martin's Press. 223-251.

Kling R.W. (1990). "Deregulation and Structural Change in the LTL Motor Freight Industry." *Transportation Journal* 29. No.3 47-53.

Klymchuk A.B. (1983). *Trucking Industry: Analysis of Performance*. Ottawa: Research Branch: Bureau of Competition Policy, Consumer and Corporate Affairs Canada, Research Monograph No. 14.

Lord R.J., and J. Shaw (1980). "A Comparative Examination of the Impact of Regulation on the Operations and Costs of Intra-Provincial Trucking Firms." in *Studies in Trucking Regulation Vol. 2*. Ottawa: Economic Council of Canada. 100-179.

Lubulwa, A.S.G. (1988). "Transport Deregulation and the Economy Wide Implications of the Wheeler-Gilmour Hypothesis." *Transportation Planning and Technology* 12. 255-262.

Maister D.H. (1978). "Deregulation and the Level of Trucking Rates in Canada: Additional Evidence." *Transportation Journal* 17. 49-62.

McFetridge, D.G., and A. Lall (1991). "Is There a Theory of Regulation?" in *Breaking the Shackles: Deregulating Canadian Industry*, W.Block and G. Lermer eds., The Frasier Institute, Vancouver p. 7-28.

Mclachlan D.L. (1972). "Canadian Trucking Regulations." *The Logistics and Transportation Review* 8. 59-81.

McMullen B.S. (1987) "The Impact of Regulatory Reform on U.S. Motor Carrier Costs." *Journal of Transport Economics and Policy*. 307-319.

McRae, J.J., and D.M. Prescott (1982). *Regulation and Performance in the Canadian Trucking Industry*. Economic Council Of Canada Report No. 23, Ottawa: Government of Canada.

Nix F.P., and A.M. Clayton (1980). *Motor Carrier Regulation: Institutions and Practices*. Ottawa: Economic Council of Canada, Working Paper E/I1. 1-144.

Noll, R.G. (1989). " Economic Perspectives on the Politics of Regulation" in *the Handbook of Industrial Organization Vol. II*, Schmalensee, R., and Willig, R.D. eds. North-Holland Publishers, Amsterdam, p. 1253-1288

OMTC, Ontario Ministry of Transportation and Communication (1983a). *Responsible Trucking: New Directions*. Toronto: OMTC.

OMTC, Ontario Ministry of Transportation and Communication (1983b). *Trucking Services to Small Communities*. Toronto: OMTC.

OMTC, Ontario Ministry of Transportation and Communication (1989). *Potential Savings Through Elimination of Empty Truck Movements (The Cost of Regulation)*. Toronto: OMTC 1-21.

OMTC, Ontario Ministry of Transportation and Communication, (1991), *Final Report of the Advisory Committee on Truck Transportation*, Toronto: Ontario Ministry of Transportation and Communication

Palmer J. (1973). "A Further Analysis of Provincial Trucking Regulation." *The Bell Journal of Economics and Management Science* 4. 655-664.

Rakowski J.P. (1988) "Marketing Economies and the Results of Trucking Deregulation in the Less-Than-Truckload Sector." *The Transportation Journal* 27. No. 3 11-22.

Sargious M., and T. Tam (1985). "Modelling Rail and Truck Freight Rates in Canada." *Logistics and Transportation Review* 21. 173-184.

Shepherd, W.G. (1990) *The Economics of Industrial Organization*, Toronto: Prentice-Hall Canada, Inc.

Sigler, G.J. (1988) *Chicago Studies in Political Economy*, Chicago: The University of Chicago Press

Sloss J. (1970). "Regulation of Motor Freight Transportation: A Quantitative Evaluation of Policy." *The Bell Journal of Economics and Management Science* 1. 327-366.

Smith, R.D., T.M. Corsi, and C.M. Grimm (1990). "Motor Carrier Strategies and Performance." *Transportation Research A* 24. 201-210.

Spady H.R., and Friedlaender, A.F. (1981). *Freight Transport Regulation*. Cambridge Mass.: The MIT Press

Spulber, D.S. (1989). *Regulation and Markets*. Cambridge Mass.: The MIT Press.

Stanbury, W.T. (1989). "Reforming Direct Regulation in Canada". in *The Age of Regulatory Reform*. K.J. Button and D.Swann Eds., Oxford: Clarendon Press. p 49-79.

Statistics Canada (1994). *Trucking in Canada 1991*. Surface and Marine Division Cat. No. 53-222. Ottawa: Statistics Canada.

Swann, D. (1989). "The Regulatory Scene: An Overview", in *The Age of Regulatory Reform*. K.J. Button and D.Swann Eds., Oxford: Clarendon Press. p 1-27

Traynor, T.L., and P.S. McCarthy (1991). "Trucking Deregulation and Highway Safety: The Effect of the 1980 Motor Carrier Act", *Journal of Regulatory Economics* 3, 339-348

Utton, M.A. (1986). *The Economics of Regulating Industry*. Oxford: Basil Blackwell.

Waterson, M. (1988). *Regulation of the Firm and Natural Monopoly*. Oxford: Basil Blackwell.

Williamson K.C., M.G. Singer, and D.J. Bloomberg (1985). "Impact of Regulatory Reform on U.S. For-Hire Freight Transportation: Carrier's Perspective." *Transportation Journal* 24. No. 4 28-51.

Windsor, H. (1994) "Did the New Democrats and Berlin Wall Fall Together?". *The Globe and Mail, Toronto*, April 29, 1994, A7

Woudsma, C.G. (1990). "*Regulatory Reform and the Ontario For-Hire Motor Carrier Industry: An Investigation of Associated Impacts*". unpublished Master's thesis, Wilfrid Laurier University, Waterloo.

Woudsma, C.G. and Kanaroglou, P.S. (1992). "Modelling the Structure of For-Hire Motor Carrier Revenues, by Commodity, and Community With an Example from Ontario under Regulation, 1987" McMaster University Q.S.E.P. Research Report # 293, Hamilton Canada

Woudsma, C.G. and P.S. Kanaroglou (1994a). "Deregulation of the Motor Carrier Industry: A Canadian Example". *Environment and Planning A 26*, 343-360

Woudsma, C.G. and P.S. Kanaroglou (1994b). "Motor Carrier Policy Evolution and Rate Issues in Ontario, 1983-1991", Submitted to *The Journal of Transport Geography*, July, 1994

Ying, J.S. (1990). "The Inefficiency of Regulating a Competitive Industry: Productivity Gains in Trucking Following Reform." *The Review of Economics and Statistics* 72. 191-201.

Chapter Two

Deregulation of the Motor Carrier Industry: A Canadian Example

Preface

This chapter is based on the following published paper:

Woudsma, C.G. and P.S. Kanaroglou (1994). "Deregulation of the Motor Carrier Industry: A Canadian Example". *Environment and Planning A 26*, 343-360

Sections 2.1 and 2.2 contain material presented in Chapter One of this dissertation. The reader may subsequently move directly to Section 2.3 where new material concerning this research is presented.

This chapter provides an introduction to the research in this dissertation through a closer look at the for-hire trucking industry in Ontario. The analysis is descriptive in nature and focuses on examining industry structure and finance, and the pattern of trucking activity with respect to small communities in Ontario. This is a first step in determining the impact of regulatory reform on the rates for service to small communities.

2.1 Introduction

The economic regulation of private enterprise by government authorities has been part of the Canadian transportation scene since the turn of the century. With regards to the trucking (motor carrier) industry, Canadian provinces have independently developed varying regulatory structures to control both the inter- and intra-provincial movement of goods by truck. In recent years, there has been a trend of regulatory reform or "deregulation" [1] with regard to numerous transportation sectors in North America. Part of this trend, the reform of trucking industry regulation within the province of Ontario, is examined in this paper.

The Ontario government passed the Truck Transportation Act on December 15, 1988, outlining a staged reform of regulations pertaining to the for-hire trucking industry. This legislative change was a response to the influence of numerous factors including the introduction of the National Transportation Act by the Federal Government in 1987, and the Motor Carrier Act (in 1980) which deregulated interstate trucking in the United States. Another contributing factor was the influence of years of debate involving industry participants, users, and academics. The focus of this debate concerned the necessity and effectiveness of regulating the trucking industry.

The main goal of this paper is to examine the regulatory reform of the motor carrier industry on two fronts. The first involves an assessment of the impacts of regulatory reform on the trucking industry itself. Specifically, issues related to the

structure of the industry and its financial status will be discussed. Secondly, the impact of regulatory reform on the users of the trucking industry will be addressed through an examination of the rates for trucking services. In particular, the spatial differentiation of rates will be reviewed through an investigation of traffic flows within the province of Ontario. This latter analysis involves extensive use of samples drawn from the 1987 to 1989 Transportation Origin-Destination survey of trucking shipments compiled annually by the Transportation Division of Statistics Canada.

The remainder of the paper is structured as follows. A brief discussion of the economic rationale for regulation is presented in the next section along with a closer look at the reasons behind the introduction of trucking regulation in Ontario and its eventual reform. Following this, the debate surrounding regulatory reform will be discussed and a review of the impacts associated with regulatory reform, drawn from experience in the United States and from research in Canada, will be undertaken. Next, the descriptive analysis of the data for each area, industry and user, will be presented and discussed. Finally, conclusions on the basis of the previous discussion will be offered and comments concerning future considerations submitted.

2.2 Background

Kahn (1970) defines economic regulation[2] in terms of 4 components; 1) control

of entry, 2) price fixing, 3) prescription of quality and conditions of service, and 4) an obligation to serve. The fundamental element in this definition is the implied replacement of competition as the governing market institution. The question which arises is why is it necessary to replace the "invisible hand" as the guiding force in certain markets within the economy?

Kay and Vickers (1990) suggest that the primary rationale for regulation is to remedy various kinds of market failure which result in welfare losses for the overall economy. The theory associated with this notion of market failure is known as the Public Interest Theory of Regulation and is stated as follows:

> If free markets cannot produce an acceptable performance in terms of efficient resource allocation and the satisfaction of consumer demands, then the government should regulate those markets so as to correct the situation (Utton, 1986, p. 13).

Utton (1986) describes this theory as the normative response to the positive analysis of market failure. It has also been described as a theory related to "old style regulation", as illustrated in Kahn's (1970) classic work[3]. This theory forms an underlying explanation for economic regulation in general, however, the specific circumstances are unique for each economic sector regulated.

2.2.1 Trucking Regulation in Ontario

Bonsor (1978) provides a detailed account of the history of trucking regulation in Ontario beginning with the forces which led to the introduction of the first Public Commercial Vehicles (PCV) Act (1927). A significant factor behind the introduction

of this Act was the aggressive political lobbying of the railroads. At the time, they viewed the trucking industry as a threat to their virtual monopoly on inter-city freight transport and felt that regulation could be used to control the growth of trucking and protect their interests (Bonsor, 1978). However, this legislation had very little impact because it lacked any kind of enforcement power and changes were introduced with the onset of the Great Depression. The following is an account of the situation in the Ontario trucking industry in the early 1930's.

> There was then a surplus of transportation of all kinds. Competition became destructive, large numbers of small operators were engaging in motor transportation. Their rates were not published. Many of the smaller operators were not aware of the costs of doing business and they made such rates as seemed required to secure traffic. Many of them failed and went out of business, but others promptly took their places. There was no rate structure and variations in individual rates were wide. Rates were constantly changing, charges to various shippers using the same carrier were often different and the service was neither stable nor reliable (Bonsor, 1978, p 104).

In response to the situation, the PCV Act (1927) was amended in 1934 and direct control over entry initiated. Entry into the industry was controlled by the Ontario Highway Transport Board (OHTB), a quasi-judicial body created to issue licenses to firms interested in entering the Ontario for-hire trucking industry. Generally, lawyers representing the applicant had to prove before the board that their client's entry into the industry was indeed in the best interest of the public. The board would then conduct hearings and the decision would be rendered. This method also applied to those firms wishing to alter their existing license for the purpose of extending their service into new markets. The trucking licence was (and still is) a lengthy and very detailed

document which outlined specific commodities a firm could carry and specific spatial limitations of the area they could serve. The filing of rates with the OHTB was also required but no form of price control was introduced. In general, the OHTB controlled entry into the industry directly through the issuance of licenses and indirectly, through the cost and bureaucratic difficulty associated with the entry procedure.

Bonsor (1978) indicates that trucking regulation remained essentially constant from 1934 onward with the exception of minor changes. This stagnation has been suggested as a factor which contributed to the introduction of major reforms in 1989. Other factors which contributed to the reform of trucking regulation in Ontario are similar to those which affected other sectors of the economy in Canada. In general, there had been a progressive growth of regulation which was viewed as an inhibitor to overall growth in the economy. Much of the regulation was viewed as ineffective and the theory of regulation for the public interest had been replaced by the theory of regulatory capture; regulation served the interests of those being regulated rather than the general public (Swann, 1989). Swann (1989. p. 19) also suggests that there exists an international knockdown effect where "in economies which are geographically contiguous (Canada, U.S.) the competitive effects of deregulation by one party are likely to divert traffic unless each party falls in line". Stanbury (1989) concurs with this suggestion, stating that the deregulation of the interstate trucking industry in the U.S. (1980) is the single most important factor in explaining the reform of trucking

regulation in Ontario and Canada.

Another factor which contributed to the change in regulation in Ontario was the debate on the merits of regulation. In relation to this paper, the debate provides a source of direction with respect to the essential question; what impact has decades of economic regulation had on the trucking industry and the users of that industry?

2.2.2 Regulatory Reform: The Debate

This section provides the focus for an investigation of the impacts of regulatory reform by reviewing the arguments for and against regulatory changes. Following a presentation of the various arguments, the results from the U.S. experience with deregulation and the evidence from Canadian research into regulation will be reviewed.

2.2.2.1 Anti-reform

The major groups who oppose regulatory reform include trucking industry lobby groups and organized labour. The arguments against reform are based on the suggestion that the industry is inherently unstable and that without some form of entry control, destructive competition will result. Bonsor (1984) describes this destructive competition as a state of persistent excess capacity leading to rate levels below those required to allow a normal rate of return on capital stock. Opponents maintain that destructive competition will eventually lead to industry concentration as only a few large firms will remain and rate levels will subsequently increase. Other justifications for continued regulation include the maintenance of safety standards and the assurance

of service to small outlying areas.

This latter argument involves the "obligation to serve" clause which has been a part of most trucking licenses. This clause is intended to insure that locationally disadvantaged or small volume shippers are not discriminated against and receive adequate service at a fair rate. This introduces the notion of cross-subsidy because these areas are generally regarded as being more costly to serve because of low load factors and the increased proportion of empty backhauls. The cross-subsidy occurs when firms charge rates below those reflecting the true cost of providing service in one market but recoup their losses by charging rates in excess of a competitive level in markets in which they enjoy a degree of monopoly power. Opponents of reform maintain that without this power, small outlying areas will suffer a drastic reduction or elimination of service coupled with severe rate increases.

2.2.2.2 Pro-reform

This group is led by large volume shippers and business organizations who have complained for years that regulation has caused shipping rates to be above those expected under normal competitive circumstances. Bonsor (1984) suggests that these higher rates have not necessarily been the result of excess profits procured by oligopolistic firms enjoying regulatory protection. Instead, he suggests that costs have been inflated under regulation because of allocative inefficiencies. These include a high rate of empty backhauls and a general state of capacity under-utilization. These

inefficiencies are attributed to the licensing structure that dictates which commodities can be carried by a firm and which specific spatial markets can be served. Bonsor (1984) also identifies x-inefficiency, or sloppy management as another factor responsible for higher than normal rates. The direct costs associated with regulatory activity have also been targeted as a factor. Proponents of reform maintain that the competitive forces associated with open entry into the industry will ensure that all requests for service will be fulfilled and that safety within the industry will not be compromised.

2.2.2.3 The Neutral Position

Kaplan (1989) has taken the position that the debate in Ontario has essentially been a facade. According to Kaplan, the debate was borrowed from the U.S. and was based on a view of regulation in Ontario as being a strictly enforced set of rules which controlled entry and operations within the for-hire trucking industry. Kaplan offers the following view of regulation in Ontario.

> Trucking regulation in Ontario has been a frail, porous, minimal system that achieved almost none of the objectives attributed to it in the deregulation debate; in fact, it achieved very few identifiable objectives of any sort (Kaplan, 1989, p.101).

He argues that the debate was a ritual which Ontario (government and industry) felt it had to engage in because of its dominant position in Canadian trucking and the fact that it was the first province to introduce (and reform) regulation. Both sides of the debate in Ontario had to justify their commitment to their position and did so by exaggerating

the impact of regulation on the marketplace.

2.2.3 Impacts of Reform: Industry and User

1) The U.S. Experience

The U.S. deregulated interstate trucking in 1980 and a number of states have deregulated intrastate trucking as well (e.g., Arizona and Florida). Harper and Johnson (1987) provide a summary of various research efforts and conclude that the period of regulatory reform has been traumatic for many carriers and to them, competition has indeed become destructive. Other reports indicate that trucking firm failures have been higher than expected, even given the large number of new entrants (Kling, 1988). This would suggest industry concentration, and is especially true in the less-than-truckload (LTL) segment of the industry. Bartlett and Steele (1992) maintain that deregulation has had a disastrous impact on the trucking industry. Over 150,000 jobs have been lost and of the top 30 firms in 1979, only 10 are still in business.

In contrast to this dire view, there is strong evidence to suggest that the majority of the industry has continued to flourish under deregulation. Ying (1990) reports of substantial improvements in firm productivity, indicating that those who suggested the existence of inefficiencies associated with regulation were partially right. Others suggest that although there is concentration in certain market segments, there is evidence of significant competitive pressure in the years following reform (Corsi and Stowers, 1991). The rate of bankruptcies has not been higher than in any other

economic sector during the decade following reform (Delaney 1992).

In relation to the users of trucking service, the most significant impact expected in the U.S. was the reduction in rates. On this issue, there is little debate. The majority of studies report that rates have declined or that increases in rate levels have been below the rate of inflation (Harper and Johnson, 1987; Beilock and Freeman, 1987). Delaney (1992) reports that average rates in 1987 were at least 20% below 1981 levels, and the biggest reason for this is the rationalization of output typified by increased average load size and a reduction in empty miles travelled.

With respect to the issue of service to small communities, the results are less consistent. Beilock and Freeman (1984) reviewed research on this question in addition to conducting their own empirical analysis and offer the following conclusion.

> Deregulation has at most a neutral effect on the non-urban shipper\receiver and is likely to exert a favourable influence on rates, service options, and competitiveness of transportation to these areas (1984, p. 80).

Kling (1990) suggests that this issue is still a valid concern and Athearn Jr. (1991) contends that there has been a serious reduction in the level of general freight less-than-truckload (LTL) service in the 10 states bordering Canada. This result is significant because LTL is the type of service that small communities and businesses are most likely to rely on.

2) Canadian Research

Canadian research has focused primarily on rates for trucking service in an

attempt to find evidence for the claim that rates in the regulated trucking sector are higher than those in a non-regulated competitive sector. This has been possible because of provincial control over trucking regulation which has created a natural economic laboratory. The unregulated province of Alberta acts as a benchmark for comparisons to other provinces which have varying degrees of regulatory control. There are a number of studies which utilized this comparative framework (see Chow 1982 for a review). The near unanimous result was that rates for service in the regulated sector were higher than those in the unregulated sector. However, these studies have been criticized for a number of reasons of which the most important is the difficulty associated with comparing across provinces. The differences in operating conditions and input factor prices could not accurately be captured in the aggregate measures utilized in those early studies.

The question of rates and service to small remote areas has also been considered in previous Canadian research. McRae and Prescott (1982) concluded that certain provinces had manipulated the intra-provincial rate structure[4] so as to benefit small remote communities. Chow (1983) concluded that the province of Saskatchewan had utilized rate control to keep rates for service to small remote areas comparatively lower than in other jurisdictions. The Ontario government conducted a survey of trucking industry users and participants located in small remote areas. One of the more strongly voiced conclusions was that regulation and the common carrier obligation to serve has

had little influence on service to small communities and that current rates were probably neither below marginal cost, implying subsidization, nor above marginal cost, indicating protection via entry control (OMTC, 1983).

2.3 A Case Study of Ontario 1987-1989

This section presents the results of analysis in relation to a number of questions which can be drawn from the previous discussion concerning the impact of regulatory reform in Ontario on the trucking industry and its users. With respect to the industry, relevant questions concern its relative size. Is there a growing number of industry participants or is there a concentration of power? Are there structural changes and a higher than expected level of business failure? Has there been a reduction in costs associated with the regulatory activities? The major impacts expected with respect to the users of the industry are related to rates for service. Is there an overall decline in rates following the introduction of reform? Is there any evidence of cross-subsidy with respect to small\remote communities under regulation and has it subsided following reform?

2.3.1 Industry Impacts

Statistics Canada provides the data which form the basis of the analysis in this section. The Motor Carrier of Freight (MCF) survey is the companion to the yearly

Transportation Origin-Destination (TOD) survey mentioned previously in this text. While the TOD survey contains output measures, the MCF contains financial information on the firms surveyed. Because of logistical and financial constraints, not all firms are surveyed each year. A class system is utilized (either 1,2[5], or 3[6]) with the entire 1st class being sampled, a representative section of the 2nd class, and after 1987, none of the 3rd class. The results from these extensive surveys are tabulated and presented in an annual report (Statistics Canada, 1988 to 1991). This report is the main source of information utilized in the following discussion.

According to the MCF survey, the number of Class 1 and 2 firms operating in Canada during 1989 was 5,486. These firms employed approximately 99,000 persons directly (Statistics Canada, 1991). In additions to these larger firms, there are thousands of single truck firms or, owner-operators, which play an important role in the industry. Firms offering general freight service are the most numerous followed by those shipping forest products, construction aggregates and other commodities. This latter category includes a wide range of consumer goods and industrial inputs and products. The size of the trucking industry in each province varies considerably.

Within Canada, the Ontario for-hire trucking industry is the dominant player, accounting for 25% of firms, yet 43% of the 9.9 billion dollar operating expenditure in 1989 (Statistics Canada, 1991). This fact further underscores the importance of investigating the Ontario experience with regulatory reform since the Ontario industry

is the leader nationally, and other provinces are likely to observe the situation in Ontario before embarking on their own reform. The focus of this study is on intraprovincial transport which presents a certain degree of difficulty in interpreting the information contained in the MCF survey. For example, carriers domiciled in Ontario may be engaged exclusively in international, interprovincial, or intraprovincial transport, or some combination of these three. This difficulty does not apply to the TOD survey where intra-provincial shipments are easily identified.

The number of Class 1 and 2 firms declined from 1,614 in 1987 to 1,452 in 1988 and 1,388 in 1989 (Statistics Canada,1989, 1990, 1991). The number of industry employees did not change dramatically during this period (averaging 43,000), nor did the level of industry output. This may suggest a concentration of the industry into fewer but larger firms, a possibility advocated by opponents of regulatory reform. However, important segments of the industry like the smaller firm and the independent owner\operator are not included in the survey, providing some doubt for this possibility. Additionally, bankruptcy statistics were reviewed and the trend towards a higher number of bankruptcies for transportation firms during the period 1987 to 1991 was no different than for other sectors of the Ontario and Canadian economy. This finding is similar to one reported by Delaney (1992) for the U.S.. Trucking bankruptcies increased dramatically in the U.S. during the period immediately following deregulation. Opponents of reform argued that this was just the type of

negative result they had predicted. Although a certain degree of rationalization did take place within certain industry sectors, Delaney (1992) points out that the bankruptcy rate for trucking firms was no worse than for firms in other sectors of the economy during that period. The recession of the early 1980's was largely responsible for this trend as is the current recession.

Another significant change is observed in the amount the industry spent on brokers, purchased transportation, and rental equipment. Their combined share of the total operating expense for the Ontario for-hire industry increased steadily from $933,987,269 in 1986 to $1,421,184,200 in 1989 (Statistics Canada 1988, 1991). This represents a relative increase from 28.23% of the total operating expense in 1986 to 33.2% in 1989. The increased use of brokers, a firm which acts as a mediator between shipper/receivers and truckers in terms of matching loads, was one of the structural changes associated with reform in the U.S. (McMullen, 1987). It appears to be manifesting itself in Ontario as well. The increased use of purchased transportation (usually the hiring of owner/operators) and rental equipment may suggest that firms are adjusting their capacity through means other than the purchase of equipment. In this way, firms may be extending their service into other markets more rapidly than in the past, and no longer rely on interlining (the reciprocal provision of service in jurisdictions where a firm is not licensed to operate) or merger, to achieve expansion.

Bonsor (1984) reported that regulatory related activities constituted a significant

financial burden for firms domiciled in Ontario. However, a review of the expense summary shows no significant change in the amount spent on taxes and licenses; $52,196,098 or 1.58% of the total operating expense in 1986 compared to $61,660,352 or 1.57% in 1989 (Statistics Canada 1988, 1991). Similarly, the relative amount spent on administration and other general expenses as a share of the total operating expense changed little from 22.58% in 1986 to 22.08% in 1989 (Statistics Canada 1988,1991).

These figures are significant since they suggest that either the cost structure has changed and new costs have replaced those related to regulation, or, that regulatory costs are still high, in spite of the re-regulation of 1989. The regulatory change is being phased in over 5 years, although the most important change, the easing of entry, has occurred. Another possibility, forwarded by Kaplan (1989) is that regulation, as it existed prior to 1989, was an ineffective policy instrument that was widely disregarded by the industry. Thus, it would be expected that the regulatory change has largely been politically motivated, yet, in reality, has made little impact on the day to day operations of the Ontario industry.

The difficulty associated with the aggregate industry indicators described previously stems from the fact that the trucking industry is extremely heterogeneous. Distinctions between markets can be drawn on the basis of a number of factors. The most prominent factor is whether the shipment is truckload (TL) or less-than-truckload (LTL). A shipment is considered truckload if it is the only good loaded on a truck

which travels from its source to its final destination directly. LTL shipments may travel to a terminal where they are consolidated in loads destined for a common area. The truck travels a route which includes numerous stops along the way. Another factor which distinguishes trucking markets is the commodity type. Firms which ship bulk liquids in tank trucks are not likely to ship fresh meat which requires refrigeration. Similarly, firms shipping fresh meat, would not ship automobiles. Commodity characteristics dictate shipping factors which further divide the industry. Finally, the spatial extent of a trucking firm's activity is another source of heterogeneity. Some firms offer long-haul service while others may only operate within a large metropolitan area. These factors combine to create the diversity which is characteristic of the trucking industry. For this reason, it is difficult to determine the precise impacts of reform reviewing the industry as a whole. The experience in the U.S. seems to suggest that specific industry segments either suffer or benefit because of regulatory reform. Overall, the statistics reviewed in the preceeding discussion suggest that the impact of reform in Ontario has thus far been limited in respect to the questions outlined in the introduction of this section.

2.3.2 User Impacts

The main questions to be addressed in this section deal with the impact of regulatory reform on rate levels in general, and specifically, on rates for service to small locationally disadvantaged regions. The main data source in this analysis is the

Transportation Origin-Destination (TOD) Survey, compiled yearly by the Transport Division of Statistics Canada. This survey of the trucking industry provides a rich and reliable source of highly disaggregate data. In this study, samples of intra-provincial shipments drawn from the 1987 through 1989 T.O.D. surveys for the Province of Ontario are utilized. The sample for each year consists of approximately 125,000 shipments. Among the 19 variables reported for each shipment are the distance, weight, commodity type, and revenue earned. This allows the calculation of shipment rates as follows:

$$\textit{Shipment Rate} = \frac{\textit{shipment revenue}}{\textit{shipment distance} \times \textit{shipment weight}} \qquad (1)$$

The survey variables also include the origin and destination of every shipment and the type of origin or destination, i.e. metropolitan or non-metropolitan[7]. The origin and destination are indicated by use of the Standard Geographic Code (SGC) which assigns a 7 digit number to each area. The areas coincide with the census subdivisions defined by Statistics Canada. Therefore, this coding facilitates the use of data from the 1986 Census of Canada (Statistics Canada 1987) which is used to identify small remote communities.

There are a total of 932 SGC areas or census subdivisions in Ontario[8]. These range in size from small urban areas to large metropolitan areas to large tracts of sparsely inhabited land in northern Ontario. The large number of possible origin-

destinations presents a myriad of possible traffic lanes to be investigated. The relationship between market size and the rate for service can be examined in relation to the arguments outlined previously regarding the cross-subsidization of rates for service to small communities.

The procedure utilized to examine this relationship follows closely the work of Chow (1983) who analyzed the service level to select small communities in Western Canada. Chow selects communities on the basis of their distance away from larger urban centres and their relatively lower population. He refers to them as Small/ Remote Communities (SRC's) (Chow,1983). In this analysis, similar selection criteria are used to identify areas in Ontario which are small in population size, and beyond the influence of major urban centres. Areas with a maximum population of 5,000 and which are located a straight line distance of greater than 50 km from any urban area of a minimum population 15,000 are classified as Small/Remote Areas (SRA's). They are classified as areas rather than communities, because in some instances, there may be numerous small communities within a specific SGC area. In the TOD data base, the origin-destinations are identified by the SGC number and not the specific community or point involved. Of the 932 SGC areas, 102 are classified as being Small/Remote. Figure 2.1 is a map of Ontario which illustrates the distribution of areas based on this classification scheme. It is evident that the majority of the areas classified as Small/Remote are located in the northern part of the province. The exceptions in the

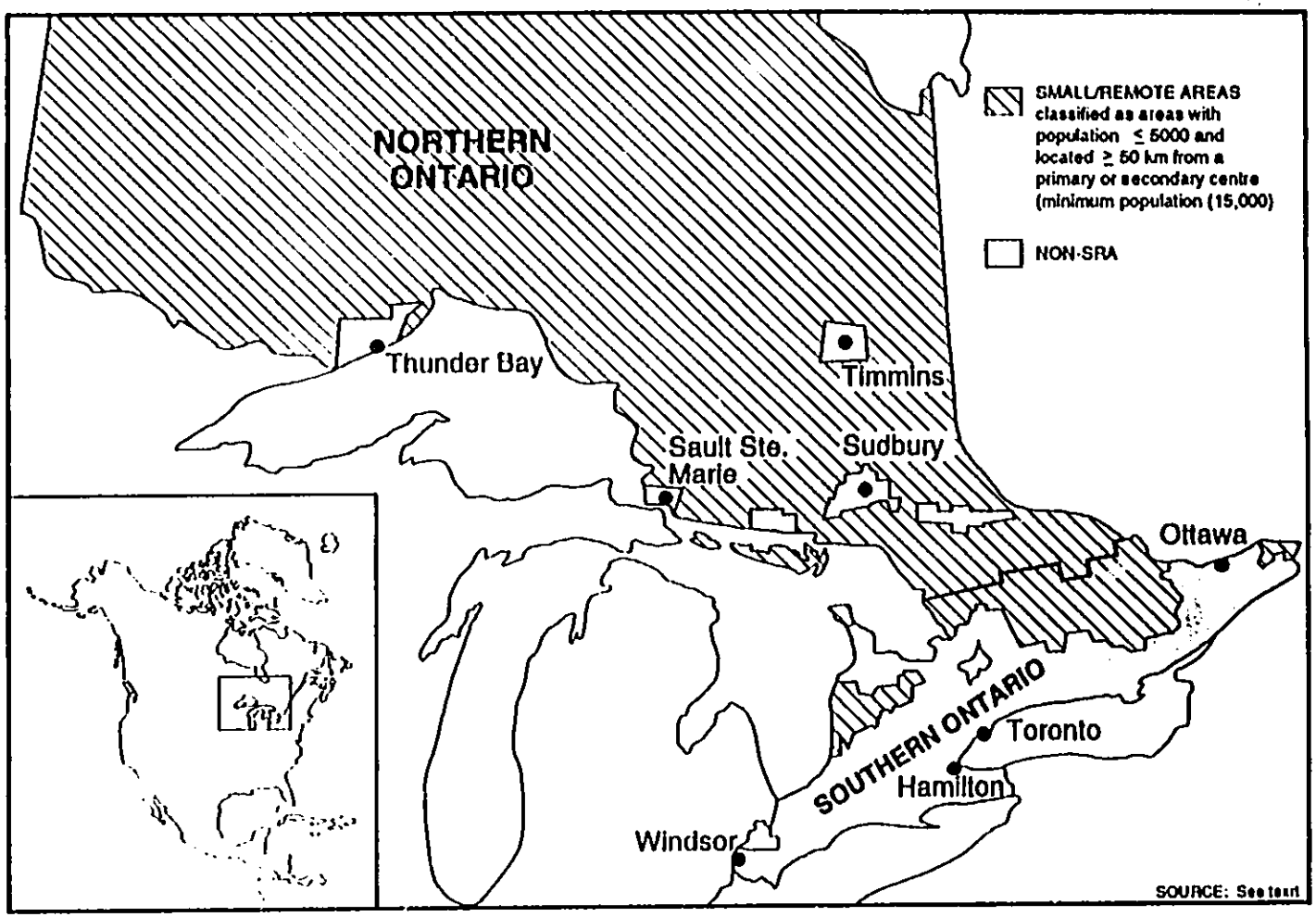

Figure 2.1: Small/Remote Areas in the Province of Ontario.

northern area are isolated pockets of urban areas associated with major resource deposits. There is a clear heartland/hinterland relationship in Ontario between the more developed south and the north. This fact is worthy of consideration in relation to the question concerning service to small/remote areas.

The total data base for each year is subdivided and classified on the basis of a number of criteria. The first criterion used to classify shipments is whether they are truckload (TL) or less-than-truckload (LTL)[9]. The two segments of the industry, LTL and TL, differ in terms of operating characteristics and costs, with the LTL carriers commonly spending more on fixed assets such as terminal facilities and activities, while the TL carriers predominantly offer long haul service which implies higher variable costs such as fuel and labour. TL shipments generally involve greater weight and greater distance in comparison to LTL shipments. The cost of producing ton-kilometres of output in the LTL segment has been identified as being higher than those produced by TL carriers (Spady and Friedlaender, 1978). The second criterion used to classify shipments is the type of commodity involved. The type of commodity is an important cost determinant with considerable variation among commodities based on weight per volume, value, and handling technique. Therefore, the classification of commodities into various groups is warranted on the basis that it may capture some of this variation, especially with regard to rates. Commodity types present in the data are in the hundreds and are grouped into one of six broad categories by Statistic Canada; 1) live

animals, 2) food, feed, beverage, and tobacco 3) crude materials inedible, 4) fabricated materials inedible 5) end products inedible, and 6) general freight. Tables 2.1 and 2.2 do not make use of this classification scheme presenting individual commodities instead.

2.3.2.1 Rate Analysis

Tables 2.1 through 2.5 utilize equation 1 in the calculation of average rates[10] for each particular shipment type. In general, there is great rate variability in almost every commodity group and shipment type. This variation is greatest in the LTL segment (tables 2.3 and 2.5) which also exhibits consistently higher average rate levels than the TL segment (tables 2.4 and 2.5). This latter point is likely explained by the cost differences between these two segments as discussed in the previous section. Overall, the substantial variability in rates may be attributed to the fact that each of the 6 broad categories represents a much higher number of specific commodity types. Aggregation of very different commodities into the same category may account for the variability observed. In addition, the greater variability in the LTL segment may be attributed to the wider range of possible rates which is related to the manner in which rates are set. Generally, weight is the dominant determinant in rate setting with rates increasing at a decreasing rate with increases in weight. Therefore, it is anticipated that the difference in rates between a 1000 and 2000 kg LTL shipment will be greater than the difference between a 19,000 and 20,000 kg TL shipment.

Generally, the flow of goods within Ontario follows conventional thoughts on the location of production and consumption. Higher order consumer goods tend to flow in and out of larger urban centers while low order goods flow in and out of communities lower in the urban hierarchy. It would be pointless to present a discussion of all possible flows in this paper; however, tables 2.1 and 2.2 provide a closer look at the goods flowing in and out of small/remote areas. These tables are based on the regional breakdown (north/south) illustrated in Figure 2.1, and on the classification of small/remote areas discussed previously.

Table 2.1 presents the top 5 commodities going in and out of small/remote areas in northern Ontario. The importance of the forestry industry in this region is apparent with 4 of the top 5 outgoing commodities related to wood or wood products. The top half of this table illustrates that there is a greater range of commodities bound for remote areas in the north. These incoming goods could be classified as basic goods; food, fuel, and general goods. Although the number of shipments in each category is not very large in certain years, the sampling procedure is supposed to ensure representative coverage.

Table 2.2 is included in order to compare the flow of goods involving small/remote areas in the North with those of similarly classed communities located in the South. Examining the bottom half of table 2.2, it is evident that there is a greater variety of goods coming out of remote areas in the south. Agricultural and

Table 2.1: Inter-regional Movements - Remote Communities in Ontario
(Rates expressed in cents per tonne-kilometre)

Top 5 Commodities Bound for Remote Communities in Northern Ontario

	1 Gasoline	2 Fuel Oil	3 Other Food Preparations	4 General Freight	5 Petroleum Products
1987					
Mean Rate	4.50	6.82	26.68	107.55	13.36
Std.Dev.	0.79	15.96	38.63	198.63	9.16
Number of Shipments	257	101	88	49	41
1988					
Mean Rate	4.36	4.06	44.52	940.11	15.28
Std.Dev.	0.88	0.60	93.25	2673.18	28.19
Number of Shipments	463	291	90	64	31
1989					
Mean Rate	4.25	9.83	46.00	162.15	4.59
Std.Dev.	1.05	95.01	53.45	444.00	4.48
Number of Shipments	439	258	42	80	68

Top 5 Commodities Originating from Remote Communities in Northern Ontario

	1 Wood Fabricated Materials	2 Lumber & Sawn Timber	3 Paper for Printing	4 Plywood	5 Household & Personal Equipment
1987					
Mean Rate	6.35	3.73	4.15	3.51	96.00
Std.Dev.	9.53	1.54	1.53	0.12	57.33
Number of Shipments	311	90	66	52	34
1988					
Mean Rate	7.06	5.86	4.45	0.00	88.11
Std.Dev.	16.22	11.01	3.79	0.00	37.29
Number of Shipments	161	270	43	0	63
1989					
Mean Rate	4.07	4.02	3.88	2.91	113.52
Std.Dev.	1.90	1.59	1.73	0.34	65.56
Number of Shipments	219	339	38	5	39

Table 2.2: Intra-regional Movements - Remote Communities in Ontario
(Rates expressed in cents per tonne-kilometre)

Top 5 Commodities Bound for Remote Communities in Southern Ontario

	1 Gasoline	2 Fuel Oil	3 Cement & Concrete Products	4 Poultry	5 Motor Veh. Engines and Parts
1987					
Mean Rate	7.71	6.60	11.17	27.09	1391.66
Std.Dev.	3.29	1.17	1.49	39.06	3151.98
Number of Shipments	205	141	108	102	39
1988					
Mean Rate	0.00	0.00	0.00	43.33	681.38
Std.Dev.	0.00	0.00	0.00	25.22	1330.17
Number of Shipments	0	0	0	54	16
1989					
Mean Rate	6.55	5.76	10.62	45.94	699.25
Std.Dev.	2.15	1.83	1.82	30.95	1426.16
Number of Shipments	308	228	148	33	50

Top 5 Commodities Originating from Remote Communities in Southern Ontario

	1 Pulpwood Chips	2 Lumber & Sawn Timber	3 Poultry	4 Household Furniture	5 Vegetables, Dried
1987					
Mean Rate	6.83	9.88	30.59	337.95	6.55
Std.Dev.	0.11	4.26	21.71	421.81	3.01
Number of Shipments	97	78	76	57	26
1988					
Mean Rate	4.89	7.88	43.33	500.68	5.36
Std.Dev.	1.22	8.83	25.22	347.88	2.59
Number of Shipments	6	66	54	13	40
1989					
Mean Rate	6.43	10.14	40.26	186.44	6.59
Std.Dev.	7.44	36.32	23.39	106.83	1.32
Number of Shipments	17	99	62	15	16

manufacturing activities are prominent not only in the top 5, but throughout the sample of shipments leaving these areas. However, forestry products still dominate the list. Forestry is not that important throughout the Province, but it is the area near the border between North and South (see Figure 2.1) which accounts for its prominence in table 2.2. As is the case in the north, a significant portion of the goods bound for remote areas in the south are fuel products, however, the rest of the top 5 are a mixture of industrial and agricultural products. This reflects the presence of a more diversified economy in the southern remote areas of the province.

In reference to the question concerning the overall rate levels, the arguments for an anticipated decline in rates following regulatory reform have been presented. Tables 2.3 and 2.4 contain a representative selection of the 6 broad commodity classes broken down into less-than-truckload (table 2.3) and truckload (table 2.4), as well as divided into metropolitan and non-metropolitan shipments. Focusing on the difference between 1988 and 1989 means (which represents before and after regulatory reform) the direction of change is not consistent. On one hand, in a number of commodity groups, it appears that rates for LTL service have declined following reform while on the other, rates have increased. Statistical tests reveal however, that the difference in these mean values from year to year is not significant in the majority of LTL segments. The large variability in rates in each case may obscure any changes in the rates for specific commodities within each aggregated grouping.

Table 2.3: Rates for Metropolitan and Non-Metropolitan Shipments
(Less-Than-Truckload rate expressed in cents per tonne-kilometre)

		1987	1988	1989
	Commodity	1) End Products Inedible		
Origin-Destination Pair				
Non-metropolitan	Mean	1299.85	980.35	563.66
	Std.dev.	5311.49	5811.51	1609.31
	N	537	527	780
Metropolitan		813.28	1072.37	1391.21
		3565.66	8690.35	4522.03
		17427	18381	19090
		2) Food,Feed,Beverage and Tobacco		
Non-metropolitan		251.03	138.16	297.55
		1445.01	294.00	829.20
		150	183	201
Metropolitan		271.07	279.75	293.16
		1004.78	1242.08	972.81
		2886	2224	2876
		3) Crude Materials Inedible		
Non-metropolitan		166.27	184.82	605.79
		141.21	176.99	1169.32
		13	12	16
Metropolitan		479.95	1434.93	525.52
		1309.88	3489.74	1683.70
		270	261	575

Table 2.4: Rates for Metropolitan and Non-Metropolitan Shipments
(Truckload rate expressed in cents per tonne-kilometre)

		1987	1988	1989
	Commodity	1) End Products Inedible		
Origin-Destination Pair				
Non-metropolitan	Mean	8.51	12.77	12.14
	Std.dev.	8.28	12.93	8.72
	N	47	36	81
Metropolitan		18.19	15.13	13.84
		29.63	17.20	25.02
		937	917	815
		2) Food,Feed,Beverage and Tobacco		
Non-metropolitan		10.19	11.81	21.65
		7.72	9.23	11.87
		555	610	1627
Metropolitan		10.16	10.69	13.06
		11.85	13.04	10.22
		2751	2933	1996
		3) Crude Materials Inedible		
Non-metropolitan		7.50	7.97	8.31
		4.07	5.79	4.53
		3733	3861	2276
Metropolitan		9.76	10.15	11.45
		7.52	9.59	14.07
		5000	3804	3176

In contrast, the TL segment presented in table 2.4, (and in table 2.5 bottom half) reveals a more consistent pattern. It appears that there is a general increase in average TL rates, specifically going from 1988 to 1989. This trend is statistically significant in the majority of cases. According to popular arguments, this result is opposite to what has been anticipated. Based on the previous discussion, it is expected that the TL segment is easier to enter, and one would expect the competitive pressure to be greater in the TL segment. The results seem to conflict with this argument. It is possible that the competitive pressure is still greater in the TL segment and that rates have been pushed to their lowest point. The increases noted may be related to the effects of above average inflation within the trucking industry. The LTL segment of the industry is the most profitable. In the U.S., the major industry changes following reform were in this segment. Perhaps the decline in rates for certain LTL markets following reform in Ontario are indicative of increased competitive pressure within this segment. Without further information on specific firm activity, this point remains speculative. Other elements related to rate determination, namely demand, competition and costs, should be included in any attempt to speculate on rate related changes.

The purpose of including the metropolitan, non-metropolitan distinction is to address the question of cross-subsidization and to determine if the size of the community (market) is an influence on the average rate for trucking service. The results in tables 2.3 and 2.4 indicate that in general, the rates for shipments between

non-metropolitan areas are significantly lower than those between metropolitan areas. This is true in all 3 years and there is little variation from year to year. This result suggests that there may be systematic cross-subsidy with reference to the provision of trucking service to these areas. It is interesting to note that in comparing the rates for goods in tables 2.1 and 2.2, in those cases where a good is prominent in both southern and northern remote communities, the rate is higher in the case of the south which echoes the results presented in tables 2.3 and 2.4.

Table 2.5 employs the classification of small/remote areas outlined previously with the intent of providing a more rigorous definition of market size and location. Of the 6 commodity classes, the results from the fabricated materials inedible group are reported since they are representative of the overall sample. In addition to the all or nothing categories (rows 1 and 4 in the LTL and TL segments respectively), the interaction between the small remote areas and larger centres is reported as well. The results in this table follow those established in tables 2.3 and 2.4. The average rate for shipments involving small remote areas is consistently lower, with little change following regulatory reform. Again, this result suggests the presence of cross-subsidy. However, the strength of this suggestion is weakened by the fact that no proper accounting of shipment costs is attempted in this analysis. Perhaps the weight and distance of the shipments to small remote areas are higher, leading to comparatively lower rates. This argument is related to the previous discussion of the manner in which

Table 2.5: Shipment Rates: Focus On Small/Remote Areas
(Rates expressed in cents per tonne-kilometre)

Commodity Group		Fabricated Material Inedible		
LESS-THAN-TRUCKLOAD				
	Year	1987	1988	1989
Origin-Destination Pair (**)				
Desremo = 1 Orgremo = 1 **	Mean	181.33	289.83	519.93
	Std.Dev.	132.48	433.08	1130.16
	N	17	23	20
Desremo = 0 Orgremo = 1		271.77	322.70	245.97
		563.55	1154.56	733.31
		83	90	58
Desremo = 1 Orgremo = 0		222.92	441.43	420.06
		823.28	3869.13	4069.31
		461	434	479
Desremo = 0 Orgremo = 0		689.20	1227.61	633.76
		5178.55	14163.67	3002.68
		8513	8799	9097
TRUCKLOAD				
Desremo = 1 Orgremo = 1		7.80	5.73	10.03
		5.50	7.49	6.23
		194	47	71
Desremo = 0 Orgremo = 1		5.96	6.12	5.50
		3.32	4.75	3.62
		899	777	867
Desremo = 1 Orgremo = 0		7.09	6.36	6.34
		3.32	3.24	3.19
		1782	2484	2113
Desremo = 0 Orgremo = 0		11.77	11.74	12.09
		9.60	8.94	10.89
		28870	29684	27290

** Desremo, Orgremo = 1 if the area is classified Small/Remote, otherwise = 0.

rates are established, which is linked with the concept of diminishing returns. Rates generally increase at a decreasing rate with weight. Perhaps the costs of insurance and congestion, related to operating in larger urban centres, are reflected in the higher rates. The need for more rigorous investigation is apparent. Regardless of whether these results are taken as evidence of cross-subsidy or not, it is clear that the change in regulation has had little impact on the observed rate differences. If cross-subsidy was apparent under regulation, it has not disappeared following reform.

2.4 Conclusion

Overall, the results presented in this paper tend to indicate that the reform of regulation has not had a substantial impact on the trucking industry or the user thus far. There are indications that some structural changes are taking place within the industry but evidence to support the argument of destructive competition is not strong. The results with respect to rates have been less than clear with both increases and decreases in average levels following reform. It appears that there is cross-subsidy with respect to shipments involving small, locationally disadvantaged shippers both before, and after reform. However, without a proper accounting of cost and demand conditions, it would be difficult to strongly support this case. In addition, the aggregation of commodities into broad groupings is a source of complication given the heterogeneous

nature of the industry.

Why does it appear that the reform of trucking regulation has had little impact in Ontario? One reason is that perhaps it is too early to tell. It is unlikely that the industry would suddenly change its structure and rate schedule over night which suggests that perhaps the changes are still forthcoming. In contrast, the industry has known about the introduction of reform since 1985 and it has been proposed that substantial re-structuring took place well in advance of reform (Boucher, 1990). There is also Kaplan's argument that regulation had no impact and therefore, its reform will have no impact as well.

Summarizing the U.S. experience, it appears that the user of the industry has benefitted the most. Delaney (1992) contends that the savings to the overall economy in the U.S. have been in the billions of dollars. Shippers report lower rates and improved service. However, the industry has suffered under the pressure of open competition. Certain markets have experienced concentration and the business failure rate suggests that the competition has indeed become destructive. The U.S. experience illustrates that even a decade after reform, determining the impact is still an issue.

In Ontario and Canada, deregulation is constantly forwarded as a contributing factor to the current problems for the trucking industry. In addition, the demand patterns for trucking activity are changing as the result of trade agreements and new production technologies such as just-in-time production. The trucking industry has not

been part of continental trade agreements such as the Canada-U.S. Free Trade Agreement. Trucking regulators in Canada, the U.S., and Mexico, have established procedural and legal guidelines for operating foreign trucks in their respective jurisdictions. Trade agreements have been linked with reductions in manufacturing activity within Ontario which translates into reduced demand for trucking service.

The fact that the economy is still mired in recession exacerbates this problem as well as the problem of isolating the impacts of reform. In the U.S., there are calls to re-introduce regulation in the interstate trucking market and there are doubts about the success of deregulation in other transport markets (Air, Rail) as well. This highlights the fact that regulation of industry is a dynamic and ongoing entity which is not entirely removed as implied by the term "deregulation". It is important that research in this area continues in order to increase our understanding of regulatory issues.

The next step in this research is the empirical analysis of this database utilizing a transport revenue model as reported in Woudsma and Kanaroglou (1992). It is expected that the proper accounting of various cost and demand factors related to rate determination will add further insight into the cross-subsidy question. The examination of specific traffic lanes and commodities is also part of our research agenda.

Endnotes

1. The term deregulation implies a complete removal of regulation. In the Canadian context, regulations have been changed but not removed completely. Therefore, in this paper, deregulation is used in reference to the case of interstate trucking in the United States; regulatory reform refers to the Canadian case.

2. Economic regulation in this context does not include social regulation or anti-trust policy.

3. Although there are more recent theories advanced with regards to regulation, a suitable discussion is beyond the scope of this paper (see Utton, 1986; Waterson, 1988; Spulber, 1989; and Kay and Vickers 1990 for a more thorough account).

4.The provinces, Manitoba, Quebec, and Saskatchewan, utilized rate regulation or prescription in addition to entry control.

5. According to Statistics Canada, a Class 1 firm is defined as one having greater than 12,000,000 dollars in operating revenue annually while a Class 2 has between 500,000 and 12,000,000.

6. The 1987 T.O.D. survey was the last year that Class 3 Carriers were included in the survey. These carriers earn less than 500,000 dollars annually. They are the largest category in terms of numbers, but the smallest in terms of actual business. This grouping is typically made up of owner\operators; single truck companies run by the driver.

7.For the purposes of this study, a metropolitan area is equivalent to a Census Metropolitan Area (CMA) as defined by Statistics Canada. A CMA consists of an urbanized core with at least 100,000 population, and adjacent urban and rural areas which have a high degree of economic and social integration with that core. Based on the 1986 Census, Ontario has 10 CMAs.

8.This is based on the 1981 census boundaries as defined by Statistics Canada. These have been altered in subsequent census years.

9.In this analysis, the separation is made using the weight of the shipment where shipments in excess of 17,000 kgs. are classified as TL and those below 2250 kgs are considered LTL shipments. This classification results in the overall sample size being reduced to 98,500 shipments and is based on a similar scheme utilized by McRae and Prescott (1982). Its use is justified on the grounds that shipments between these two weight limits may be either TL or LTL, depending on their weight per volume and the size of vehicle used in the shipment. Even so, the possibility exists that some of the shipments may be erroneously classified although in such a large sample, the proportion of such cases would be insignificant.

10.The rates calculated from the 1988 and 1989 sample were adjusted for the mean annual rate of inflation (4.1 and 5 % respectively).

References

Athearn Jr.. F. (1991). "Availability of Less-Than-Truckload Service Since Deregulation in the Ten States Bordering Canada." *Proceedings of the 26th Annual Meeting of the Canadian Transportation Research Forum*, 69-83.

Beilock, R., and J. Freeman (1984). "Deregulated Motor Carrier Service to Small Communities." *Transportation Journal* 23, 71-82.

Beilock, R., and J. Freeman (1987). "The Effect on Rate Levels and Structures of Removing Entry and Rate Controls on Motor Carriers." *Journal of Transport Economics and Policy* 21, 167-188.

Bonsor, N.C. (1978). "The Development of Regulation in the Highway Trucking Industry in Ontario." in *Government Regulation: Issues and Alternatives*. Toronto: Ontario Economic Council.

Bonsor, N.C. (1984). *Transportation Economics; Theory and Canadian Policy*. Toronto: Butterworth & Co..

Boucher, M. (1990). "The Impact of Deregulation on the Quebec Trucking Industry: A Preliminary Assessment." *Proceedings of the 25th Annual Meeting of the Canadian Transportation Research Forum*, 123-133.

Bryan, I.A. (1986). *Economic Policies in Canada*. Toronto: Butterworths.

Chow, G. (1982). *Rate and Cost Analysis of For-Hire Trucking: Provincial Comparisons*. Toronto: Research Branch; Bureau of Competition Policy, Consumer and Corporate Affairs Canada, Research Monograph 13.

Chow, G. (1983). "An Evaluation of Less-than-Truckload Transport in Small Rural Communities of Western Canada." *The Logistics and Transportation Review* 19, 225-244.

Corsi, T.M., and Stowers, J.R. (1991). "Effects of a Deregulated Environment on Motor Carriers: A Systematic, Multi-Segment Analysis." *Transportation Journal* 30. No. 3, 4-28.

Delaney, R.V. (1992). "The North American Scene: A Macro-Economic View." *Transportation Quarterly* 46. 19-35.

Harper, D.V., and J.C. Johnson (1987). "The Potential Consequences of Deregulation of Transportation Revisited." *Land Economics* 63, 137-146.

Kahn, A.E. (1970). *The Economics of Regulation: Principles and Institutions, Volume 1: Economic Principles*. New York: John Wiley and Son.

Kaplan, H. (1989). *Policy and Rationality: The Regulation of Canadian Trucking*. Toronto: University of Toronto Press.

Kay, J., and J. Vickers (1990). "Regulatory Reform: An Appraisal." in *Deregulation or Re-regulation: Regulatory Reform in the U.S. and Europe*. G. Majone editor. New York: St. Martin's Press. 223-251.

Kling, R.W. (1990). "Deregulation and Structural Change in the LTL Motor Freight Industry." *Transportation Journal* 29, 47-53.

McMullen, B.S. (1987). "The Impact of Regulatory Reform on U.S. Motor Carrier Costs." *Journal of Transport Economics and Policy*. 307-319.

McRae, J.J., and D.M. Prescott (1982). *Regulation and Performance in the Canadian Trucking Industry*. Economic Council Of Canada Report No. 23, Ottawa: Government of Canada.

Ministry of Supply and Services Canada (MSSC). (1985). *Freedom to Move: A Framework for Transportation Reform*. Ottawa: Government of Canada.

Ontario Government (1989). "Bill 88, The Truck Transportation Act (1988); An Act to Regulate Truck Transportation." *1st Session, 34th Legislature Ontario*. Toronto: Queens Printer for Ontario.

(OMTC) Ontario Ministry of Transportation and Communication (1983). *Trucking Services to Small Communities*. Toronto: OMTC.

Spady, R.H., and A.F. Friedlaender (1978). "Hedonic Cost Functions for the Regulated Trucking Industry." *The Bell Journal of Economics* 9, 159-179.

Spulber, D.S. (1989). *Regulation and Markets*. Cambridge Mass.: The MIT Press.

Stanbury, W.T. (1989). "Reforming Direct Regulation in Canada". in *The Age of Regulatory Reform*. K.J. Button and D.Swann Eds., Oxford: Clarendon Press. p 49-79.

Statistics Canada (1987) *1986 Census of Canada*, Ottawa: Statistics Canada.

Statistics Canada (1988). *Trucking in Canada 1986.* Surface and Marine Division Cat. No. 53-222. Ottawa: Statistics Canada.

Statistics Canada (1989). *Trucking in Canada 1987.* Surface and Marine Division Cat. No. 53-222. Ottawa: Statistics Canada.

Statistics Canada (1990). *Trucking in Canada 1988.* Surface and Marine Division Cat. No. 53-222. Ottawa: Statistics Canada.

Statistics Canada (1991). *Trucking in Canada 1989.* Surface and Marine Division Cat. No. 53-222. Ottawa: Statistics Canada.

Swann, D. (1989). "The Regulatory Scene: An Overview", in *The Age of Regulatory Reform.* K.J. Button and D.Swann Eds., Oxford: Clarendon Press. p 1-27

Utton, M.A. (1986). *The Economics of Regulating Industry.* Oxford: Basil Blackwell.

Waterson, M. (1988). *Regulation of the Firm and Natural Monopoly.* Oxford: Basil Blackwell.

Woudsma, C.G. and Kanaroglou, P.S. (1992). "Modelling the Structure of For-Hire Motor Carrier Revenues, by Commodity, and Community With an Example from Ontario under Regulation, 1987" McMaster University Q.S.E.P. Research Report # 293, Hamilton Canada

Ying, J.S. (1990). "The Inefficiency of Regulating a Competitive Industry: Productivity Gains in Trucking Following Reform." *The Review of Economics and Statistics* 72. 191-201.

Chapter Three

Regulatory Reform and the Structure of For-hire Motor Carrier Revenues In Ontario, 1987-1989

Preface

This chapter is based on the following published paper:

Kanaroglou, P.S. and C.G. Woudsma (1994). "Regulatory Reform and the Structure of For-Hire Motor Carrier Revenues in Ontario: 1987-1989", *Geographical Analysis* , 23 No. 3, 246-260

The reader may wish to skip to page 99 where a description of the specific hypotheses investigated in this chapter begins. The results from the application of the model of analysis with respect to the rate related hypotheses outlined in Chapter One are presented in this chapter. A descriptive analysis of average rate changes from 1987-1989 for commodity groups and shipment types (truckload and less-than-truckload) is followed by a discussion of the results of application of the model to the selected data. In relation to the overall research project, this paper represents the first set of empirical results and is a follow up to Chapter Two.

3.1 Introduction

In recent years, the Canadian Federal government has undertaken a cautious

change in policy direction with respect to numerous economic sectors including energy, communications, and transportation. Changes have consistently involved the restructuring or removal of economic regulation with the intent of allowing free market, competitive forces, to shape industry structure and performance. The relative merits of economic regulation have been debated in numerous studies (see Woudsma and Kanaroglou 1992 for a review). In certain sectors reform provides the opportunity to investigate regulatory changes in a before and after context. Studies of a single jurisdiction, based on before and after data, are more likely to correctly evaluate the impact of regulation as opposed to those studies in which different jurisdictions are compared. For example, the bulk of Canadian research has involved comparisons between the non-regulated Province of Alberta and other regulated provinces.

This paper focuses on the regulatory change implemented on Jan. 1, 1989 which effectively "deregulated"[1] the for-hire trucking industry in the Province of Ontario. The major change has been with entry requirements which have been relaxed to the point where entry into the industry is virtually wide open. Pricing controls have never been a significant part of trucking regulation in Ontario, unlike the previous U.S. interstate regulations. Although the related Canadian federal policy, the National Transportation Act (1987) was introduced a year earlier, the Ontario legislation represents the first provincial initiative to follow up on the Federal policy. The Canadian provinces have traditionally maintained control over regulation of the

trucking industry. Therefore, although the federal policy calls for reform, the individual provinces must provide the actual legislative response. The response in Ontario provides the stimulus for this empirical study of the impact of regulatory change. The central analysis involves an investigation of motor carrier revenues (rates) during the period 1987 to 1989. More specifically two research questions are examined; first, whether the average rate levels declined after reform and secondly, whether rate levels for small/remote areas increased. The model utilized is explained in detail in Woudsma and Kanaroglou(1992). The main, but not exclusive, source of data for this study is the Transportation Origin-Destination Survey (TOD) collected annually by Statistics Canada.

The remainder of the paper is organized as follows. Following this introduction, a presentation of necessary background information related to the regulatory debate and the importance of this research are outlined. The third section contains a description of the data and methods of analysis which is a necessary precursor to the presentation of the industry's rate profile for the study time period. The model results are then reviewed and discussed in section 5. Lastly, concluding comments related to this study are offered and future research avenues for expanding this study are outlined.

3.2 Background

In general, the merits of regulation have been, and continue to be the source of debate in many circles. With reference to the trucking industry, the debate has centred on questions regarding competition, rates for service (pricing), and provision of service. The following is a brief synopsis of the major arguments for and against regulation.

Proponents of regulation in trucking argue that it is necessary to prevent destructive competition from occurring. This leads to an unstable industry and usually involves cut-throat or predatory pricing and an increase in unsafe operations due to the slim profit margins and concomitant shoe-string approach to the business. Without entry control, they maintain, the industry will be subject to over-capacity and only the largest carriers will survive the ensuing competitive battles. Proponents also argue that regulation is necessary to ensure that trucking service is provided to small outlying areas and to low volume shipper/receivers.

Opponents of regulation argue that regulation has been an ineffective policy tool, achieving few of its more politically motivated goals, and remained static while the industry has grown and changed dramatically (Kaplan, 1989). They argue that regulation has created serious inefficiencies in the system; often related to monopolistic or oligopolistic powers acquired by firms in certain market segments. The strongest

argument by far is that this inefficiency has led to rate levels in excess of what is expected under normal competitive circumstances. They do not view the industry as being incapable of handling open competition. In fact, they argue that this open competition will provide better service and more importantly, a maintenance of service to small/remote areas. These are a few brief statements of the arguments, of which a more thorough accounting is beyond the scope of this paper.

The debate continues on despite the change in regulation and depending on the medium, the language ranges from dire pessimistic rhetoric to rational informed discourse. The "deregulation" of the trucking industry in Ontario is consistently mentioned in the media as a source of trouble for the trucking industry. The question as to the validity of this assertion forms the underlying impetus for this study. The United States experience with regulatory reform serves as an example from which relevant observations concerning the situation in Ontario can be made.

The Motor Carrier Act (MCA, 1980) effectively "deregulated" interstate trucking in the U.S.. Although a significant period of time has elapsed since this change, no clear consensus on the results of the change has been forwarded. Harper and Johnson (1987) offer a detailed review of the arguments and predictions made by proponents of reform in the U.S.. Generally, studies have reported reduction in rates for some services (Beilock and Freeman, 1987) and an overall improvement in industry efficiency and productivity (Ying, 1990; Corsi and Stowers, 1991). Much of the

concern has been with specific segments of the industry, most notably, the less-than-truckload (LTL) common carrier segment (Rakowski 1988, Kling 1990). While reports of billions of dollars of savings to the overall economy are forthcoming (Delaney, 1992), the trucking industry has been identified as being the biggest loser. The question of provision of service to small volume, locationally disadvantaged shipper/receivers has received less attention in the era following reform. The results have been mixed with both improved service and removal of service reported (Athearn, 1991). Certain industry groups have reportedly petitioned the Interstate Commerce Commission to reinstate regulation (Corsi and Stowers, 1991).

This latter point is noteworthy because the vast majority of states continue to regulate intrastate trucking. Exceptions such as Florida and Arizona have been studied with the results being generally positive. Beilock and Freeman (1987) report an overall reduction in rate levels, and a reduction in the rate differential[2] associated with small remote shipper/receivers. Policy makers in jurisdictions around the U.S. are no doubt studying cases such as these. The current situation in Ontario is similar to that of Arizona and Florida and subsequently, is of interest not only within Canada, but elsewhere as well.

Previous Canadian research related to regulation and the for-hire trucking industry has taken advantage of the regulatory differences across Canadian provinces to conduct comparisons between various jurisdictions: some regulated, others not (Chow

1982 provides a review). The goal has been to identify the impacts of regulation through comparing performance between jurisdictions. However, these studies have been criticized for a number of reasons, among which the most prominent is difficulty in comparing different jurisdictions. Factors related to the numerous economic conditions in various provinces were either not included, or lost through aggregation. There were also difficulties related to the classification of provinces as being regulated or non-regulated. Some provinces enforced their regulations to different degrees, again exacerbating the comparative difficulty. Consequently, the situation in Ontario allows for a Canadian first; the comparison between time periods, before and after regulatory reform.

The reform of regulation in Ontario has been directed at easing entry requirements. Prior to reform, the onus was on applicants to prove, in front of a regulatory board, that their service was needed. They were applying for a " certificate of public necessity and convenience". This often presented itself as a costly, and time consuming hurdle for new entrants who had to face off against established carriers who often collaborated their efforts against such challenges. The new legislation now places the onus on established carriers to prove that the applicant's service would not be needed nor would it be in the public's interest. This "reverse-onus" test is significant and by all accounts, entry applications and extensions to licenses are being granted as fast as bureaucratically possible. Eventually, this entry test will be phased out over 5

years and only a fitness test will remain.

The objective of this paper is to analyze empirically the rate effects associated with reform, by examining the following research questions:

a) Have rate levels for service to small/remote areas increased following reform?

b) Have overall rate levels declined following reform?

The question concerning rates for service to small/remote areas is based on the argument that regulation, through a licence clause referred to as "the obligation to serve", forced carriers to provide this service at a level which did not allow them to earn a normal rate of return. Because these carriers possibly obtained monopoly powers in other jurisdictions, they may have engaged in cross-subsidization; charging rates below the marginal cost of providing service on one hand while on the other, extracting monopolistic excess profit in other markets. Therefore, following regulatory reform, it is anticipated that carriers will no longer be able to do this, and the rate for providing service to small/remote areas will reflect the actual cost of providing that service. This is expected to be higher than a similar shipment in a more high density traffic route because of factors related to the possibility of obtaining return load and the potential to utilize equipment more efficiently.

In reference to the question concerning rate levels in general, their reduction following reform is based on a similar argument regarding competition. With ease of entry, carriers will be challenged in markets where they have enjoyed regulatory

protection, if the potential for a new firm to make a profit exists. Rates are expected to fall in line with marginal costs, thus approaching the competitive ideal of the free market. Additionally, this competitive pressure should force existing firms to improve their management techniques. Also, the inefficient allocation of resources associated with regulation should be remedied following reform, thereby lowering overall costs and allowing for the possibility of reduced rates. Cost savings related to the removal of the administrative burden of regulation should also contribute to reduced rates.

In summary, the two research questions to be investigated in this paper form the core of the debate regarding the impact of regulatory reform. The issue of service to small/remote areas is particularly important in the province of Ontario given the regional differences. Ontario is a geographically extensive region where the majority of the population live in a relatively small linear area adjacent to the U.S. border. The remainder of the province is characterized by dispersed pockets of settlements with minimal air and rail transportation linkages. The main linkages in these areas are through a relatively sparse road network. The trucking industry is subsequently vital to many communities and the issue of continued service at a reasonable rate following regulatory reform is of prime concern. The issue of reduced rate levels following reform is also a key concern. The economy wide implications of reduced rates has already been discussed with reference to the U.S. experience. Trucking is a billion dollar business in Ontario and an efficient and cost-effective industry would translate

into savings for the overall economy.

3.3 Data and Methods of Analysis

The primary data source for this study is the TOD survey compiled annually by Statistics Canada. This database contains estimates of trucking industry output based on a comprehensive survey of industry participants. The basic reporting level is the shipment itself, with records indicating shipment weight, distance, commodity type, origin, destination and revenue earned. The database for this study includes a sample of approximately 125,000 such records for each year of observation. The information in each record allows for the calculation of shipment rates which are expressed as revenue per tonne-kilometre; an accepted standard. The possibility of rate discounting for large volumes of freight exists. The revenue reported for a shipment incorporates such discounting. Therefore, a rate calculated as:

$$\text{Shipment Rate} = \frac{\text{shipment revenue}}{\text{shipment distance} \times \text{shipment weight}} \qquad (1)$$

is different from published rates submitted to rate agencies or traffic boards. The rates utilized in this study are calculated as in (1) above. Furthermore, (1) implies a direct relationship between the rates of a shipment and the revenue reported for that shipment.

The time frame for this analysis is the period 1987 to 1989 with the latter being

the first year of de-jure regulatory reform. The time frame of the data implies that this study concentrates on the short-run effects of reform. As data become available with time, the long-run effects will be investigated. A problem identified in this time series concerns the comparability of the 1987 data to the other years. Statistics Canada altered their survey universe in 1988 to exclude Class 3 carriers; those whose gross annual intercity revenues were below $500,000. Although this presents some difficulty, the results for the 1987 analysis are included, but they are interpreted with caution. Class 1 carriers (revenues greater than $12,000,000) are all selected for use in the survey while Class 2 carriers ($500,000 to $12,000,000) are selected on the basis of where they fit in the overall industry picture. For example, a specialized Class 2 carrier may be selected every time while a common contract carrier may only be selected occasionally. This selection, although subjective, attempts to maintain an accurate cross-section of industry segments. The reason all Class 1 firms are selected is "because of their known heterogeneity and importance to the for hire industry" (Statistics Canada, 1991 p. 185). For the 1989 survey, Class 1 firms represented approximately 40 percent of firms surveyed while the Class 2 selection represented a third of the industry total for that class (Statistics Canada, 1991).

Additional data sources include the Census of Canada which is utilized for the creation of variables related to population density and community size. The T.O.D. shipments are coded on the basis of their Standard Geographic Code which is also

utilized by the census to identify zones known as census subdivisions. This facilitates the use of census publication data for the creation of variables related to the type of a shipment's origin and destination. The two main variables created for use in the model to be outlined are a population density variable and a community size/remoteness variable. The first is utilized as a surrogate for market conditions with higher density areas generally thought to be associated with higher demand for trucking services and subsequently greater competition. The latter is a dummy variable classifying each of the 932 possible locations (census subdivisions) in Ontario as either small/remote or not.

A detailed description of the model, employed to test the research questions outlined earlier in this paper, is provided in Woudsma and Kanaroglou(1992). The model can be estimated with shipment observations for a given commodity type i and within a market j. In the context of this paper each year of observation corresponds to a different market. The general structure of the model is:

$$\ln R_{ij} = a_{ij} + \beta_{Dij} \ln D + \beta_{Wij} \ln W + \beta_{1ij} x_1 + \beta_{2ij} x_2 + \ldots \beta_{tij} x_t \qquad (2)$$

$$a_{ij} = \ln [(m_{ij} + 1) k_{ij}]$$

Revenue R for a shipment is expressed as a function of its distance D and weight W, as well as variables x_1, x_2, ...x_t that characterize the origin and destination. Distance and

weight, while unrelated to each other, act as gross surrogates of the cost of a shipment, which is a function of a wide variety of elements including fuel, labour (driving and handling), vehicle maintenance, terminal operations, capital equipment, insurance and administration. According to Bonsor(1984), labour accounts for 41 percent and fuel combined with maintenance accounts for an additional 39 percent of the total cost of a shipment. Variables measuring these direct costs are not usually available while distance (D) and weight (W) are. Distance is a surrogate for fuel consumption, labour of driving and maintenance, and weight acts as a surrogate for labour of handling and vehicle maintenance. Thus, distance and weight account for a large percentage of the variability in shipment costs.

The form of equation (2) implies that parameters β_{Dij} and β_{wij} are elasticities of revenue with respect to distance and weight, respectively. Their estimated values are expected to be in the interval (0,1] and they are directly comparable across markets and commodity types. The constant α can attain any value and as shown in (2), it is a function of m_{ij} and k_{ij}, which, at least with the data available in this case, are neither observable nor can they be estimated. m_{ij} is a non-negative dimensionless number and it attains a positive value if excess profits are present, otherwise it is zero. k_{ij}, on the other hand, is a constant, specific to commodity i and market j. Costs, specifically related to commodity type, captured by k_{ij}, include terminal facilities and activities, capital equipment and insurance. The latter is directly related to the value of the

commodity shipped. For a given commodity, differences in rates between two markets that can be attributed to their administrative cost structure differential are also captured by k_{ij}.

In a before and after study, such as this, if for a given commodity type the estimated "after" value of α_{ij} is larger than the "before", then this implies that either excess profits or administrative costs or both were higher after regulatory reform. The possibility also exists that one of these terms increased and the other decreased but the net result amounted to an increase. Although the available data do not allow for the identification of the exact cause of change in α_{ij}, this kind of analysis can point the direction for further research.

For the purposes of this study, two variables x_1 and x_2 are utilized, representing measures of accessibility of an origin and destination, respectively. Two model types are established, depending on the definition of x_1, x_2. For the first model, they are continuous variables, measuring the population density of an origin (*Orgpden*) and of a destination (*Despden*), respectively.

$$\ln R_{ij} = a_{ij} + \beta_{Dij} \ln D + \beta_{Wij} \ln W + \beta_{1ij} Orgpden + \beta_{2ij} Despden \qquad (3)$$

For the second model, x_1, x_2 are categorical variables, defined as:

Orgremo (Desremo) = 0 if origin (destination) population is less than 5,000 and the centre is further than 50 km away from urban centres with population in excess of 15,000

= 1 otherwise

A similar classification of communities was employed by Chow(1983). The resulting model is:

$$\ln R_{ij} = a_{ij} + \beta_{Dij} \ln D + \beta_{Wij} \ln W + \beta_{1ij} Orgremo + \beta_{2ij} Desremo \qquad (4)$$

An estimated positive value for β_{1ij} (β_{2ij}) in (3) implies that high density origins (destinations) are associated with higher shipment rates and visa-versa. Similarly, an estimated positive value for β_{1ij} (β_{2ij}) in (4) implies that small/remote origins (destinations) are associated with lower shipment rates and vice-versa. In both cases a positive value for β_{1ij}(β_{2ij}) can be looked upon as an indicator of cross-subsidization. It is possible, however, that cross-subsidization is present even with a negative value for β_{1ij}(β_{2ij}), if this value is higher than what it would be with complete absence of cross-subsidization. It is therefore important in a time comparative study, such as this, to observe not only the sign, but also the direction of change in parameter β_{1ij}(β_{2ij}). A decrease in the value of the parameter over time will signify a shift towards less cross-subsidization.

A third model type utilized in this study involves the introduction of a dummy variable to represent time, thus accounting for the change in regulation from 1988 to 1989. For each commodity group two samples (one for each year) are combined into one sample. A dummy variable, *Time*, denoting the year of a shipment is defined as follows:

Time = 0 for a 1988 shipment;

1 for a 1989 shipment;

The resulting model is:

$$\ln R_{ij} = a_{ij} + \beta_{Dij} \ln D + \beta_{Wij} \ln W + \beta_{1ij} x_1 + \beta_{2ij} x_2 + \beta_{3ij} Time \qquad (5)$$

where x_1, x_2 denote either the population density variables or the small/remote community variable, as defined for models (3) and (4). Parameter β_{3ij} measures the change in parameter α_{ij} from 1988 to 1989, when costs and the spatial effects of accessibility for the origin/destination of shipments of a given commodity type are controlled. Thus, based on our previous discussion, β_{3ij} measures, ceteris paribus, the change over time in the sum of administrative costs and excess profits for shipments of a given commodity type. In this respect, equation (5) serves a dual purpose. Firstly, it provides the means for testing the statistical significance of a change in parameter α_{ij}. Secondly, it represents with one value, and therefore in a more compact way, what otherwise is represented by the two values of α_{ij}, corresponding to the two time periods involved.

3.4 The Ontario Rates: 1987-1989

Within Canada, the Ontario for-hire trucking industry is the dominant player,

accounting for 25% of firms, yet 43% of the 9.9 billion dollar operating expenditure in 1989 (Statistics Canada, 1991). This fact underscores the importance of investigating the Ontario experience with regulatory reform, since the Ontario industry is the leader nationally, and other provinces are likely to observe the situation in Ontario, before embarking on their own reform. The focus of this study is on intraprovincial transport. This section presents a univariate analysis of rates during the study period as precursor to the multivariate analysis of the following section.

Because of the heterogenous structure of the industry, aggregate rate measures convey little information about industry performance. As discussed previously, commodity characteristics are most responsible for differences in firm operations. Thus, shipments in the samples are classified into six broad categories, according to the type of commodity shipped. Furthermore, previous research has identified the importance of distinguishing shipments into less-than-truckload (LTL) and truckload (TL). In this study, LTL and TL shipments are those below 2250 Kgs and above 17000 Kgs in weight, respectively.

Table 3.1 outlines the average rates for LTL shipments[3]. It is interesting to note that the aggregate rate estimates[4] (bottom of table 3.1) indicate an increase between 1987 and 1988 followed by a decrease between 1988 and 1989. Also of interest is the increase in mean rate values as one moves into the higher commodity groups; those commodities with relatively higher manufacturing value added. This suggests a

Table 3.1: Mean comparison of Less-than-truckload Shipment Rates (LTL)
(rate expressed in dollars per tonne/kilometer)

COMMODITY GROUP	1987	1988	1989	Percentage Change 1987 vs. 1988	1988 vs. 1989
1) Live Animals					
mean	1.403	1.745	1.419	24.40%	-18.67%
std. dev.	1.399	3.298	1.739		
n	606	503	521		
2) Food, Feed, Beverage					
and Tobacco	2.534	2.962	2.691	16.89%	-9.15%
	8.955	10.759	8.824		
	4685	4181	5384		
3) Crude Materials					
Inedible	6.893	11.484	5.276	66.60%	-54.05%
	48.510	30.005	16.015		
	419	395	732		
4) Fabricated Materials					
Inedible	6.610	11.801	6.206	78.54%	-47.41%
	50.236	137.699	30.536		
	9064	9346	9654		
5) Endproducts					
Inedible	7.916	9.863	11.148	24.59%	13.04%
	38.604	75.782	371.206		
	25638	26380	28383		
6) General Freight					
Unclassified	10.550	10.509	8.777	-0.39%	-16.48%
	39.174	81.406	38.555		
	1427	2172	3652		
Overall Average					
mean	7.016	9.679	8.846	37.96%	-8.61%
n	41839	42474	48326		

number of things including the presence of value-for-service pricing where the rate for a given commodity is set on the basis of the proportion of its final market price that the transportation component represents. The increase in mean rate values may also be related to higher insurance costs associated with higher value goods. The extreme variability in rates within commodity groups, as indicated by the size of the standard deviations, is also apparent in table 3.1. This can be taken as evidence of the heterogenous nature of the trucking industry and suggests that further disaggregation on the basis of commodity type would be desirable.

Table 3.2 presents the average rate values for the TL segment. The overall pattern in this case indicates a steady increase from 1987 to 1989. However, on a commodity basis, this trend is not consistent. The mean rate values in this table are considerably lower than those presented in table 3.1. This difference is attributed to the operational differences between TL and LTL service. The latter typically involves a much higher level of administrative and terminal expenses per unit of production. TL service is more straightforward and less capital intensive in comparison to LTL service. As a result, the number of firms, and consequently, the competitive pressure, is generally higher in the TL segment of the industry. This lack of competitive pressure may also explain why the rates in table 3.1 increase steadily towards the higher commodity groups yet, remain relatively stable in table 3.2.

In reference to the question concerning the average rate levels, the arguments

Table 3.2: Mean comparison of Truckload Shipment Rates (TL)
(rate expressed in dollars per tonne/kilometer)

COMMODITY GROUP	1987	1988	1989	Percentage Change 1987 vs. 1988	Percentage Change 1988 vs. 1989
1) Live Animals					
mean	0.16556	0.1566	0.1428	-5.41%	-8.81%
std. dev.	0.10053	0.14	0.1022		
n	815	893	663		
2) Food, Feed, Beverage					
and Tobacco	0.10759	0.0982	0.1374	-8.73%	39.92%
	0.10849	0.102	0.1079		
	5979	6630	6342		
3) Crude Materials					
Inedible	0.08423	0.085	0.0922	0.91%	8.47%
	0.06456	0.0884	0.0906		
	16063	14121	10020		
4) Fabricated Materials					
Inedible	0.11322	0.112	0.115	-1.08%	2.68%
	0.09334	0.0871	0.1054		
	31694	32992	30341		
5) Endproducts					
Inedible	0.15528	0.2216	0.1473	42.71%	-33.53%
	0.24527	0.2374	0.2357		
	1483	1562	1230		
6) General Freight					
Unclassified	0.09774	0.0884	0.1356	-9.56%	53.39%
	0.13152	0.0457	0.1529		
	629	684	104		
Overall Average					
mean	0.106	0.109	0.115	2.58%	5.18%
n	56663	55989	48700		

for an anticipated decline in rates following regulatory reform have been presented. The results in tables 3.1 and 3.2 present a conflicting view. On one hand, it appears that rates for LTL service have declined following reform while on the other, TL rates have increased. This could suggest that competitive pressures or efficiency related improvements have been more pronounced in the LTL industry segment. However, based on the previous discussion, it is expected that the TL segment is easier to enter, and one would expect the competitive pressure to be greater in the TL segment. The results seem to conflict with this argument. It is possible that the competitive pressure is still greater in the TL segment and that rates have been pushed to their lowest point. The increases noted may be related to the effects of above average inflation within the trucking industry. The LTL segment of the industry is the most profitable and in the U.S., the major industry changes following reform were in this segment. Perhaps the decline in rates for LTL service following reform in Ontario is indicative of increased competitive pressure within this segment. Without further information on specific firm activity, this point remains speculative. Other elements related to rate determination, namely demand, competition and costs, should be included in any attempt to speculate on rate related changes. The model outlined previously is a step towards achieving this aim and the results from its application will now be discussed.

3.5 Model Results and Discussion

Through the course of this research, numerous versions of the model were tested as were various categorizations of the data. It would be pointless to present all of the different results, hence only certain runs of the model, illustrating the main findings of this study, have been selected for review. At the onset, it would be useful to indicate that residual analysis revealed no difficulties with regard to violations of the underlying assumptions of linear regression. The regression analysis was performed with the SPSS/PC software. The residuals were homoscedastic and exhibited no serious departure from normality. Outlier and influential case analysis was also performed utilizing Cook's and Mahalanobis' distance as indicative measures. Those cases identified as outliers were examined and found to be within the expected range of possible variable values and not improperly input data. Multicollinearity was also not cause for concern and overall, the model performed adequately and consistently.

Tables 3.3 and 3.4 present the results of models (3) and (4), applied to crude materials inedible (low cost, unprocessed) and to food, feed, beverage and tobacco (higher cost, processed) commodity groups, respectively. The data for each year were further subdivided on the basis of shipment weight, i.e. TL vs LTL. In addition to the parameter estimates and t-statistics, the standardized beta coefficients are reported for the purposes of comparability across variables and commodities. The explained

Table 3.3: Sample Regression Run: 1987-1989 Crude Materials Inedible

	Less-than-truckload (LTL)			Truckload (TL)		
Variables	1987	1988	1989	1987	1988	1989
Distance (beta)	0.191195	-0.01131	0.176946	0.530299	0.550637	0.628449
(T-Score)	5.617	-0.255	5.665	99.538	98.803	96.915
(Stan-beta)	0.18353	-0.01048	0.194423	0.62453	0.63144	0.702398
Weight	0.483353	0.417174	0.336073	0.288802	0.061596	-0.17906
	23.524	15.019	18.251	12.865	3.099	-7.446
	0.762856	0.609605	0.656027	0.08012	0.019869	-0.05296
Orgpden	4.5E-05	-1.1E-05	-7.6E-05	2.4E-05	-7.9E-05	1.9E-05
	2.305	-0.44	-4.344	7.744	-28.775	5.677
	0.074355	-0.01789	-0.13502	0.048686	-0.1855	0.040634
Despden	-3.9E-05	-9.7E-06	-6.7E-06	-2.2E-05	-3.6E-05	-1.3E-05
	-1.845	-0.347	-0.309	-7.973	-13.184	-4.581
	-0.0603	-0.01421	-0.01027	-0.04952	-0.08421	-0.03255
constant	0.289117	6.709335	6.227472	-0.10659	6.966075	8.989136
	1.249	22.934	26.494	-0.45	33.347	35.617
adj.R.sqrd.	0.57489	0.36501	0.35079	0.38958	0.43116	0.50367
cases	419	395	732	16063	14121	10020

Table 3.4: Sample Regression Run: 1987-1989
Food, Feed, Beverage and Tobacco

	Less-than-truckload (LTL)			Truckload (TL)		
Variables	1987	1988	1989	1987	1988	1989
Distance (beta)	0.153902	0.167777	0.159535	0.606454	0.70096	0.394736
(T-score)	14.132	12.312	14.253	56.357	65.241	59.276
(Stan.beta)	0.148505	0.155146	0.134278	0.559652	0.593206	0.592328
Weight	0.470822	0.418084	0.473459	0.848211	0.770472	0.272387
	72.256	47.298	79.385	27.599	26.888	11.538
	0.725453	0.585031	0.7411	0.274202	0.247264	0.114442
Orgremo	0.02496	0.160976	0.143463	0.109595	-0.16827	-0.10056
	0.384	1.724	1.589	1.001	-4.702	-3.995
	0.03902	0.021597	0.014739	0.020673	-0.04281	-0.04042
Desremo	-0.02651	0.062655	-0.06013	-0.02067	0.119145	0.201193
	-0.754	1.521	-1.702	-1.001	2.055	5.167
	-0.00788	0.019401	-0.01593	-0.02067	0.018442	0.051168
constant	0.030561	5.131885	5.011962	-6.00968	-1.04944	5.720909
	4.476	59.912	71.866	-19.285	-3.627	24.176
adj.R.sqrd.	0.5305	0.3624	0.54002	0.42362	0.4671	0.39497
cases	4691	4181	5384	5979	6630	6342

revenue variability ranged between 35 and 57 percent.

In general, the parameters for distance (D) and weight (W), when significant, fell within the expected interval (0,1] with few exceptions, and were most prominent in accounting for variation in shipment revenues. The distance parameter is consistently higher in value and also displays a stronger t-score and standardized beta value for the TL segment while the same holds true for the weight variable in the LTL segment. This implies that the revenue of a shipment is more responsive (or more elastic with respect) to distance for TL rather than LTL shipments. For example, a one percentage point increase in the distance of a crude materials inedible, LTL shipment in 1987, would increase its revenue by .19 percent. If the same commodity were shipped as TL then a one percent increase in distance would increase revenue by .53 percent.

A potential explanation for this difference is that in TL segment, the whole truck is allocated to a particular shipment. Generally, there is a special rate for truckload shipments which applies regardless of the weight. For example, a shipper may request that their shipment be the only one on a truck in order to ensure safe and prompt delivery. Even if the truck was only partially filled, a truckload rate would be charged. This suggests that a greater proportion of variation in revenues for a given sample of truckload shipments would be associated with the shipment distance since the truckload rate applies if the weight is 4000 or 20000 kgs. In the LTL segment, the rate is set on the basis of the weight of a particular shipment which represents only a

portion of a trucks' capacity. Since a wide variety of shipments may constitute a loaded LTL truck, their respective weight becomes an important factor. Therefore, the variation in LTL revenues exhibits a stronger association with variations in shipment weight. Parameter estimates exhibit some variation between commodity types, which is attributed to the influence of commodity specific characteristics, such as weight-to-volume ratio.

The inclusion of the population density variables (*orgpden, despden*) in model (3) and the size/accessibility variables (*orgremo, desremo*) in model (4) is meant to address the question concerning the rate levels for shipments involving small/remote communities. The results for LTL are representative of the overall trend in this segment, illustrating a lack of statistical significance. In contrast, for the TL segment the results appear to be significant in the majority of cases. This observation is not a mere artifact of the larger sample sizes for TL. It rather suggests that the location and size of an origin or destination has little bearing on the determination of rates for LTL shipments. This finding, coupled with the importance of the distance of a shipment in determining the TL rates, underscore the importance of geography in studying the TL segment of the trucking industry.

The results in tables 3.3 and 3.4 provide no solid support for the existence of cross-subsidization across the industry. The parameter of the *orgpden* variable for the LTL, for example, in table 3.3 has steadily decreased over time, which supports the

premise that the level of cross-subsidization decreased in the crude materials inedible commodity grouping. On the other hand, the persistent increase of the corresponding parameters for the TL segment between 1988 and 1989 indicate a shift towards cross-subsidizing shipments to small/remote communities. Although one may argue for devising more sensitive measures to describe small/remote communities, these results suggest that overall, the industry is heterogeneous. Cross-subsidization may be present in some sectors, but sweeping generalizations are better to be avoided.

With respect to the second question, it is expected that rates will decline following regulatory reform. As mentioned earlier in this paper, the value of the constant term for a given commodity type and its variation over time is strongly related to changes in the sum of administrative costs and excess profits. The most consistent finding is a substantial increase in the value of the constant term between 1987 and 1988. The results in tables 3.3 and 3.4 concur with this observation. This increase can be partially explained by the change in the survey universe between the two years. The exclusion of smaller carriers, which generally do not have high administrative and terminal expenses, would inflate the importance of these factors for the remaining firms in 1988. Since the 1987 data cannot be made compatible to those of 1988 and 1989, the remaining of this section concentrates in comparing 1988 to 1989. One should point out that the ability of the model to capture the change in the survey illustrates its validity.

The direction of change in the constant term, shown in tables 3.3 and 3.4, corresponds well with the changes in rates observed in tables 3.1 and 3.2. This implies that even after the costs associated with distance and weight are taken into account, the direction of change for the remaining items that make-up revenue (excess profit and administrative costs) is preserved in the majority of the cases. Can we produce evidence as to whether this change is statistically significant? To answer this question we turn to model (5) and its associated runs that are presented in tables 3.5 and 3.6.

The results with respect to the rate levels for LTL shipments in table 3.1 conflict with those in tables 3.5 and 3.6. All the significant values of β_{3ij} are positive with the exception of that for the live animals grouping. Even the two groups, crude materials inedible and fabricated materials inedible, that largely contributed to the drop in rate between 1988 and 1989 for this segment, are associated with insignificant parameter values in table 3.5. One must conclude that the observed decline in the LTL trucking rates between 1988 and 1989 are not the result of a decline in the sum of administrative costs (fixed costs) and excess profits. This is an important observation because both these components are expected to be reduced under increased competitive pressure. The observed reduction in rates is rather the result of decreased costs in a combination of factors such as fuel, labour, vehicle maintenance and terminal operations, capital equipment and insurance. This latter type of cost reduction may or may not be related to regulatory reform.

Table 3.5: Sample of Regression Runs, Pooled Data 1988 and 1989

	Crude Material Inedible		Fabricated Mat. Inedible		End-Products Inedible	
Variables	LTL	TL	LTL	TL	LTL	TL
Distance (beta	0.102006	0.572079	0.235459	0.511774	0.329204	0.345954
(T-score)	3.991	134.883	42.165	221.571	93.499	29.012
(stan-beta)	0.1076	0.649066	0.237743	0.675626	0.279783	0.466334
Weight	0.360343	-0.024464	0.381727	0.365506	0.412922	-0.144195
	23.556	-1.582	112.609	45.641	218.87	-3.044
	0.635769	-0.008023	0.621922	0.137573	0.65262	-0.048927
Orgpden	-4.29E-05	-4.52E-05	-1.16E-06	2.445E-05	4.219E-05	-3.43E-05
	-2.93	-21.113	-0.431	23.36	23.542	-5.11
	-0.072248	-0.101606	-0.002386	0.07027	0.070297	-0.081937
Despden	1.363E-05	-2.93E-05	-3.47E-05	2.859E-05	1.571E-05	-3.73E-05
	0.812	-14.421	-9.555	19.678	7.49	-5.02
	0.020615	-0.06941	-0.054031	0.059677	0.022493	-0.080491
Time	0.025666	0.001377	0.0155	0.044878	0.068176	-0.312871
	0.51	0.195	1.496	10.464	10.186	-13.839
	0.013229	0.0009934	0.008235	0.031223	0.030087	-0.222093
constant	6.437064	7.727627	5.439627	4.157114	4.708403	10.496345
(T-score)	35.384	47.269	148.875	48.872	217.809	22.208
adj. R. Sqrd	0.34911	0.44756	0.42654	0.4402	0.52407	0.28433
Cases	1127	24141	19000	63334	55021	2793

Table 3.6: Sample of Regression Runs, Pooled Data 1988 and 1989

	Live Animals		Food,Feed,Beverage and Tobacco		General Freight Unclassified	
Variables	LTL	TL	LTL	TL	LTL	TL
Distance (beta	0.334319	0.421072	0.15578	0.534768	0.319157	0.657843
(T-score)	8.104	25.724	18.132	83.155	30.997	43.71
(stan-beta)	0.242749	0.563014	0.135787	0.582087	0.331412	0.807216
Weight	0.639134	0.014923	0.457615	0.558151	0.297132	1.45729
	18.143	0.301	89.685	29.033	51.536	24.353
	0.470887	0.005969	0.683351	0.20221	0.552189	0.396621
Orgpden	0.000154	-6.22E-05	4.103E-06	5.265E-06	5.529E-05	-2.38E-05
	7.594	-5.379	1.24	1.886	11.878	-3.045
	0.197073	-0.108451	0.009264	0.0132	0.127016	-0.056784
Despden	-5.88E-05	2.857E-05	-2.1E-05	-4.0116	1.713E-05	-2.36E-05
	-4.861	7.229	-4.394	-16.293	2.384	-5.269
	-0.146652	0.156405	-0.033631	-0.113385	0.02534	-0.101854
Time	-0.196372	0.019552	0.14855	0.234444	0.124019	0.176789
	-3.822	0.995	10.14	22.633	6.245	5.665
	-0.098679	0.020158	0.07573	0.156386	0.065865	0.100738
constant	3.039431	8.498415	4.993685	2.005558	5.060926	-7.463935
(T-score)	10.851	16.704	90.312	10.309	75.424	-12.49
adj. R. Sqrd	0.32707	0.39965	0.47468	0.42085	0.36032	0.79754
Cases	1024	1556	9565	12972	5824	788

For the TL segment the results are not significantly different. The only commodity group with a significant drop in value of parameter β_{3j} is end products inedible. Thus, regulatory reform appears to have had an effect on this particular sector of the industry either by making it administratively more efficient, or by reducing previously existing excess profits, or by a combination of both these factors.

3.6 Concluding Comments

Regulatory reform of the for-hire trucking industry was implemented in Ontario as of January 1989. This paper examined the impact of this change on trucking rates utilizing yearly shipment data from the 1987-1989 time period. Two research questions were the focus of this study. The first, regarding the increase in rates for shipments to small/remote communities following regulatory reform is not supported by the results presented for the vast majority of the industry sectors analyzed.

The second question examined was whether shipment rates declined because of increased competition that presumably resulted from regulatory reform. The evidence presented from univariate rate analysis indicates that less-than-truckload (LTL) rates declined between 1988 and 1989, while truckload (TL) rates increased in the same time period. Rates also increased for both segments of the industry in the 1987-1988 time period. However, a multivariate analysis of the 1988-1989 data illustrated that the

decline of the LTL rates in this time period was most likely not the result of changes in regulation. Only two (live animals for LTL and end products inedible for TL), out of twelve sectors of the industry examined, indicated changes supporting the supposition of a drop in rates as a result of increased competition introduced by changes in the regulatory environment. The contrast of conclusions reached between univariate and multivariate analysis as far as the LTL segment is concerned demonstrates the danger of basing public policy on arguments derived from aggregate univariate measures.

A variety of possible reasons may be forwarded to explain the results with respect to both research questions. One reason is that regulation may not have had a great influence on the day-to-day operations of the for-hire trucking industry in general, and subsequently, its removal has had little impact overall (Kaplan, 1989). By the same token, certain segments may have been more subject to this apathy than others. Another possibility is that the bulk of the changes within the industry may have occurred well before the actual date of regulatory reform. It has been suggested elsewhere (Boucher, 1990) that the industry started to move in response to the proposed changes in regulation as early as 1985, the year the federal government released a policy paper outlining its intention to push for reform. However, although significant changes were observed in the years immediately following reform in the U.S., the literature suggests that changes related to deregulation of the trucking industry are ongoing. This would suggest that continued study of the situation in Ontario is

warranted. Finally, there is the possibility that the aggregation of the various commodities into broad classes has blurred or biased the results presented. The trucking industry can rarely be described as being comprised of six main areas.

Given the heterogenous nature of the industry, one can suggest that a possible direction of future research would be to investigate individual commodities and traffic lanes for impacts of regulatory reform. This would allow for the inclusion of information related to competition within certain markets, and perhaps allow for a more accurate determination of the impact of reform, if any is to be identified.

The trucking industry in Ontario is currently in the midst of a great deal of trouble according to industry publications and media reports. A large portion of Ontario's and Canada's trade is with the U.S. and Ontario represents the major gateway for this trade. The entrance of U.S. firms into the Ontario trucking market has been heralded as the end of the Ontario trucking industry. Delaney (1992) quotes one official who predicts that the Ontario industry will disappear in 10 years. In reality, it is not that the industry would disappear, but merely move to the U.S. in order to take advantage of substantially lower operating costs. This argument is speculative but it indicates the importance of being informed and making decisions and drawing conclusions based on facts and sound analysis. This paper represents a step in this direction and hopefully adds to a greater understanding of the trucking industry in Ontario.

Endnotes

1. "Deregulated" is a term often applied in situations where there has been a major change in regulation, usually towards a substantial reduction in government involvement. Some are hesitant to use this term because it implies a complete removal of regulation, which is seldom the case; thus the quotation marks. Regulatory reform is a suitable alternative and is utilized throughout this paper.

2.This differential is the difference between rates for shipments involving rural areas and those not involving rural areas.

3.The rates in tables 3.1 and 3.2 are adjusted for the annual rate of inflation.

4.t-tests were conducted in all cases and the difference between yearly mean values was consistently and strongly significant (95% level).

References

Athearn, F. (1991). "Availability of Less-Than-Truckload Service Since Deregulation in the Ten States Bordering Canada." *Proceedings of the 26th Annual Meeting of the Canadian Transportation Research Forum*, 69-83.

Beilock, R., and J. Freeman (1987). "The Effect on Rate Levels and Structures of Removing Entry and Rate Controls on Motor Carriers." *Journal of Transport Economics and Policy* 21, 167-188.

Bonsor, N.C.(1984). *Transportation Economics; Theory and Canadian Policy*. Toronto: Butterworth & Co..

Boucher, M. (1990). "The Impact of Deregulation on the Quebec Trucking Industry: A Preliminary Assessment." *Proceedings of the 25th Annual Meeting of the Canadian Transportation Research Forum*, 123-133.

Chow, G. (1982). *Rate and Cost Analysis of For-Hire Trucking: Provincial Comparisons*. Toronto: Research Branch; Bureau of Competition Policy, Consumer and Corporate Affairs Canada, Research Monograph 13.

_____ (1983). "An Evaluation of Less-than-Truckload Transport in Small Rural Communities of Western Canada." *The Logistics and Transportation Review* 19, 225-244.

Collins, F.E., and J.M. Bowland, (1989). "The Early Results of Transportation Regulatory Reform in Canada: Revisited." *Proceedings of the 24th Annual Meeting of the Canadian Transportation Research Forum*, 21-29.

Corsi, T.M., and J.R. Stowers, (1991). "Effects of a Deregulated Environment on Motor Carriers: A Systematic, Multi-Segment Analysis." *Transportation Journal* 30. No. 3, 4-28.

Delaney, R.V. (1992). "The North American Scene: A Macro-Economic View." *Transportation Quarterly* 46. 19-35.

Harper, D.V., and J.C. Johnson (1987). "The Potential Consequences of Deregulation of Transportation Revisited." *Land Economics* 63, 137-146.

Kaplan, H. (1989). *Policy and Rationality: The Regulation of Canadian Trucking.* Toronto: University of Toronto Press.

Kling, R.W. (1990). "Deregulation and Structural Change in the LTL Motor Freight Industry." *Transportation Journal* 29, 47-53.

McMullen, B.S. (1987). "The Impact of Regulatory Reform on U.S. Motor Carrier Costs." *Journal of Transport Economics and Policy*. 307-319.

Rakowski, J.P. (1988). "Marketing Economies and the Results of Trucking Deregulation in the Less-Than-Truckload Sector." *The Transportation Journal* 27, 11-22.

Statistics Canada (1988). *Trucking in Canada 1986.* Surface and Marine Division Cat. No. 53-222. Ottawa: Statistics Canada.

Statistics Canada (1989). *Trucking in Canada 1987.* Surface and Marine Division Cat. No. 53-222. Ottawa: Statistics Canada.

Statistics Canada (1990). *Trucking in Canada 1988.* Surface and Marine Division Cat. No. 53-222. Ottawa: Statistics Canada.

Statistics Canada (1991). *Trucking in Canada 1989.* Surface and Marine Division Cat. No. 53-222. Ottawa: Statistics Canada.

Statistics Canada (1987) *1986 Census of Canada*, Ottawa: Statistics Canada.

Woudsma, C.G. and P.S. Kanaroglou, (1992). "Modelling the Structure of For-Hire Motor Carrier Revenues, by Commodity, and Community With an Example From Ontario Under Regulation, 1987." Quantitative Studies in Economics and Population (QSEP), Research Report No. 296, Faculty of Social Sciences, McMaster University, Hamilton, Ontario, Canada..

Ying, J.S. (1990). "The Inefficiency of Regulating a Competitive Industry: Productivity Gains in Trucking Following Reform." *The Review of Economics and Statistics* 72. 191-201.

Chapter Four

Motor Carrier Policy Evolution and Rate Issues in Ontario, 1983-1991

Preface

This chapter is based on the following paper which has been accepted for publication:

Woudsma, C.G. and P.S. Kanaroglou (1994, accepted). "Motor Carrier Policy Evolution and Rate Issues in Ontario, 1983-1991", *The Journal of Transport Geography*

The time frame of analysis is extended to allow for consideration of the suggestion that the industry may have begun reacting to the proposed regulatory changes before they became law. The descriptive rate analysis for the years 1983, 1987-1989, and 1991, is substantiated with an application of the revenue model which deals with the 1983 and 1991 data in particular. The model features the introduction of an accessibility measure which represents an attempt to more accurately model the market conditions in which trucking shipments take place. The rate hypotheses outlined in objective two are addressed in this chapter as are the modelling efforts associated with objective three. The reader may wish to move directly to page 134 where the specific objectives associated with this chapter are outlined. The material leading up to that page has been

presented in previous chapters.

4.1 Introduction

The economic regulation of the intra-provincial for-hire trucking industry in Ontario has undergone a major change with the introduction of the Truck Transport Act (TTA, 1988). The debate concerning the merits of this policy change began well before the passing of this Act and continues on today (see Woudsma and Kanaroglou, 1994 or Kaplan, 1989 for a review). There is considerable rhetoric being issued on both sides of the debate with proponents of the Act referring to the competitive bliss of the open market while those opposed, refer to the chaos and blood-letting associated with 'deregulation'. This paper makes reference to the rhetoric but primarily, it provides a rigorous empirical investigation of the impacts of regulatory reform in Ontario.

Specifically, a previously verified model is employed to test a number of hypotheses related to trucking shipment rates. The essential questions examined are: 1) have rates for shipments in and out of small communities increased? 2) have overall rate levels declined? and 3) has value-for-service pricing decreased? These questions arise frequently in arguments presented by the various players in the regulatory debate and their examination here is based on the economic pricing principles associated with

various market structures.

The primary data source is the Transportation Origin-Destination (TOD) survey compiled quarterly by Statistics Canada. This disaggregate shipment level database is based on shipment waybills sampled from a range of for-hire carriers and provides very detailed information on industry output. An important feature of this paper is that a longer time frame is considered. Previous work for the Ontario case by Kanaroglou and Woudsma (1994) concentrated on 1987-1989, the years immediately preceding and following the de-jure introduction of policy change. Not only does this represent a short-term look at the impact of reform, but it has been suggested (Boucher, 1990) that the agency responsible for administering economic regulation prior to the TTA, may have begun a process of de-facto regulatory reform. Therefore in this paper, data from 1983 and from the most recent database available (1991) are utilized in order to address these concerns.

The paper is structured as follows. The first section of the paper will outline the evolution of economic regulation in Ontario and present the underlying arguments associated with each of the hypotheses investigated. An introduction to the data and a preliminary investigation of hypotheses 2) and 3) are presented in the second section along with an outline of the model employed. The ensuing section contains discussion of the results from application of the model of analysis. Finally, concluding comments and directions for future research are offered.

4.1 Background

The evolution of economic regulation in the Ontario trucking industry began with the introduction of the Public Commercial Vehicle Act (PCV) in 1927[1]. The aim of this legislation was to instill some order in what was then viewed as an unstable industry. Licenses were issued but it soon became apparent that too many were being granted (Ontario Ministry of Transportation and Communications (OMTC), 1991). Subsequently, an amendment to the PCV Act was passed in 1934 which introduced stricter control over entry into the industry. The Public Interest and Convenience test was initiated and the Ontario Highway Transport Board (OHTB) was created to oversee administration of it.

This legislated control of industry entry and market scope (geographic and commodity specific) changed very little until the Truck Transportation Act (TTA) was introduced in 1988. Trucking firms had to apply before the Board to enter markets enduring a quasi-judicial process where the onus was on them to prove that indeed their entrance was in the best interest of the public. Existing firms had the opportunity to protest any application and often did so collectively. It was considered difficult to enter the industry and the level of competition in markets was effectively controlled[2].

Licenses became complex, drawn out documents which in addition to affecting

the structure and operation of the industry, began to take on economic value well beyond their cost. In response to this, existing firms became even more protective of their markets and it has been suggested that in circumstances like these, the board may have begun acting in the interest of existing firms rather that in those of the general public[3].

Although the PCV Act changed little during the period between 1927 and 1988, the trucking industry changed drastically. Technological and infrastructure improvements changed the scope of the trucking industry while growth of the Canadian manufacturing sector fueled demand for trucking services. This maturation of the industry is one of the factors which contributed to the introduction of the TTA. Other factors include regulatory changes in the U.S. and a change in policy orientation within Canada and Ontario. A number of influential reports provided the policy inertia which culminated with the passing of new legislation in 1988[4].

The TTA represents an almost complete opening of entry into the industry with the exception of a 'fitness'[5] test. The overall direction of this legislation in summarized in the following excerpt from Section 2 of the Act:

> The new regulatory system will: foster productive, fair and innovative competition and the existence of a dependable and viable trucking industry in furtherance of the public interest; and be of benefit to the users of transportation services and not for the protection from competition of individual providers of such services (Government of Ontario, 1988 p. 4)

"Not for the protection from competition" is the key phrase in this case, echoing the

sentiments of those in favor of reduced government involvement in the marketplace. In 1983, the final report of a committee conducting a review of the PCV Act offered this recommendation:

> We think that regulation should protect fair trade and equitable competition, not individual carriers. Public convenience is best defined and pursued by exchange in the marketplace, not in the hearing rooms of the Transport Board (OMTC, 1983, p.1)

This recommendation obviously made it through to the legislation which appeared 5 years later. As mentioned in the introduction, the question of timing is an issue in this study. If the Board began reacting to this recommendation in 1984, it is possible that de-facto regulatory change began occurring well before the introduction of legislation in 1988. The data in this study include a sample from 1983 with the intent of addressing this concern and perhaps filtering out other economic factors which may impede the determination of the impacts of reform. This latter issue is related to the fact that the reform of regulation coincided with the onset of an economic recession.

There has been a great deal of research into the impacts of economic regulation and its removal with respect to the trucking industry. This is especially true in the U.S. following the deregulation of interstate trucking in 1980[6]. In general, previous Canadian research has focussed on provincial comparisons of rate related issues (see Chow and Caravan, 1991 for a review). The fact that each province has control over trucking regulation creates a mosaic of legislation which allows the comparison of Alberta (no economic regulation) with other provinces which employ a variety of

regulations. The study presented in this paper is unique because Ontario is the first province to engage in major reforms of trucking regulation (intra-provincial as well as extra-provincial). Comparison between time frames within the same jurisdiction is now possible which is considered an improvement over jurisdictional comparisons (Chow, 1982).

Joskow and Rose (1989) offer a full review of the various indicators of firm and/or market behavior which have been considered in regulatory research. These range from considerations of safety and productivity improvements to profitability and redistribution of rents. Rate issues enjoy considerable research attention because they are considered overall indicators of industry performance (Chow and Caravan, 1991). They are also of prime interest to the users of transport services. The three rate related hypotheses tc be considered in this research are:

1) rates for shipments in and out of small communities will increase.
2) overall shipment rates will decline.
3) value-for-service pricing will decline.

The first hypothesis centers on the suggestion that under the previous regulatory regime in Ontario, firms were 'obliged'[7] to provide service to those who requested it as long as the request was within their operational jurisdiction. Generally, small volume shipper/receivers located in relatively low access areas are more costly to serve because of low load factors (Bonsor, 1984). Not only is equipment not used to capacity, but the chance for return or backhaul shipment is reduced and therefore, costs rise.

Consequently, the revenues earned shipping to these areas should reflect these higher costs. However, because of possible monopolistic or oligopolistic powers enjoyed by firms, cross-subsidy could occur. Firms could lose money, charging rates below the marginal cost of providing service to small communities but could make up those loses by charging higher than normal rates in more lucrative markets where they are shielded from open competition. With the greater competitive pressure associated with more liberal entry into the trucking industry, it is expected that rates for shipments to small communities will rise as protection disappears.

In general, one of the strongest arguments in support of regulatory reform in Ontario (or any other jurisdiction) is that shipment rates should decline following reform. It is argued that under regulation, rates are inflated because of inefficiencies such has a high incidence of empty backhauls which increases shipment costs. There are also direct costs associated with regulatory compliance and other indirect costs attributed to a lack of competitive pressure. These include a lack of managerial initiative and inefficient capacity utilization. It is anticipated that under the TTA, rates should decline (hypothesis 2) through the amelioration of these difficulties. It has also been argued that higher than normal profits may have been earned by firms enjoying protection from competition which may have also contributed to higher rates under regulation. The opening of industry entry would therefore limit a firm's ability to secure these excess profits and rates would decline, reflecting the marginal cost of

providing service.

The remaining hypothesis (3) deals with arguments related to monopolistic (oligopolistic) powers and the practice of collective rate making (Beilock and Freeman, 1987). There is some debate as to the reasons for value-for-service pricing. On one hand it could be related to higher costs associated with higher order commodities while on the other, firms may charge higher prices for these goods just because they can. Put another way, since the transportation cost represents a relatively smaller proportion of the market price of higher order goods, trucking firms may be able to charge a rate in excess of the marginal cost of providing that service. The protection from competition under entry control allows this to continue. Therefore, removing entry control and increasing competition should reduce a firm's ability to price in this manner. Additionally, it is unlikely that collective action by a number of trucking firms can continue in an environment of open entry.

4.3 Methodology and Preliminary Analysis

4.3.1 Data

The Transportation Origin-Destination Survey (TOD) has been employed in numerous other Canadian studies into the impact of economic regulation (McRae and Prescott 1981, Chow and Caravan 1991, Kanaroglou and Woudsma 1994). The survey

universe consists of Canadian for-hire trucking firms which are stratified on the basis of their yearly total revenue. A representative selection of the lower strata and a total selection of the upper strata are then used for the ultimate sample which is a random selection of shipments. The final product is thus a sample of shipment level data including information on shipment weight, distance, revenue, commodity type, and origin-destination code. The data employed in this study are Ontario intra-provincial shipments from 1983, 1987-1989, and 1991 (approximately 120,000 shipments per year).

Statistics Canada (1994) reports on a number of sources of error associated with this sample including coverage errors, response errors, and processing errors. However, the major difficulty with respect to this study is the fact that the sample universe has changed from 1983 to 1991. After 1987, firms which formed the lowest strata (Class 3; average yearly revenue between 100,000 and 500,000 dollars) were no longer sampled. Although these firms made up a high proportion of the total number of trucking firms in Canada, they did not account for a significant proportion of total industry revenues. In 1990, the survey universe was again changed with the lower limit for Class 2 carriers being raised from 500,000 to 1,000,000 dollars. Statistics Canada suggests caution be used when attempting time-series analysis with these data (Statistics Canada, 1994). In this analysis, distinction among firms by size is not an issue and it can be argued that the various samples adequately represent the activity of

the for-hire industry in general.

The information contained in each record allows for the calculation of shipment rates employing the formula:

$$shipment\ rate = \frac{shipment\ revenue}{shipment\ weight \times shipment\ distance} \qquad (1)$$

Rates calculated in this fashion represent the true rate charged as opposed to the rate often quoted by firms or filed with regulatory boards[8]. This is due to the fact that rate discounting is common and since rates calculated in this manner are based on the actual freight waybill, any discounting will be accounted for.

The trucking industry is heterogeneous by nature and certain distinctions between segments of the industry are maintained throughout this analysis. One of the most common distinctions, often based on shipment weight, is between truckload (TL) and less-than-truckload (LTL). Truckload shipments are those which travel directly between one point and another occupying the entire truck. Less-than-truckload shipments are generally smaller shipments which are consolidated into larger loads and delivered as part of a series of stops along a trip. The major difference is that LTL service requires extensive terminal operations to facilitate shipment consolidation and breakdown and it is generally more labor intensive. Subsequently, firms offering LTL

service have higher production costs and require a more extensive route structure to survive. TL service is relatively easier to provide and this segment of the trucking industry is the most volatile in terms of entry and exit (Prentice, 1994).

The second main distinction between segments of the trucking industry is related to the type of commodities carried. The physical characteristics of the commodities and their economic value contribute to the heterogeneity of the industry. Bulk goods require specialized handling equipment while perishables require refrigeration. General freight can be shipped in traditional cube vans while lumber and steel make substantial use of flatbed trailers. It is unlikely that a firm specializing in produce would also ship live animals. In order to reflect some of this variety, Statistics Canada (1994) recognizes 6 broad commodity groupings which are themselves composed of hundreds of different commodity types. The groups are 1) live animals, 2) food, feed, beverage and tobacco, 3) crude materials, 4) fabricated material inedible, 5) end products inedible, and 6) general freight.

4.3.2 Preliminary Data Analysis

Equation (1) is employed to calculate the shipment rates[9] necessary to investigate hypotheses 2 and 3. Table 4.1 contains the mean rates for the LTL segment of the industry over the 5 years of data along with the percentage rate change from year to year and the change from 1983 to 1991. The rationale behind this selected time-series has been discussed in the previous section.

Table 4.1: Summary of Shipment Rates in the Less-than-truckload Sector
(Rates expressed in dollars per tonne-kilometre)

Commodity Group		1983	1987	1988	1989	1991	Percentage Rate Change: Less-than-truckload Sector 1983 to 1987	1987 to 1988	1988 to 1989	1989 to 1991	1983 to 1991
1) Live Animals	mean	1.00	1.24	1.53	1.25	0.64	24.00%	23.39%	-18.30%	-48.80%	-36.00%
	std.dev	3.98	1.23	2.89	1.53	0.88					
	n	407	606	503	521	51					
2) Food, Feed, Bev., and Tobacco		1.54	2.23	2.60	2.36	3.79	44.81%	16.59%	-9.23%	60.59%	146.10%
		4.69	7.89	9.43	7.75	47.94					
		5500	4685	4181	5384	4507					
3) Crude Materials		3.09	6.08	10.07	4.63	7.53	96.76%	65.63%	-54.02%	62.63%	143.69%
		11.32	42.77	26.31	14.06	20.67					
		1113	419	395	732	332					
4) Fabricated Material Inedible		4.11	5.83	10.35	5.45	5.25	41.85%	77.53%	-47.34%	-3.67%	27.74%
		15.42	44.29	120.72	26.81	29.85					
		8108	9064	9346	9654	7894					
5) End Products Inedible		4.87	6.98	8.65	10.05	6.43	43.33%	23.93%	16.18%	-36.02%	32.03%
		35.97	34.03	66.44	325.93	28.12					
		27511	25638	26380	28383	22683					
6) General Freight		7.01	9.30	9.21	7.71	9.46	32.67%	-0.97%	-16.29%	22.70%	34.95%
		25.93	34.54	71.37	33.85	94.57					
		1516	1427	2172	3652	3824					
Overall Weighted Average		4.3085897	6.1859502	8.3891398	7.9205194	6.1867695	43.57%	35.62%	-5.59%	-21.89%	43.59%
	n	44155	41839	42977	48326	39291					

With respect to hypothesis 2, certain commodity groups indicate a significant decline in rates following the introduction of regulatory reform. This is particularly evident in the year immediately following the introduction of reform, 1989. In 1991, the overall trend (as indicated at the bottom of column 9) is again a downward one, largely because of the influence of the End Products Inedible sector. The years leading up to 1989 in general exhibit steady increases in mean shipment rates over and above general inflationary effects. With respect to the question of the timing of change, it does not appear that rate levels responded to any early suggestions of regulatory reform (e.g.. the 1983 OMTC report on Reforming the PCV Act), at least not in a downward direction.

The question of the existence of value-for-service pricing is addressed through a comparison of the mean rate levels for each commodity grouping in any given year. Table 4.1 illustrates a fairly consistent trend of higher rates associated with commodity groups 4, 5, and 6 in every year. These groups tend to be made up of products with a higher value added component. The differences between the groups is statistically significant[10] in each year and it does not appear that there is a decline associated with range of rate values following regulatory reform. This would suggest that value-for-service pricing may not be related to monopolistic or oligopolistic powers enjoyed by certain firms under the previous regulatory structure. The various characteristics of the commodities would probably have more influence on the rate charged for their

Table 4.2: Summary of Shipment Rates in the Truckload Sector
(Rates expressed in dollars per tonne-kilometre)

Commodity Group		1983	1987	1988	1989	1991	Percentage Rate Change 1983 to 1987	1987 to 1988	1988 to 1989	1989 to 1991	1983 to 1991
1) Live Animals	mean	0.125	0.146	0.137	0.125	0.134	16.80%	-6.16%	-8.76%	7.20%	7.20%
	coef. of variation (%)	50.40	60.96	89.78	72.00	97.01					
	n	1084	815	893	663	202					
2) Food, Feed, Bev., and Tobacco		0.111	0.095	0.086	0.121	0.106	-14.41%	-9.47%	40.70%	-12.40%	-4.50%
		91.89	101.05	103.49	78.51	110.38					
		5012	5979	6630	6342	2645					
3) Crude Materials		0.066	0.074	0.074	0.081	0.065	12.12%	0.00%	9.46%	-19.75%	-1.52%
		87.88	77.03	104.05	98.77	87.69					
		11270	16063	14121	10020	8433					
4) Fabricated Material Inedible		0.09	0.1	0.1	0.1	0.1	11.11%	0.00%	0.00%	0.00%	11.11%
		77.78	80.00	80.00	90.00	90.00					
		42055	31694	32992	30341	25570					
5) End Products Inedible		0.161	0.137	0.194	0.129	0.122	-14.91%	41.61%	-33.51%	-5.43%	-24.22%
		96.89	157.66	107.22	160.47	115.57					
		1702	1483	1562	1230	1027					
6) General Freight		0.07	0.086	0.078	0.119	0.094	22.86%	-9.30%	52.56%	-21.01%	34.29%
		57.14	134.88	51.28	112.61	65.96					
		647	629	684	104	294					
Overall Weighted Average											
	Mean	0.090	0.094	0.095	0.100	0.093	4.34%	1.32%	5.41%	-6.53%	4.15%
	n	61770	56663	56882	48700	38171					

movement as suggested previously in this section.

Table 4.2 contains the rate calculations for the truckload (TL) segment of the industry. The most apparent difference in comparison to Table 1 is that the mean rate levels are considerably lower and less variable in the TL segment of the industry. The TL segment of the industry also exhibits the overall increase leading up to regulatory reform and the decrease following reform although neither is as pronounced as in the LTL segment. However, unlike the LTL segment, certain commodity groups within the TL segment have 1991 mean rates below those exhibited in 1983. This observation agrees with the suggestion that rates for certain lanes in Ontario at that time, were at the same level they were 10 years earlier (Foster, 1989). Unlike the LTL segment, the TL segment is less consistent in the years leading up to reform with certain segments showing rate declines during that period.

Returning to the question of value-for-service pricing, the results in table 4.2 again suggest considerable variation depending on commodity groups although the higher rates are associated with groups 1 and 5 in this case. The shipment of live animals is fairly specialized which may account for the comparatively higher rates for TL shipments. The trend does not shift from year to year which again supports the notion that regulation or its reform, may not have had a great influence on commodity based price differentials. Overall, there is not sufficient evidence to support the relationship between value-for-service pricing and economic regulation of the trucking

industry.

In summary, there is evidence to support the existence of rate declines following reform in the majority of industry sectors. The picture in LTL seems to be more consistent while declines in TL rates are evident well before the de-jure introduction of the TTA in 1988. The possibility exists that the results for the TL segment, which is generally easier to enter and operate in, may be due to greater competition in that sector. If de-facto reform had started before 1988, it is likely that the impact would be most pronounced in the TL sector. Alternatively, the observed rate changes from year to year may also be related to other factors such as the demand for services, changes in technology or, changes in the structure and price of production inputs. The appropriate step would be to use a multivariate framework of analysis, taking into account these various factors.

4.3.3 Model of Analysis

In order to account for the various factors that influence rate levels for a commodity i in market j, the following model has been developed:

$$\ln Rev = \alpha_{ij} + \beta_{Dij} \ln D + \beta_{Wij} \ln W + \beta_{1ij} x_1 + \beta_{2ij} x_2 + \ldots . \beta_{Iij} x_I \qquad (2)$$

$$\text{where: } \alpha_{ij} = \ln [(m_{ij} + 1) k_{ij}]$$

Rev is the revenue collected for a shipment of commodity i in market j and *D*, *W* are the

distance and weight of the shipment, respectively. Rates are not directly observable. The use of rate, calculated from equation (1), as a dependent variable in equation (2) would introduce spurious correlation between dependent and independent variables in the model[11]. Furthermore, since we control for the distance and weight of a shipment the use of revenues as opposed to rates, has no bearing on the research questions under investigation. In this sense, rates and revenues are interchangeable; the question of declining rates becomes one of declining revenues. Distance and weight act as surrogates for shipment costs such as fuel, labor (driving and handling), and maintenance. Bonsor (1984) indicates that these 3 elements combine to make up over 80% of shipment costs.

The constant term α is a function of two elements which are either unobservable, or data for them are unavailable. m_{ij} is a non-negative number measuring the level of excess profits (supranormal). k_{ij} is specific to commodity i and represents fixed cost elements associated with each shipment such as terminal activities, insurance, and administrative costs. Thus, for a given commodity i, changes in the estimated values of the constant term α between two different markets j and j' signify changes in excess profits and/or administrative costs.

The two specific forms of the model used in this analysis vary in terms of the definition of the independent variables represented by x_1, $x_2 \ldots x_l$. In the first, an accessibility variable is introduced to capture the influence of market conditions on

shipment revenues.

$$\ln Rev = \alpha_{1j} + \beta_{D1j} \ln D + \beta_{W1j} \ln W + \beta_{11j} Orgacs + \beta_{21j} Desacs \quad (3)$$

Orgacs and *Desacs* represent the accessibility of a shipment's origin and destination, respectively. The Standard Geographic Code is used to identify the origin and destination in the TOD shipment records. This code corresponds to the census subdivision spatial unit as defined by Statistics Canada. This relationship facilitates the use of census data as demonstrated in the following formula which defines the accessibility A_i of zone i[12]:

$$A_i = \sum_{j=1}^{n} \frac{P_j}{d_{ij}^{\beta}} \quad (4)$$

There are 956 zones (census subdivisions) within Ontario[13]. P_j is the population of a census subdivision j and d_{ij} is the distance between the centroids of census subdivisions i and j. β is the exponent for distance decay which has been set to 1 in this particular example[14]. Defined in this manner, A_i represents the accessibility of a point in relation to all other points within the defined region. Accessibility is directly related with population and inversely related to the distance to all other zones. Large communities located close together would have very high accessibility values while small towns located on their own would have very low values.

In accounting for variation in shipment revenues, it is expected that, other things being equal, high accessibility areas would be associated with lower shipment revenues and thus lower rates. This is because demand for trucking services, as well as competition, would be expected to be greater in these areas. The expected sign of the parameters of *Orgacs* and *Desacs* would therefore be negative.

With respect to first hypothesis concerning shipment rates to small communities, an estimated positive value for the parameters of *Orgacs* and *Desacs* would suggest the existence of cross-subsidy. Additionally, it is possible that cross-subsidy exists with a negative sign on the parameter if the value of that parameter is higher than what would be expected in the complete absence of cross-subsidy. Therefore, the direction of change in the parameter values (β_1 ,β_2) is also important in a time-series study such as this. A decrease in parameter values over time would signify a shift towards less cross-subsidization.

A variety of other variable specifications were investigated in the course of developing this model. The majority focus on capturing market conditions in the origin-destination of shipments. Population density, employment levels in various sectors such as transportation and manufacturing and, a classification of the census subdivisions were employed. The latter classification, based on the work of Chow (1983), considered the relative size of communities and their distance from a larger community. Generally, A_i as defined in equation (4) provided the most consistent

results. This fact, combined with document size limitations implies that the results employing the other variables will not be reported on here[15].

The second model relies on a pooling of the data from various years and employs a dummy variable to account for the change in time period from the previous regulatory regime to the current less-restrictive one:

$$\ln Rev = \alpha_{ij} + \beta_{Dij} \ln D + \beta_{Wij} \ln W + \beta_{1ij} Orgacs + \beta_{2ij} Desacs + \beta_{3ij} Time \qquad (5)$$

Time takes on the value of 1 for the period following reform (1989 and beyond) and a value of 0 for the period before. Previous studies making use of rate models have used such a variable to capture the influence of regulatory reform on shipment rates (Blair et al., 1987) with negative parameter estimates taken as evidence of reduced rates following reform. In this model, *Time* captures that part of the change in shipment revenues not explained by costs and the relative location of origins and destinations of shipments. β_{3ij} measures, ceteris paribus, the change over time in the sum of administrative costs and excess profits for shipments of a given commodity type as represented by the constant α_{ij}. An estimated significant negative value for β_{3ij} indicates a decline in the sum of administrative costs and excess profits following regulatory reform.

4.4 Results

Due to space limitations only representative examples from the estimation of models (3) and (5) are discussed in this section. Focussing on the long term effects of economic regulation, results based on the 1983 and 1991 data sets are contrasted.

The purpose of the example in table 4.3 is to examine the hypothesis of a move to less cross-subsidization after regulatory reform for shipments in or out of inaccessible communities. Of particular importance are the parameter estimates for the *Orgacs* and *Desacs* variables. In the LTL sector, the estimate is significantly positive yet decreasing from 1983 to 1991 for *Orgacs*. This suggests that other things being equal following reform, shipments originating in small, less accessible communities generate less revenue than shipments originating in more accessible locations, although not to the same degree as before. Stated more directly, cross-subsidy still exists following regulatory reform but it is not as pronounced as before. Similarly, for the TL sector in table 4.3 the drastic reduction in the value of the parameter for *Desacs* illustrates that, other things being equal, shipments destined (*Desacs*), to small, less accessible communities are associated with higher revenue following reform. This provides support for the hypothesis that rates for shipments destined to small/remote communities increased relative to other rates although the same cannot be said from the evidence provided by the parameter estimates for the origin (*Orgacs*).

Table 4.3: Regression Example from 1983 and 1991: Food, Feed, Beverage and Tobacco

		Less-than-Truckload		Truckload	
Variables		1983	1991	1983	1991
Distance	beta	0.470346	0.208611	0.351686	0.389746
	T-Score	37.048	13.06	42.16	30.173
	std. beta	0.437615	0.186812	0.507076	0.507169
Weight		0.463646	0.435268	-0.062324	0.021725
		57.875	58.791	-2.318	0.589
		0.613976	0.659823	-0.029832	0.009782
Desacs		-3.722E-07	1.519E-06	7.271E-06	-5.771E-06
		-0.357	1.047	11.928	-5.863
		-0.004254	0.015003	0.151546	-0.103203
Orgacs		3.0764E-05	4.656E-06	8.575E-06	8.5712E-06
		34.86	4.627	12.452	9.929
		0.360424	0.051565	0.158716	0.163591
Constant		1.906009	4.557625	8.713023	8.062983
		16.871	35.804	29.736	20.553
n		5500	4507	5012	2645
Adj. R. Sqr.		0.46659	0.44243	0.29037	0.[illegible]067

The results in table 4.4 with respect to this question, however, are rather conflicting. The LTL sector for fabricated materials suggests that small, less accessible origins and destinations are charged higher revenues for shipments (all else considered equal) both before and after reform. In the TL sector, it appears that for shipment origins (Orgacs), there has actually been a significant increase in the level of cross-subsidy with the parameter sign changing from negative to positive.

Overall, if one considers the six commodity groups and the two shipment classes (TL and LTL), there is no clear pattern with respect to hypothesis 1. Cross-subsidy is apparent both before and after the reform of economic regulation in Ontario. It would appear that depending on the sector in question, rates for shipments in and out of small communities may have increased or decreased relative to similar shipments involving larger, more accessible locations. The only consistent result is that the accessibility variable is significant more often in the TL segment of the industry. The complexity involved in the setting of LTL rates may be reflected in this result (Raney, 1989).

A number of factors may be responsible for the lack of consistency with respect to these results. The fact that each of the commodity groupings is made up of a large number of individual commodities is a concern. It is possible that commodity specific changes may be getting lost in the aggregation. The fact that the change in regulation does not appear significant in many cases suggests that the 'obligation to serve' clause

Table 4.4: Regression Example from 1983 and 1991: Fabricated Materials Inedible

		Less-than-Truckload		Truckload	
Variables		1983	1991	1983	1991
Distance	beta	0.22931	0.152423	0.559254	0.535801
	T-Score	21.806	11.448	195.515	155.468
	std. beta	0.230141	0.131335	0.70886	0.796379
Weight		0.380457	0.425342	0.391915	0.137039
		84.304	73.085	49.652	13.298
		0.654454	0.633251	0.170482	0.056793
Desacs		-1.045E-05	-6.348E-06	7.191E-06	2.1633E-06
		-12.859	-5.651	35.129	8.196
		-0.134708	-0.064539	0.123815	0.039296
Orgacs		-8.924E-06	-5.026E-06	-4.58E-06	1.6549E-06
		-13.637	-5.482	-24.536	6.715
		-0.10789	-0.049639	-0.0861	0.03096
Constant		5.861414	5.7387	3.604255	6.253898
		68.676	49.845	42.209	54.976
n		8108	7894	42055	25570
Adj. R. Sqr.		0.51707	0.41655	0.51387	0.56611

and the control of entry may not have had an influence in the determination of rates to small communities. Trucking firms do consider traffic lanes when setting their rates (Erb, 1994) although the variable specification employed in this model appears unable to reflect this. The dominance of Metropolitan Toronto in this database may also be a source of bias contributing to the inconsistency of the results.

The question of the anticipated decline in rates following regulatory reform has been examined in the previous section. Referring back to the last column in tables 4.1 and 4.2, both increases and decrease in average rate levels from 1983 to 1991 are evident. The parameter estimate on the constant term for the regression results in tables 4.3 and 4.4 mirror these changes. In particular, the change in the constant term value from 1983 to 1991 is the same as the rate change with the exception of the LTL sector in table 4.4. This result is consistent across commodity groups and shipment sectors (LTL, TL). As discussed previously, this would suggest variation in the level of fixed costs or excess profits. Additionally, the model presented in equation (5) is designed to test the significance of this change.

Regression results for a number of commodity groups are presented in tables 4.5 and 4.6. Of prime consideration with respect to hypothesis 2) is the parameter estimate for the dummy variable *Time* . With the exception of the fabricated material commodity grouping in table 4.6, the parameter estimate for *Time* (when significant) matched the change in average rate levels noted in tables 4.1 and 4.2. Examining table

Table 4.5: Pooled Regressions ('83 and '91): Less-than-Truckload

Variables		Food, Feed, Bev. and Tobacco	Fabricated Mat. Inedible	End Prod. Inedible
Distance	beta	0.353777	0.187063	0.381969
	T-Score	34.786	22.075	73.652
	std. beta	0.325223	0.173567	0.268745
Weight		0.432951	0.401941	0.487043
		77.456	109.443	240.453
		0.626383	0.641629	0.690201
Desacs		-3.9872E-07	-9.1999E-06	-1.4363E-06
		-0.458	-13.511	-3.44
		-0.00436	-0.105556	-0.012275
Orgacs		1.99632E-05	-7.483E-06	-3.1366E-06
		29.39	-13.545	-8.483
		0.228811	-0.081878	-0.026415
Time		0.194914	0.000214241	0.147753
		12.239	0.019	19.873
		0.096467	0.00011079	0.055729
Constant		3.079753	5.865627	3.932292
		35.646	82.326	87.031
n		9983	15980	49833
Adj. R. Sqr.		0.4197	0.45649	0.61065

Table 4.6: Pooled Regressions ('83 and '91): Truckload

Variables		Food, Feed, Bev. and Tobacco	Fabricated Mat. Inedible	End Prod. Inedible
Distance	beta	0.370675	0.552899	0.435202
	T-Score	52.569	251.789	31.263
	std. beta	0.517071	0.75454	0.537068
Weight		-0.021942	0.302213	0.338077
		-1.009	48.078	7.484
		-0.010283	0.129109	0.1135
Desacs		3.613E-06	5.6122E-06	-8.124E-06
		6.914	34.78	-7.72
		0.071809	0.098462	-0.120406
Orgacs		8.8571E-06	-2.528E-06	3.2425E-06
		16.432	-16.966	3.121
		0.167621	-0.046841	0.051586
Time		-0.027792	-0.063753	-0.411107
		-2.316	-17.183	-17.15
		-0.022704	-0.04645	-0.256782
Constant		8.32183	4.542474	5.17192
		35.366	66.368	10.731
n		7642	67404	2729
Adj. R. Sqr.		0.28488	0.54051	0.39528

4.6, it would appear that either excess profits or fixed costs associated with TL shipments have declined significantly between 1983 and 1991.

Unlike the LTL sector, the TL sector exhibiting declining rates in certain commodity groups prior to 1989, the first year following reform. This may suggest that the anticipated reform of regulation may have lead to de-facto reform well in advance. In contrast, Kaplan (1989) has argued that the prior regulatory system had very little influence on the day-to-day operations of the for-hire trucking industry in Ontario. It may simply be a reflection of the less complex and more competitive nature of the TL segment responding to economic swings. However, since general inflationary effects have been accounted for, competition is the more likely factor.

In summary, the model results support the rate changes noted in the preliminary results. The long term results indicate no consistent trend with respect to the TL or LTL sector of the industry although more decreases are evident in the former. With respect to hypothesis 2) the 1989 to 1991 average rate changes suggest that rates have indeed declined following reform. However, this is not true in all sectors represented in this study.

4.5 Conclusion

The picture with respect to the influence of regulatory reform on the rate issues

discussed in this paper is unclear. There is some evidence to support a decline in rates following reform in both the LTL and TL sectors of the for-hire trucking industry although this is not true across all commodity groupings. The existence of cross-subsidy and the anticipated increase in rates for shipments involving small communities is apparent in some sectors but not all. There is however fairly strong evidence that economic regulation has had little influence on value-for-service pricing.

One of the main goals of this paper was to take a more long term look at the question of rate effects and economic regulation. The rates for the TL sector did decline for some commodity groupings well before the introduction of reform. This may support the proposition that de-facto reform occurred before the de-jure. However, the fact that the same cannot be said for the LTL segment of the industry presents a conflict. Either the OHTB treated the two segments of the industry differently with respect to entry control, or other factors may have influenced the rate levels. It seems plausible that even with entry control, competition may have been more pronounced in certain industry sectors. Since data on the number of firms operating in Ontario is not analyzed here, it would be difficult to resolve these issues.

A number of the difficulties associated with this study have been discussed. In particular, the need to take a more disaggregate look at shipment rates is apparent. The trucking industry cannot be described in aggregate terms unlike the airline industry. Passenger airplanes carry people whereas not all trucks are the same nor do the carry

similar cargo. An examination of specific commodities travelling on specific traffic lanes may reveal more about the influence of economic regulation.

Another difficulty concerns the ability of the model to capture the variation in shipment revenues and to reflect general economic conditions. Although the model captured a good part of the variation in some cases, it performed poorly in others. The difficulty in separating out the influence of a recession for example, has been consistent throughout studies of this kind. This is important since many Canadian Provinces and U.S. States still regulate trucking within their borders and look closely at the experiences in jurisdictions which have gone through change. Therefore, there is a need to enhance modelling efforts to provide an unbiased and rigorous examination of the issues involved.

The level of competition within the trucking industry is obviously a key element in this study. The opening of entry was the big change associated with the reform of regulation in Ontario, directed at enhancing competition and letting market forces prevail. However, roughly three years after the introduction of the TTA (1988) an amendment was passed which called for a moratorium on the issue of new licenses to operate within the Province of Ontario. This moratorium was lifted on April 30, 1993. In the course of reviewing the TTA (OMTC, 1991), it was discovered that the trucking industry was suffering because of excess capacity and decreased demand. Limiting entry was viewed as an easy, albeit temporary, solution to the problem. The data for

that time period are as of yet unavailable but it will be interesting to examine the influence of this temporary entrance restriction in the future.

Prentice (1994) suggests that stability in the trucking industry usually associated with regulatory control is balanced against the efficiency of the open market. He suggests that the best solution in terms of pricing is for the industry to operate without control on entry or exit. The evidence provided in this paper tends to support this suggestion. It is unclear what the next step will be although it is unlikely that economic regulation will completely disappear. Studies of this kind can hopefully provide insights which may be of use in making future decisions regarding the regulation of trucking.

Endnotes

1. Bonsor (1978) provides an excellent discussion of the first half-century of regulation in Ontario

2. Some (OMTC, 1983; Kaplan, 1989) suggest that the regulatory system in Ontario was not that strictly enforced and describe it as having been full of loopholes. Subsequently, they consider the debate surrounding the introduction of new legislation to be more of a ritual rather than a well founded discussion.

3.This type of activity is associated with Capture Theory as presented by Stigler (1988). According to this theory, over time, regulatory boards become 'captured' by the industry they regulate and begin to serve the needs of industry rather than those of the general public.

4. At the federal level, the policy paper "Freedom to Move" (MSSC, 1985) is regarded as being a major influence. At the provincial level, the 1983 review of the PCV Act (OMTC,1983) set the tone for a number of future changes.

5. This fitness refers to a firm's ability to be financially viable, maintain proper insurance, and have a thorough knowledge of the legislative intricacies of the trucking industry. The Public Interest test had been changed to a hearing which may have only be called in unique circumstances where a valid challenge had been made. Generally, it was called a "reverse onus" test because the onus was on the challenging firm to provide the evidence rather than the applying firm as the case was under the old PCV Act. However, this part of the entrance requirement has been phased out as of Jan 1., 1993 and only the fitness test remains. The OHTB no longer deals with any trucking applications which are now handled by the Ministry of Transport.

6. Harper and Johnson (1987), Glaskowsky, Jr. (1990) and Dempsey (1992) offer a broad review of interstate deregulation while McMullen (1987), Ying (1990) focus on costs and productivity respectively. Allen et al. (1993) provide an excellent review of studies into the impact of intra-state deregulation.

7.There was an 'obligation to serve' clause in most licenses.

8. Rate filing or publishing of rates (making them public) is still required under the TTA (1988) in Ontario. Rate prescription or direct rate control has never been part of the regulatory scene in Ontario.

9. The rates are adjusted to take into account inflationary effects using the Implicit Price Index published by Statistics Canada.

10. T-tests were performed and the difference in means were found to be significant at the 95 % level.

11. A paper presenting a detailed discussion of this problem is available from the authors on request.

12. This variable was created using ArcInfo GIS which contains this formula as part of its network analysis functions.

13. Each census subdivision is composed of a number of enumeration areas (EA). The accessibility was calculated at the EA level and then averaged for each census subdivision. This action was taken to avoid the problem of major urban areas exhibiting relatively low accessibility values; a problem related to the form of equation (4). The difficulty is that the population of an area is not considered in the calculation of its accessibility value.

14. The value of 1 for β was chosen in order to maintain the influence of distance rather than enhance it or reduce it. A value of 2 for example, would intensify the influence of distance thereby reducing interaction between points far apart. The accessibility would rapidly approach zero as the distance increases.

15. The results from the use of other variables and model specifications are available from the authors on request.

References

Allen, B.J., Maze, T.H., and C.K. Walter (1993) `Intrastate Trucking Deregulation: Have Both The Negative and Positive Impacts Been Overstated?', *Transport Journal*, 33, pp. 30-39

Beilock, R., and J. Freeman (1987) `The Effect on Rate Levels and Structures of Removing Entry and Rate Controls on Motor Carriers', *Journal of Transport Economics and Policy*, 21, pp. 167-188.

Blair R.D.,D.L. Kaserman, and J.T. Mclave (1986) `Motor Carrier Deregulation: The Florida Experiment', *The Review of Economics and Statistics*, 68, pp. 159-164

Bonsor, N.C. (1984) *Transportation Economics; Theory and Canadian Policy*, Toronto: Butterworth & Co.

Boucher, M. (1990) `The Impact of Deregulation on the Quebec Trucking Industry: A Preliminary Assessment', *Proceedings of the 25th Annual Meeting of the Canadian Transportation Research Forum*, University of Saskatchewan Press, Saskatoon, pp. 123-133.

Chow, G. (1982) *Rate and Cost Analysis of For-Hire Trucking: Provincial Comparisons*, Toronto: Research Branch; Bureau of Competition Policy, Consumer and Corporate Affairs Canada, Research Monograph 13

Chow, G, and J. Caravan (1991) *Concentration, Market Share, and Rates in Canadian LTL Trucking*, Vancouver: Policy and Coordination, Economic Analysis, Transport Canada, Report TP 11068-E

Dempsey, P.S. (1992) `Interstate Trucking: The Collision of Textbook Theory and Empirical Reality', *Transportation Law Journal*, 20, pp. 185-254

Erb, W. (1994), Personal Correspondence, July 10, 1994.

Foster, C., (1989) `Courting Competition', *Canadian Transportation and Distribution Management*, Jan. 1989, pp. 31-33

Glaskowsky Jr., N.A. (1990) *Effects of Deregulation on Motor Carriers*, Westport, Conn.: Eno Transportation Foundation Inc.

Government of Ontario (1989) *Bill 88, An Act to Regulate Truck Transportation*, Toronto: Queen's Printer for Ontario

Harper, D.V., and J.C. Johnson (1987) `The Potential Consequences of Deregulation of Transportation Revisited', *Land Economics*, 63, pp. 137-146

Joskow, P.L. and N.L. Rose (1989) `The Effects of Economic Regulation' in Schmalensee, R. and Willig, R.D. (eds) *Handbook of Industrial Organization Vol. II*, Amsterdam: North-Holland Publishers, pp. 1449-1506

Kanaroglou, P.S. and C.G. Woudsma (1994) `Regulatory Reform and the Structure of For-Hire Motor Carrier Revenues in Ontario: 1987-1989', *Geographical Analysis*, 23(3), pp. 246-260

Kaplan, H. (1989) *Policy and Rationality: The Regulation of Canadian Trucking*, Toronto: University of Toronto Press

McMullen B.S. (1987) `The Impact of Regulatory Reform on U.S. Motor Carrier Costs', *Journal of Transport Economics and Policy*, 21(3), pp. 307-319.

McRae, J.J., and D.M. Prescott (1982) *Regulation and Performance in the Canadian Trucking Industry*, Ottawa: Government of Canada, Economic Council Of Canada Report No. 23,

Ministry of Supply and Services Canada (MSSC), (1985) *Freedom to Move: A Framework for Transportation Reform*, Ottawa: Ministry of Supply and Services Canada

Ontario Ministry of Transportation and Communication (OMTC) (1983) *Responsible Trucking: Final Report of the Ontario Public Commercial Vehicles Act Review Committee*. Toronto: Ontario Ministry of Transportation and Communication

Ontario Ministry of Transportation and Communication (OMTC), (1991), *Final Report of the Advisory Committee on Truck Transportation*, Toronto: Ontario Ministry of Transportation and Communication

Prentice, B.E. (1994) `The Stability/Efficiency Regulatory Trade-off: Policy Implications for For-Hire Trucking', *Proceedings of the 29th Annual Meeting of the Canadian Transportation Research Forum*, University of Saskatchewan Press, Saskatoon, pp. 494-507

Raney, B. (1989) `Relationship Between Costs and Rates in the Less-Than-Truckload Market', *Proceedings of the 24th Annual Meeting of the Canadian Transportation Research Forum*, University of Saskatchewan Press, Saskatoon, pp. 163-177

Sigler, G.J. (1988) *Chicago Studies in Political Economy*, Chicago: The University of Chicago Press

Statistics Canada (1994) *Trucking in Canada: 1991*, Ottawa: Surface and Marine Division

Woudsma, C.G. and P.S. Kanaroglou (1994) `Deregulation of the Motor Carrier Industry: A Canadian Example', *Environment and Planning A*, 26, pp. 343-360

Ying, J.S. (1990) `The Inefficiency of Regulating a Competitive Industry: Productivity Gains in Trucking Following Reform', *The Review of Economics and Statistics* 72, pp. 191-201

Chapter Five

Motor Carrier Regulation: A Market Specific Analysis

Preface

This chapter is written as a stand-alone paper in preparation for submission to a scholarly journal. Sections 5.1 and 5.2 contain variations of previously presented material with a few exceptions. The reader may wish to proceed directly to section 5.3.. The research in this chapter includes an analysis of the rate related hypotheses and a refined effort to introduce a more realistic accounting of market conditions. This latter effort involves a comparison of accessibility measures included in the model. The market specific orientation applies the use of a selection of representative commodities and highway corridors from the Ontario data. The goal is to determine the impact of regulatory reform on more narrowly defined shipment markets.

5.1 Introduction

The Canadian media often mention deregulation along with taxation and 'free trade' as difficulties faced by the transport sector. Of course, the interpretation of the impact of any policy change often depends on which side of the fence it is viewed

from. The case of economic regulatory reform of the for-hire trucking industry in the province of Ontario is no different.

The reform became law with the passing of the Truck Transportation Act (TTA) on Jan. 15, 1989. This Act essentially opened entry into the for-hire trucking industry within the province by reducing the powers of the regulatory board concerning the issuance of licenses. Over 13,000 applications for new licenses or extensions were received by the regulatory board in the first year and a half following reform (OMTC, 1991). However, this return to open market competitiveness was short lived with an amendment to the Act being introduced on April 25th, 1991. This amendment was in fact a moratorium on the issue of new licenses for two years.

The review committee established to determine the impact of the TTA did not support this part of the amendment which was, however, supported by the Minister of Transport at the time. While shippers were lauding the lower rates and improved service associated with open entry, the Ontario Trucking Association was speaking out on the job losses and bankruptcies. Although the review committee received numerous submissions and studies concerning the short-term impacts of reform, it is apparent that effective lobbying had more influence than objective, rigorous empirical analysis. The need for this type of research is considered necessary for making future policy decisions and for understanding existing or previous policies. (Hoyle, 1993; Chow,

1991).

The analysis contained in this paper is an attempt to address this need, providing an investigation into two impacts associated with reduced regulation of for-hire trucking in Ontario. The first is the impact of reform on overall rate levels within the province and the second concerns the influence of reform on the rates for shipments involving small communities. The question of rate levels has received considerable attention in previous Canadian research[1] while the same cannot be said for the small communities question.

While the majority of previous research has focused on aggregate provincial comparisons, the results of a more disaggregate investigation of distinct time periods (pre and post reform) within the same jurisdiction are discussed in this paper. The consideration of specific traffic corridors within Ontario and specific commodities is directed at capturing some of the characteristic heterogeneity of the for-hire trucking industry. This is an extension of earlier work on this same topic (Kanaroglou and Woudsma, 1994).

The next section of this paper briefly considers the economic arguments associated with reforming economic regulation and provides further justification for the analysis to follow. The data selection and analytical model are described in the third section. Subsequently, the results of the univariate and multivariate analysis are discussed in the fourth section and the paper concludes with a summary and suggestions

for future study.

5.2 Regulation or Open Market?

The case for economic regulation rests on the notion that the trucking industry is inherently unstable and that uncontrolled entry would lead to 'destructive competition'. This type of competition is described as, " a state of persistent excess capacity leading to rate levels below those required to allow a normal rate of return on capital stock" (Bonsor, 1978, p. 120). Those opposed to regulation argue that entry control leads to rate levels in excess of those which would occur under open competition. They suggest that regulation leads to a number of inefficiencies including capacity under-utilization and excess profits related to monopolistic or oligopolistic pricing practices. The latter occur because competition in geographic or commodity markets is limited by entry control.

The TTA (1988) contains a series of reforms the most prominent of which has been the phased in removal of entry control. The question which stems from the above discussion is, *has regulatory reform resulted in an overall decline in shipment rates*? This question is at the core of the regulatory debate, particularly, from the perspective of those who demand trucking services. In the Canadian context, this question has been examined in numerous research efforts beginning with the work of Sloss (1970).

His study compared Canadian provinces which had independently developed trucking regulation and determined that the rates in regulated provinces were higher than those in the unregulated province of Alberta. One of the main criticisms of this approach is that aggregate comparisons of different jurisdictions are unable to properly capture the heterogeneity of the trucking industry (Chow, 1982). Studies which followed (McRae and Prescott, 1982 for example) made use of disaggregate shipment level data in their analysis of provincial trucking rates and concluded among other things that rates for less-than-truckload service were the highest in Ontario. However, these studies were still based on jurisdictional comparisons which are made difficult by the fact that regulation varied not only between provinces, but within them as well.

In contrast, this paper is based on an analysis of a single jurisdiction (Ontario) which has undergone a change over time. This represents a rather unexploited opportunity to examine the influence of regulatory reform in Canada. Ontario is the first province to reform intra-provincial trucking regulation[2]. The benchmark for comparison in this case is not another jurisdiction but the same jurisdiction previously under entry control. The desire to capture industry heterogeneity is realized in this paper through a focus on specific market segments.

The question of service to small communities is regarded as a secondary issue in terms of the debate on whether regulatory or open market forces should guide the for-hire trucking industry. Those in favour of regulation maintain that regulation is

necessary to ensure adequate provision of service at a fair rate to these geographically disadvantaged areas. They also suggest that regulation may introduce cross-subsidy where firms may earn above normal rates of return in markets in which they enjoy a degree of regulatory protection, in order to subsidize the loses they may incur providing shipment rates below marginal costs to small communities. The existence of cross-subsidy is considered one of the primary reasons for the existence of economic regulation in the trucking industry (Posner, 1971). Those in favour of reduced economic regulation counter that the demand for service from small communities will be met although the rates will reflect the costs of providing that service. The research question that arises from this discussion is subsequently, *have rates for shipments involving small communities increased following regulatory reform in Ontario*?

Previous Canadian research into this question has suggested that cross-subsidy is evident with respect to small communities in some provinces although Ontario is not among them (McRae and Prescott, 1982). A study of small communities in Ontario suggested that rates for shipments to these areas were not below costs (subsidized) (OMTC,1983). The first study mentioned introduced the population totals of origins and destinations in their analysis and indicated the simplicity of this approach. The second study provided no analytical results to substantiate this conclusion with the exception of reference to previous studies. Our own study (Kanaroglou and Woudsma, 1994) has provided evidence to support the existence of cross-subsidy in some Ontario

trucking markets (markets defined by six broad commodity groups and truckload versus less-than-truckload).

In this paper, a more rigorous approach to the investigation of this question is utilized. Two different specifications are used to determine the accessibility of communities in Ontario. Geographic Information Systems (GIS) facilitate the development of accessibility measures which consider the provincial highway system as well as the population of communities. The goal is to more accurately model the interaction between points in Ontario which will contribute to our understanding of the variability in rate setting. Ultimately, the purpose is to provide policy makers with a better assessment of the two research questions described in the preceding paragraphs.

5.3 Methodology

The Transportation Origin-Destination (TOD) survey compiled quarterly by Statistics Canada is the main data source used in this paper. It provides disaggregate information on trucking industry output at the shipment level including the following details; shipment revenue, weight, distance, commodity code and the Standard Geographic Code of the origin and destination. Shipment rates are calculated from this information as follows:

$$shipment\ rate = \frac{shipment\ revenue}{shipment\ weight \times shipment\ distance} \quad (1)$$

The survey attempts to provide an overview of for-hire trucking firm activity in Canada.

In this paper, a selection of Ontario intra-provincial shipments for the years 1983, 1987 to 1989, and 1991 are employed to investigate the two rate related research questions. These years of data have been chosen because they represent respectively, a period well before the introduction of reform (1983), the pivotal years before and after reform (1987-1989), and the most recent year for which data are available (1991). There is some difficulty associated with comparing these time periods because Statistics Canada has altered the survey universe in 1988 and 1990 to focus on the more prominent firms within the trucking industry. However, the focus here is not firm comparison but on general industry activity which one can argue is sufficiently represented in each year. The data from each year are subdivided on the basis of commodity and spatial extent in keeping with the market specific orientation of this paper. First, the commodity breakdown will be reviewed.

The Standard Commodity Classification system is used by Statistics Canada to identify the commodities in the TOD survey. Thousands of commodities are represented and in order to generalize the situation, a broad classification system is employed as follows; 1) live animals, 2) food, feed, beverage and tobacco, 3) crude

materials inedible, 4) fabricated materials inedible, 5) end products inedible, and 6) general freight unclassified. Previous work (Kanaroglou and Woudsma,1994) has suggested that part of the difficulty in determining the impacts of reform may be this aggregation of commodities. Additionally, others have pointed out that in some cases regulation varies within a jurisdiction on the basis of a specific class of carrier or commodity (Bonsor,1984; Chow, 1982). These are two important reasons why in this paper individual commodities from two of the more important groups, 4) fabricated materials inedible (truckload shipments) and 5) end products inedible (less-than-truckload shipments), are singled out for analysis.

Commodities from these two groups are selected (see figures 5.2 and 5.3) because they represent areas where the for-hire trucking industry is most active. For example, in 1991, 32.9 % of Canadian Trucking industry revenues were from fabricated materials while 31 % were from end products (Statistics Canada, 1994). Furthermore, competition from other modes, most notably rail, is not expected to be significant for commodities in these groupings since the shipments are within Ontario and typically under 500 km in length. Although no attempt is made here to analyze competition, this selection process seeks to avoid a possible source of bias in the results.

The geographic element of trucking activity is the second factor which governs the data selected for study here. The goal is to enhance our investigation of the

question of rates for service to small communities through an analysis of specific traffic corridors within the province. Although the majority of previous studies into this question have been at the provincial scale, some have attempted to examine specific communities or lanes (Chow, 1983, Lord and Shaw, 1980). Since trucking licenses under regulation outlined specific geographic markets which could be served by various firms, it seems appropriate to introduce this into the analysis presented here. Additionally, firms often set their rates on the basis of the traffic corridor in which the shipment takes place (Erb, 1994). The bias introduced by the dominance of certain centres such as Toronto in the data is also controlled in this case.

Table 5.1 outlines the 6 traffic corridors which have been selected while figure 5.1 maps their position within the province. The various corridors were selected on the basis of their importance within the provincial transportation network and their place in the regional economic fabric. H401w for example, represents a section of highway 401 which is a major multi-lane freeway[3] running through the economic heartland of Ontario. The list of communities for this section (see table 5.1) includes a number of major centres, Kitchener-Waterloo, London, and Windsor, along with a mixture of small and medium sized communities. The mixture of communities targets the question of cross-subsidy with respect to community size. However, the contrast between segments from northern Ontario (H11nbn, H17nss, and H17tb) and the remainder of the province is also important in relation to the small communities question.

Table 5.1 : Summary of Highway Sections *

H401w (100 kmph) Highway 401 West		Hwy6 (80 kmph) Highway 6		H33_15 (80 kmph) Highways 33 and 15	
Communities	Pop. (1991)	Communities	Pop. (1991)	Communities	Pop. (1991)
Cambridge	92772	Nanticoke	22727	Stirling	2140
Kitchener	168282	Haldimand	20573	Frankford	2114
Waterloo	71181	Dundas	21868	Trenton	16908
Woodstock	30075	Hamilton	318499	Wellington	1426
Ingersoll	9378	Flamborough	29616	Bloomfield	689
London (TP)	5877	Guelph (TP)	3288	Picton	4373
London	303165	Guelph	87976	Bath	1257
Dutton	1201	Fergus	7940	Kingston	56597
West Lorne	1477	Arthur	2123	Morton	1677
Rodney	1087	Mt. Forest	4266	Crosby	968
Highgate	488	Durham	2558	Smith Falls	9396
Ridgetown	3246	Chatsworth	521	Carleton Place	7432
Blenheim	4679	Owen Sound	21674	Almonte	4382
Chatham	43557	Shallow Lake	505	Pakenham	1782
Tilbury	5040	Wiarton	2313	Arnprior	6679
Essex	6759			Renfrew	8134
Windsor	191435			Cobden	1026
				Pembroke	13997
H11nbn (90 kmph) Highway 11 North of North Bay		**H17nss (90 kmph)** Highway 17: North Bay, Sudbury, S.S. Marie		**H17tb & H17tbT (90 kmph)** Highway 17 North of Thunder Bay	
Communities	Pop. (1991)	Communities	Pop. (1991)	Communities	Pop. (1991)
North Bay	55405	North Bay	55405	Thunder Bay (CMA)	124287
East Ferris (TP)	4028	East Ferris (TP)	4028	Finmark	150**
Temagami	939	Sturgeon Falls	5837	Shabaqua	150**
Latchford	345	Hagar (TP)	877	English River	483
Colbalt	1470	Webwood	588	Ignace	1935
Haileybury	4962	Massey	1186	Wabigoon	103
New Liskeard	5431	Espanola	5527	Dryden	6505
Coleman (TP)	470	Nickel Center	12332	Ear Falls	1294
Dymond (TP)	1270	Sudbury	92884	Red Lake	2268
Harris (TP)	572	Walden	9805		
Hudson (TP)	472	Elliot Lake	14089		
Englehart	1726	Blind River	3355		
Kirkland Lake	10440	Iron Bridge	823		
Matheson (TP)	3451	Thessalon	1543		
Iroquois Falls	5999	Bruce Mines	684		
Cochrane	4585	Sault Ste. Marie	81476		
Smooth Rock Falls	2208				
Moonbeam (TP)	1330				
Kapuskasing	10344				
Val-Rita Harty (TP)	1178				
Mattice Val Cote (TP)	1015				
Hearst	6079				

* TP indicates a Township while the T in the highway name indicates the inclusion of Toronto as part of that route (1991 Population 635,395)

** Part of a larger territory

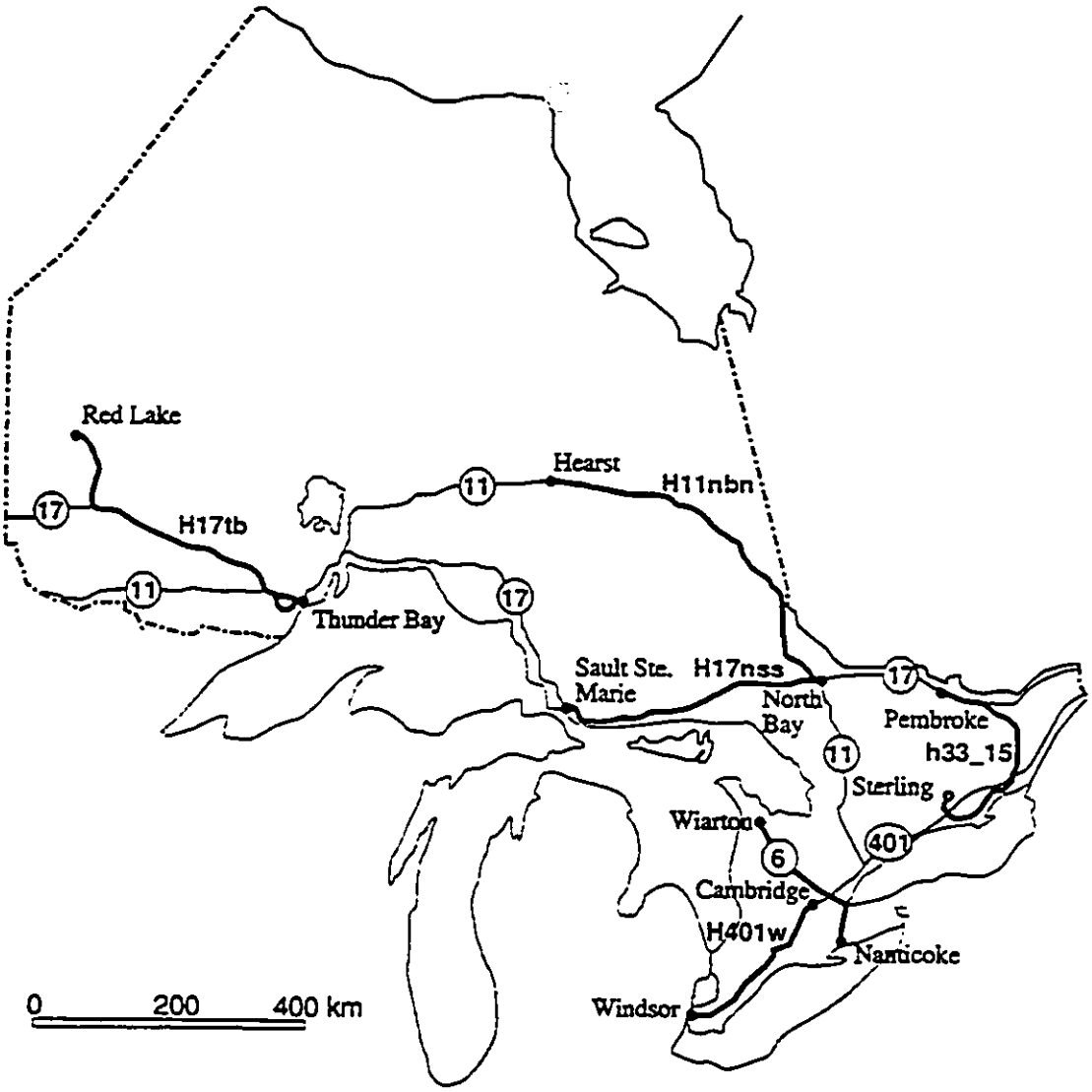

Figure 5.1 Selected Highway Corridors in Ontario.

The sections selected from the north represent the main, if not exclusive, highway routes in that region. Although the remainder of the provincial highway network has been omitted from figure 1, it should be pointed out that the network density is much greater along the southern regions of the province. The communities associated with these corridors are comparatively smaller than those from H401w and Hwy6. Subsequently, the demand/supply for trucking services would also be smaller for communities in the northern corridors. If cross-subsidy has played a role in trucking within Ontario, these communities would be the most likely candidates for such pricing activity.

5.3.1 Modelling Shipment Revenues

In order to account for the various factors that influence rate levels for a commodity i in market j, the following model has been developed:

$$\ln Rev = \alpha_{ij} + \beta_{Dij} \ln D + \beta_{Wij} \ln W + \beta_{1ij} x_1 + \beta_{2ij} x_2 + \ldots . \beta_{kij} x_k \qquad (2)$$

$$\text{where: } \alpha_{ij} = \ln [(m_{ij} + 1) k_{ij}]$$

Rev is the revenue collected for a shipment of commodity i in market j and *D*, *W* are the distance and weight of the shipment, respectively. Rates in this case are not directly observable as part of the TOD survey, being calculated as shown in equation (1). The use of rate as a dependent variable in equation (2) would introduce spurious correlation

between dependent and independent variables in the model[4]. The use of revenue as opposed to rate has no bearing on the research questions. Therefore, the questions are rephrased with rate being replaced by revenue. Distance and weight act as surrogates for shipment costs such as fuel, labour (driving and handling) , and maintenance. Bonsor (1984) indicates that these 3 elements combine to make up over 80% of shipment costs.

The constant term α is a function of m_{ij}, a non-negative number measuring the level of excess profits (supranormal), and k_{ij}, a commodity specific measure of fixed costs. These fixed shipment costs include terminal activities, insurance, and administrative costs. Thus, for a given commodity i, changes in the estimated values of the constant term α between two different markets (pre- and post-reform) j and j', signify changes in excess profits and/or administrative costs.

The various forms of the model used in this analysis differ in terms of the definition of the independent variables represented by x_1, $x_2 \ldots x_l$. First, consider two versions of an accessibility measure intended to capture the influence of market conditions on shipment revenues[5]. The basic premise is that more accessible communities would be associated with higher levels of trucking activity. Communities with relative low accessibility would possibly be more expensive (greater costs) to serve because firms face lower load factors and the chance that one leg of a trip may be undertaken empty.

The two accessibility measures are based on the following formula which defines the accessibility A_i of zone i as:

$$A_i = \sum_{j=1}^{n} \frac{P_j}{d_{ij}^{\beta}} \qquad (3)$$

P_j represents the population of zone j and d_{ij}, the distance between zones i and j. In order to determine an appropriate value of β, a series of tests employing a range of values for β were conducted at the census subdivision (CSD) level . The CSD is a geo-statistical unit defined by Statistics Canada which is at the sub-county (region) level (there are 956 CSDs in Ontario). A value of $\beta = 2$ resulted in a pattern of interaction which precluded the involvement of the majority of Ontario beyond major urban areas. Since the interest here is in interaction between all communities within the province, this value was rejected. Values of β below 1 tended to diminish the influence of distance which biased the identification of communities which may be subject to cross-subsidy and subsequently, these values were ruled out as well. In the end, the value of β was set to 1 for the calculation of both accessibility measures. Further sensitivity analysis on this parameter was not conducted because of the volume of calculations involved.

The Standard Geographic Code identifying each origin and destination in the TOD database coincides with the CSD spatial unit. Initial calculations of accessibility

at the CSD level presented the problem that major areas such as Metropolitan Toronto exhibited accessibility values which were relatively low. This problem was related to the form of equation (3) and was avoided by calculating accessibility at the smallest geo-statistical unit, the enumeration area (EA), and then aggregating up to the CSD level. GIS (ArcInfo) facilitated the calculation of accessibility values for each of the 15,119 EAs in Ontario. The average accessibility of the EAs which made up a CSD was calculated and subsequently linked to the data selected from the TOD survey.

The two measures of accessibility are similar with P_j defined as the population of an enumeration area j. However, they differ significantly in the definition of distance, d_{ij}. In the calculation of variables *Orgacs* and *Desacs* (the accessibility of shipment origin and destination respectively), d_{ij} represents the euclidian distance between EA centroids. In the second accessibility measure (variables *Hiacorg* and *Hiacdes*) d_{ij} represents the shortest path on the provincial highway network between each EA. The network analysis capabilities of ArcInfo (GIS) allow for link impedances to be included in the determination of accessibility. The calculation of this particular variable involved 3 weeks of continuous CPU use on a Hewlett-Packard workstation. It is hoped that this more realistic representation of the spatial interaction within the province will enhance the modelling of shipment revenues.

In accounting for variation in shipment revenues it is expected that, other things being equal, high accessibility areas would be associated with lower shipment revenues

and thus lower rates. This is because demand for trucking services as well as competition would be expected to be greater in these areas. The expected sign of the parameters of *Orgacs* (*Hiacorg*) and *Desacs* (*Hiacdes*) would therefore be negative.

With respect to the hypothesis concerning shipment rates to small communities, an estimated positive value for the parameters of *Orgacs* (*Hiacorg*) and *Desacs* (*Hiacdes*) would suggest the existence of cross-subsidy. Additionally, it is possible that cross-subsidy exists with a negative sign on the parameter if the value of that parameter is higher than what would be expected in the complete absence of cross-subsidy. Therefore, the direction of change in the parameter values is also important in a time-series study such as this. A decrease in parameter values over time would signify a shift towards less cross-subsidization.

The second model relies on a pooling of the data from various years and employs a dummy variable to account for the change in time period from the previous regulatory regime to the current less-restrictive one:

$$\ln Rev = \alpha_{ij} + \beta_{Dij}\ln D + \beta_{Wij}\ln W + \beta_{1ij} Orgacs\,(Hiacorg) + \beta_{2ij} Desacs\,(Hiacdes) + \beta_{3ij} Time \qquad (4)$$

Time takes on the value of 1 for the period following reform (1989 and beyond) and the value of 0 for the period before. Previous studies making use of rate models have used such a variable to capture the influence of regulatory reform on shipment rates (Blair et

al., 1987) with negative parameter estimates taken as evidence of reduced rates following reform. In this model, *Time* captures that part of the change in shipment revenues not explained by costs and the relative location of origins and destinations of shipments. β_{3ij} measures, ceteris paribus, the change over time in the sum of administrative costs and excess profits for shipments of a given commodity type as represented by the constant α_{ij}. An estimated significant negative value for β_{3ij} indicates a decline in the sum of administrative costs and excess profits following regulatory reform.

5.4 Results

5.4.1 Descriptive Rate Analysis

Rather than present tables of values for the average rates for each of the specific markets in each year, the results are presented in graphical format[6]. The size of the sub-sample in each case ranges from a minimum of 30 to a maximum of 1000. Space limitations dictate that not all the results are presented. Those which are most representative appear in figures 5.2 through 5.5.

The commodities in figure 2 are taken from the end products (LTL) grouping which is one in which an overall decline in rates following reform is evident. Examining each of the commodities, the only statistically significant changes are those

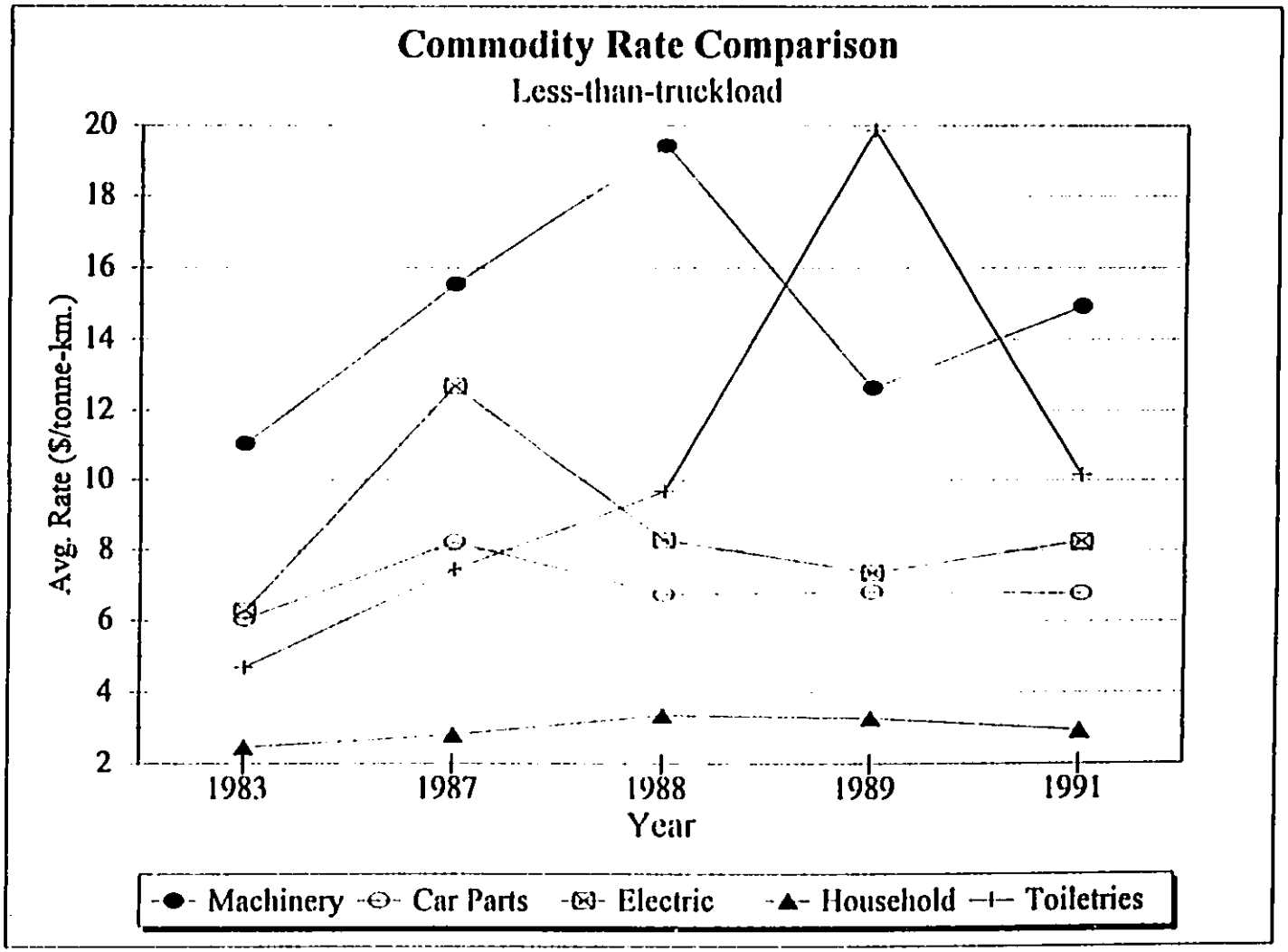

Figure 5.2 Commodity Rate Comparison (LTL)

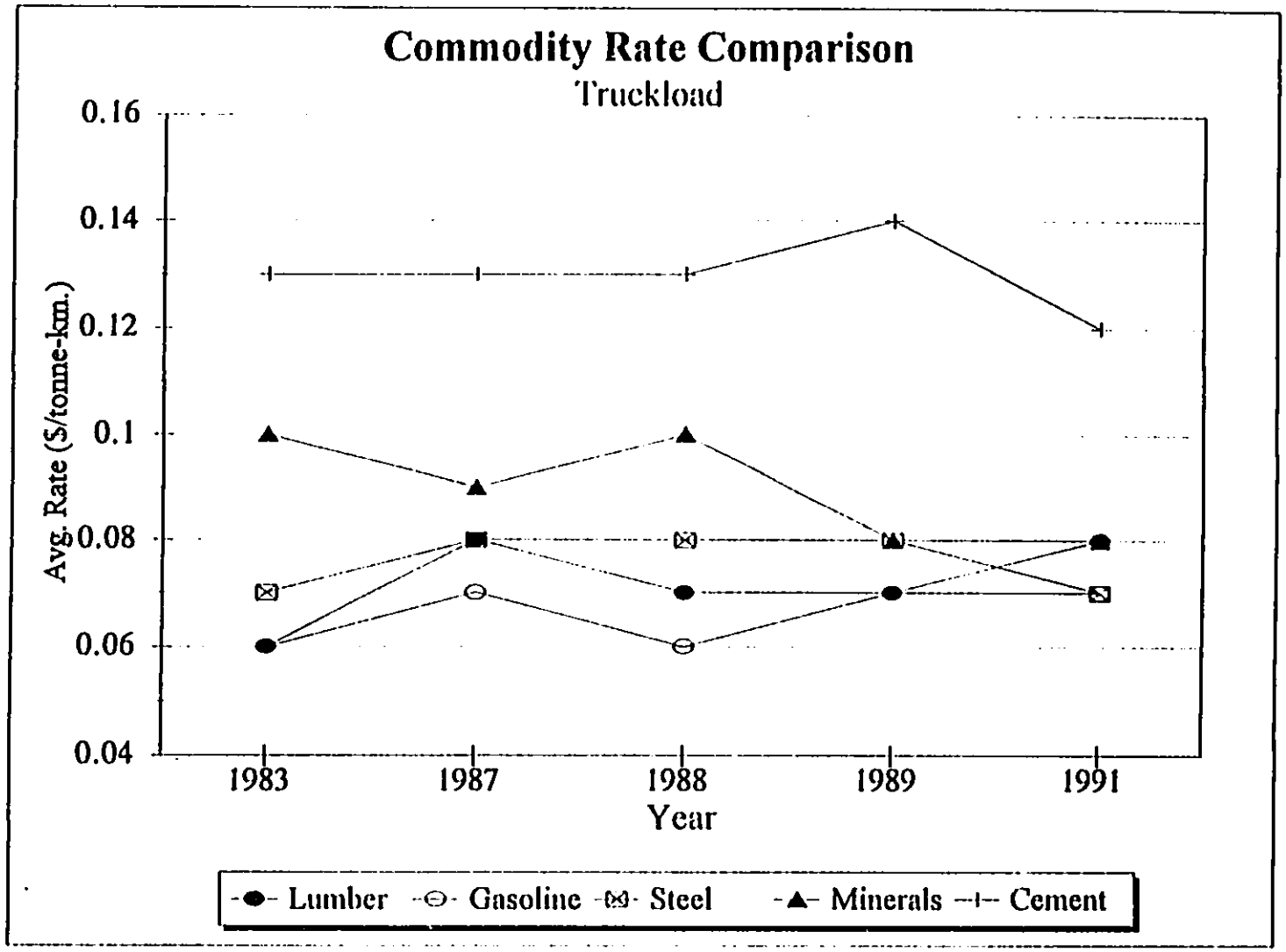

Figure 5.3 Commodity Rate Comparison (TL)

associated with machinery and toiletries from 1989 to 1991. The remaining commodities are stable throughout the period examined. This would suggest that although the overall group exhibited a decline in rates following reform, the same is not true for all commodities within that group. The possibility exists that regulation or its removal has had little impact on the setting of rates for the majority of commodities in that group. The differences between commodity rates are persistent from year to year which supports the idea that commodity characteristics are a strong influence on rate determination. The modelling of these rates will take into account costs associated with each commodity and provide more insight into the question of rate declines.

Figure 3 is a graph of average rates for commodities from the fabricated materials grouping (truckload). It is generally accepted that the truckload segment of the trucking industry is one where competition is greatest because fixed costs, as a barrier to entry, are considerably lower than the less-than-truckload segment. The lower costs are reflected in the lower average rate levels in figure 3. With respect to the question of rate declines following reform, the pattern varies with significant increases and decreases evident not only following reform, but before as well.

One apparent trend in figure 3 is a reduction in the commodity based variation of rates in the years following reform, 1989 and 1991. This suggests a decrease in the level of price-discrimination or value-for-service pricing, based on commodity. This topic has been investigated elsewhere (Beilock and Freeman, 1987) with the general

conclusion being that value-for-service pricing in trucking tends to exist regardless of the regulatory environment. The results in this case, while not contradictory, indicate a reduction in the range of value-for-service pricing. Those in favour of regulatory reform would argue that this is because of increased competition which neutralizes the ability of existing firms to set prices on the basis of what the commodity in question can bear.

Figures 5.4 and 5.5 contain average rates from the overall commodity groupings end products (figure 5.4) and fabricated materials (figure 5.5) for the highway sections described in the previous section. The greater variance of average rates for the highway sections in figure 4 is responsible for the majority of the yearly changes being statistically insignificant. The higher rates associated with the southern routes (H401w and Hwy6) in figure 4 is however significant. If other factors are considered equal, then this could suggest the existence of cross-subsidy based on the relative location of the highway sections. As illustrated in table 1, the northern highway sections are generally made up of smaller communities. However, this suggestion is speculative at this point since general inflation is the only factor controlled for. It is interesting to note that the section H17tbT which includes Toronto, consistently exhibits the lowest rates. The most likely reason would be the longer distances involved. The basic relationship between distance and rate is one in which rate levels decrease with distance at a decreasing rate until some plateau is reached.

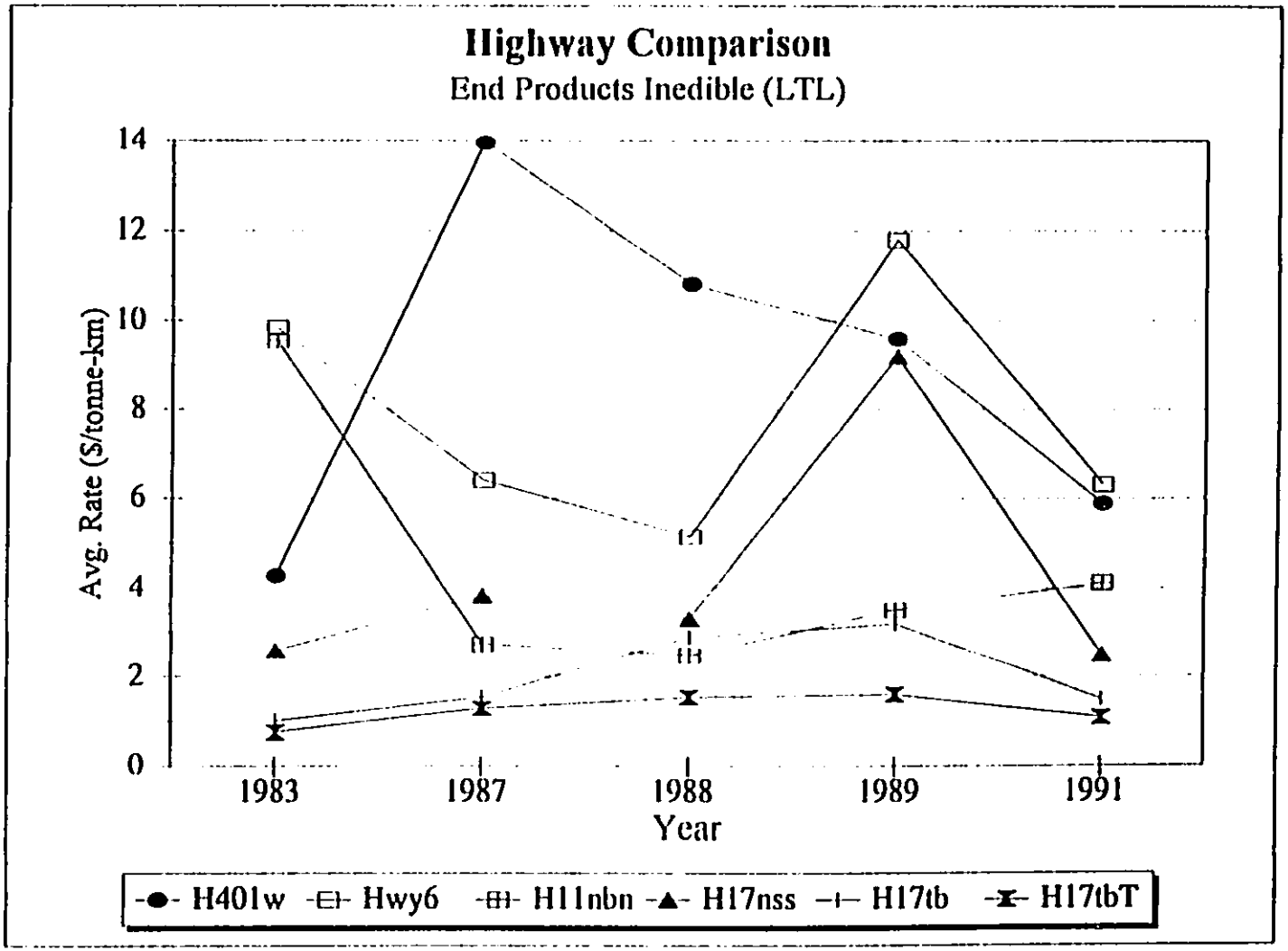

Figure 5.4 Highway Comparison (LTL)

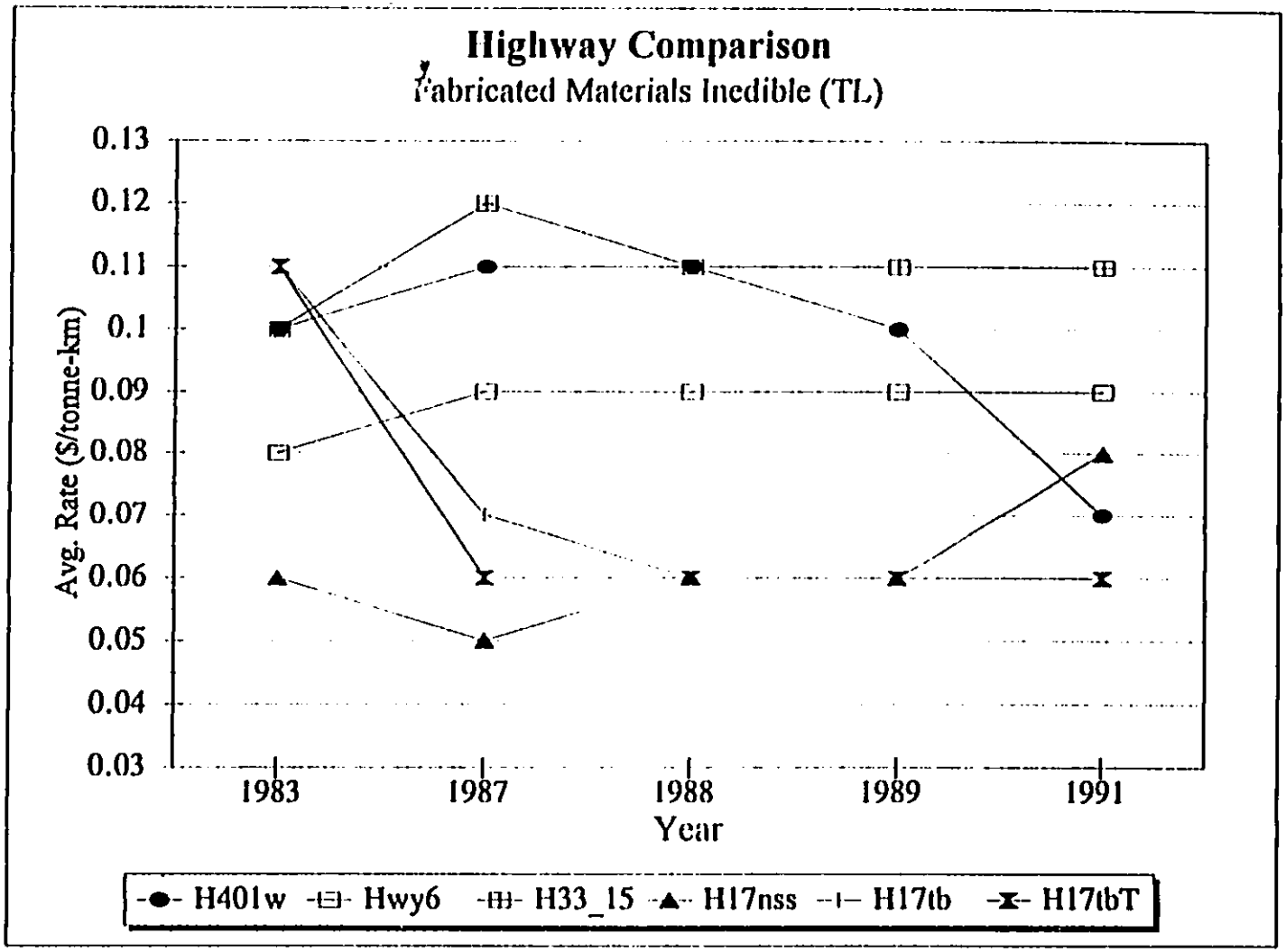

Figure 5.5 Highway Comparison (TL)

Referring to equation (1), if shipment weight and revenue are assumed to be constant, the large distances between Toronto and the Thunder Bay region would drive the average shipment rate down. This may account for the low average shipment rates for H17tbT in comparison to the other much shorter corridors.

In contrast to figure 5.4, the year to year changes in average rate levels in figure 5.5 are statistically significant. The sharp declines in the three northern sections (H17nss, H17tb, and H17tbT) from 1983 and 1987 are most likely related to the change in the TOD survey universe which excluded smaller carriers. However, it has been suggested that the industry and regulatory board may have begun a process of de facto deregulation well before the official change (Boucher, 1990). This may be taken as evidence of such a change but if cross-subsidy was present, than one would expect the rates on the northern sections to increase while those on the southern sections declined; the opposite is observed here. The years following reform (1989, 1991) appear to be relatively stable in figure 5.4 with the exception of a continued decline associated with H401w and an increase associated with H17nss. The pattern of rates associated with H401w appears to confirm industry claims that rates along the 401 corridor are below those of the early 1980's. This may reflect the greater competition associated with the opening of industry entry. The increase in average rates for H17nss may suggest that cross-subsidy was present prior to reform, however, the other northern highway sections appear relatively consistent. The average rates on the

southern sections (H401w, Hwy6, and H33_15) are again significantly higher than those of the northern sections.

The discussion thus far has brought to light some interesting changes and patterns in the average rates for the various market segments; segments based on commodity, highway corridor, or time period. Consistency is, however, lacking in most cases which may reflect the difficulty in examining the trucking industry. This difficulty is primarily related to the heterogeneity characteristic of this industry. However, the analysis thus far has been limited to examining differences in averages. The next section presents a more rigorous examination of the patterns and changes noted above.

5.4.2 Modelling Results

The first research question to be addressed in this section is the one dealing with the anticipated decline in rates associated with regulatory reform. Referring to the methodological discussion, of interest in the first two sets of results presented (tables 5.2 and 5.3) is the parameter estimate for the *Time* dummy variable.

Table 5.2 presents the regression results for the individual commodities (from end products LTL) pooled over the 5 years of data. The parameter estimate for the *Time* variable appears both significantly positive and negative. The significant negative sign in the case of toiletries matches the significant decline in average rates for this commodity as identified in Figure 2[7]. Since the *Time* variable represents the

Table 5.2: Regression Results with Data Pooled over 5 years: End Products Inedible (LTL)

		Machinery	Car Parts	Electric Components	Household Furniture	Toiletries Cosmetics
Distance	Beta	0.103795	0.221407	0.485735	0.228548	0.128963
	T-score	6.871	31.344	29.117	20.695	9.22
	Stan.Beta	0.097649	0.194111	0.372806	0.220579	0.108742
Weight		0.354047	0.384469	0.548376	0.52638	0.453946
		48.256	110.991	57.514	75.242	71.916
		0.599783	0.658361	0.583506	0.71132	0.777375
Hiacorg		4.21E-06	-1.1E-05	-3.24E-05	-3.23E-06	2.42E-06
		1.652	-9.101	-10.043	-2.114	0.909
		0.020713	-0.053585	-0.107449	-0.020552	0.009313
Hiacdes		-3.77E-06	-1.1E-05	-2.18E-05	-1.56E-06	-1.3E-05
		-1.249	-8.082	-6.617	-0.798	-4.613
		-0.0177	-0.050627	-0.07917	-0.008678	-0.0552
Time		0.003698	0.02814	0.202426	0.127365	-0.136959
		0.14	2.492	6.709	6.933	-5.536
		0.001734	0.014554	0.065769	0.065523	-0.059994
Constant		6.207947	5.569976	3.725859	4.530352	5.23799
		59.479	114.477	29.011	56.415	51.458
N		4150	16673	2982	4782	3353
Adj. R. Sq.		0.36632	0.44689	0.7248	0.57854	0.66762

Table 5.3 Regression Results for Traffic Corridors: Pooled over 5 years
Fabricated Materials Inedible Grouping (TL)

		H401w	Hwy6	H33_15	H17nss	H17tb	H17tbT
Distance	Beta	0.528999	0.592742	0.412328	0.697468	0.435676	0.556415
	T-score	32.123	23.696	22.446	62.891	28.159	56.8
	Stan.Beta	0.477378	0.284849	0.465138	0.810345	0.609203	0.8322
Weight		0.775017	0.278999	0.847866	0.219234	0.364443	0.309975
		22.601	20.086	22.068	6.25	9.271	8.016
		0.358037	0.208811	0.254764	0.085894	0.130217	0.110922
Orgacs		-4.9E-05	1.3E-05	0.000319	1.23E-05	-0.000192	-5.5E-06
		-22.204	7.756	16.865	2.158	-10.192	-3.82
		-0.354225	0.209312	0.199973	0.028109	-0.283146	-0.051852
Desacs		1.4E-05	3.9E-05	-0.000112	2.33E-05	-9.2E-05	-7.6E-06
		8.076	20.901	-14.602	3.605	-4.692	-5.256
		0.123411	0.558901	-0.303579	0.047733	-0.104062	-0.074485
Time		-0.114723	-0.021936	-0.037547	-0.107892	-0.164747	-0.163714
		-5.789	-5.508	-2.267	-6.832	-7.34	-7.364
		-0.091347	-0.052712	-0.025915	-0.096882	-0.100596	-0.096769
constant		0.744723	2.679779	-4.799343	3.986351	7.804469	4.616119
		2.032	10.51	-8.475	10.664	13.435	11.08
cases		1410	8370	1369	1884	2130	2292
adj. R. Sq.		0.70099	0.25738	0.83641	0.72763	0.6175	0.61066

significance of changes in either excess profits or fixed costs, this result would suggest that following regulatory reform either or both of these elements have declined. This would support the argument that rate declines following reform would be linked to increased competitive pressure which would reduce the possibility of excess profits and force firms to operate more efficiently.

However, the remaining commodities in table 5.2 generally exhibit significant positive parameter estimates for *Time*. If it is accepted that direct costs associated with regulatory compliance have been reduced following reform, then either other costs have increased or excess profits have increased. There is also the destructive competition argument which suggests that industry concentration will increase following reform and rates would subsequently increase as a result of monopolistic or oligopolistic pricing by surviving firms.

The question of industry concentration cannot be investigated with the data available here. However, previous work has suggested that concentration may be on the rise. An empirical study of the Canadian LTL trucking market (Chow and Caravan, 1991) indicates that concentration has increased in certain markets following the introduction of the Motor Vehicle Transport Act (1987). The Ontario for-hire trucking industry in general has exhibited signs of concentration with the overall number of firms dropping while the number of employees has increased (Woudsma and Kanaroglou, 1994). The relationship between market structure and firm performance

in for-hire trucking (for which price (rate) is an indicator) is explored further in Chow and Caravan (1991).

The regression results from the data for the highway sections and commodity group (fabricated materials TL) presented in figure 5.5 are depicted in table 5.3 (pooled over the 5 years of data). While the results in figure 5.5 suggested a mixed response to the change in regulatory environment, the response in table 5.3 is a consistent one. The parameter estimate on the *Time* variable is significantly negative for each highway section considered. As discussed in the previous example, this suggests a significant decrease in either excess profits or fixed costs. The truckload (TL) segment of the for-hire trucking industry is generally more competitive than the LTL segment. This result suggests that under easier entry, the industry has become even more competitive.

Overall, the results in tables 5.2 and 5.3 are typical of the larger data set. If regulatory reform had any influence on rate levels within the province of Ontario, it appears to have been on the truckload segment of the industry. The consistent negative estimate for *Time* (table 5.3) based on the highway sections is evident in the majority of commodity groupings. There are however, positive and significant parameter values for *Time* associated with individual commodities within the broader commodity groups (truckload) examined. These cases tend to be in the minority and therefore, do not influence the overall trend noted for the truckload segment. Based on this discussion, the decline in excess profits or fixed costs associated with the truckload segment of the

industry appears to be the only consistent impact of reform noted thus far. If this is indicative of declining rates following reform, it does not appear to be associated with every segment of the trucking industry. Thus, if regulation has had any influence on rates, it appears to have varied depending on commodity and shipment size (TL versus LTL). A final possibility is that the relatively straightforward model employed is unable to account for all the influences on shipment rates.

Considering the second research question concerning rates for shipments to small communities, the next set of tables deal with the accessibility variables. Table 5.4 presents the regression results for two of the highway sections for each of the five years and the end products (LTL) commodity grouping. The parameter estimates for both *Hiacorg* and *Hiacdes* are largely insignificant suggesting that for this particular data set, the relative accessibility of origins and destinations is not an important factor in the determination of shipment revenues (rates). This result is consistent throughout each of the six highway sections considered and there is no apparent difference between northern and southern sections.

Table 5.5 presents the results for highway sections H17tb and H17tbT for the fabricated materials (TL) grouping. Examining the overall model performance (adjusted R-squared), it is apparent that the inclusion of Toronto as an origin/destination reduces the overall model performance. This is more than likely related to changes in the variability of particular independent variables such as *distance*.

Table 5.4: Highway Regression Results (End Products Inedible LTL)

		1983		1987		1988		1989		1991	
		H401w	H17nss	H401w	H17nss	H401w	H17nss	H401w	H17nss	H401w	H17nss
Distance	Beta	0.202476	0.186098	0.32716	-0.018609	0.060339	0.339125	-0.074092	0.116286	-0.016031	0.392588
	T-score	4.287	1.968	4.433	-0.12	1.072	3.324	-1.388	1.395	-0.282	2.259
	Stan.Beta	0.075186	0.129967	0.206095	-0.009177	0.03179	0.236079	-0.036881	0.135346	-0.010487	0.197144
Weight		0.630732	0.493164	0.35123	0.504141	0.451197	0.612551	0.483114	0.437922	0.411408	0.473006
		51.755	14.666	14.74	10.535	31.276	11.738	33.267	7.606	20.186	7.855
		0.911729	0.881578	0.630753	0.826827	0.771727	0.820042	0.776401	0.718821	0.696968	0.704289
Hiacorg		-6.8E-06	-9.4E-05	-1.6E-05	7.65E-05	-1.9E-05	-6E-05	3.36E-05	-0.000128	4.59E-07	-0.000117
		-0.724	-1.268	-1.186	0.724	-1.967	-0.56	3.328	-0.904	0.042	-0.957
		-0.014402	-0.076081	-0.05356	0.057565	-0.055882	-0.040954	0.08758	-0.085804	0.001681	-0.088714
Hiacdes		8.92E-06	-2.3E-05	-1.3E-05	-0.000106	-1.8E-05	-1E-05	3.35E-05	-7.3E-05	3.32E-05	-6.1E-06
		1.201	-0.434	-1.213	-1.309	-2.159	-0.145	3.901	-0.752	3.246	-0.054
		0.020482	-0.028583	-0.058984	-0.105348	-0.061621	-0.010475	0.102821	-0.071897	0.130392	-0.005102
constant		3.689794	5.432562	5.336412	6.11955	5.857461	4.004822	5.602405	6.375085	5.853537	4.352939
		18.938	10.396	15.378	6.079	25.86	5.243	24.394	8.228	21.215	3.989
N		671	73	327	65	757	59	700	54	447	67
adj. R. Sq.		0.85549	0.7614	0.42286	0.63282	0.58116	0.7199	0.62548	0.54649	0.49015	0.50807

Table 5.5: Highway Regression Results (Fabricated Materials Inedible (TL)

		1983		1987		1988		1989		1991	
		H17tb	H17tbT	H17tb	H17tbT	H17tb	H17tbT	H17tb	H17tbT	H17tb	H17tbT
Distance	Beta	0.523431	0.413109	0.307651	0.655304	0.516784	0.718926	0.774099	0.822638	0.42626	0.650525
	T-score	42.712	56.126	6.454	19.461	12.928	20.816	54.408	46.495	12.56	22.354
	Stan.Beta	1.088221	0.875671	0.351127	0.842282	0.599255	0.936815	0.978624	1.178083	0.506101	0.823755
Weight		0.560495	0.539607	0.641418	0.40016	0.926889	0.581417	0.57531	0.630561	0.511292	0.41556
		19.556	15.289	6.701	3.912	7.947	5.23	12.424	10.222	4.973	3.131
		0.243966	0.23506	0.240193	0.144004	0.339648	0.206257	0.205868	0.228938	0.128277	0.107491
Orgacs		0.0001052	3.36E-06	-0.000607	3.42E-07	-0.000481	-9.3E-06	-9.9E-05	-2.1E-05	-0.00046	-7.1E-06
		7.425	1.126	-8.409	0.085	-8.221	-2.967	-5.307	-12.33	-12.24	-1.528
		0.215205	0.016964	-0.77025	0.003086	-0.601825	-0.109477	-0.135541	-0.261653	-0.645216	-0.054222
Desacs		0.0002523	1.95E-08	-0.000419	-7.4E-06	-0.000285	-6.6E-06	-7.2E-05	-1.9E-05	-0.000692	-1.9E-05
		17.401	0.014	-4.637	-2.059	-4.235	-1.752	-3.383	-8.992	-17.521	-3.245
		0.417697	0.0002292	-0.333247	-0.082651	-0.253398	-0.062879	-0.068808	-0.18847	-0.667539	-0.116456
constant		-1.791624	2.978077	13.937406	2.872617	6.897167	0.737154	2.451454	0.111252	16.105159	2.990094
		-4.068	8.017	6.753	2.558	4.485	0.59	4.28	0.162	11.708	2.131
N		843	872	332	373	320	363	314	350	2130	2292
adj. R. sq.		0.87513	0.80434	0.62514	0.5804	0.65493	0.60835	0.93954	0.87712	0.78831	0.61649

It appears that *distance* becomes more important in explaining variation in shipment revenues when Toronto is included with the exception of 1983. In cases where there is an improvement, the variability of *distance* may increase as does the mean value while in the opposite case, the mean value increases while the variability is reduced. The relative importance of the number of shipments involving Toronto is a factor in each of the years considered. Although not an entirely surprising result, it provides some evidence of the sensitivity of the model employed.

The parameter estimates for *Orgacs* and *Desacs* in H17th reveal a fairly consistent pattern of a significant positive estimate for 1983 followed by a series of significant negative estimates for the remaining years. The early positive value suggests that, all else considered equal, shipments involving less accessible communities generated less revenues (lower rates) than those involving more accessible communities under the previous regulatory regime. The negative parameter estimates following reform indicate that less accessible communities are associated with higher shipment rates which is the expected result under normal competitive circumstances. Taken together, this suggest that cross-subsidy existed prior to reform but has since diminished.

The overall results suggest that the accessibility variables contribute more to explaining the variation in truckload revenues as opposed to those from the less-than-truckload. This may be related to the greater complexity associated with rate setting in

the LTL segment. The pattern evident in table 5.5 is present with respect to other highway segments. However, in a number of cases, there is a mixture of both significant positive and negative parameter estimates for the accessibility variables both before and after reform. Although not presented here, the pattern for H401w is one of consistent positive values for the accessibility variables. It can be argued that cross-subsidy would not be an issue for communities along a major traffic corridor such as H401w which may account for this result. In order to address this possibility, the remaining results consider a combination of highway sections from the north and the south.

In table 5.6, the communities from H401w and H17tb are combined for the fabricated materials (TL) grouping. The parameter estimates for *Hiacorg* suggest that less accessible (small) communities are associated with lower shipment rates relative to more accessible communities both before and after the introduction of reform. Examining the yearly change in the parameter estimate, does not suggest a reduction in the level of cross-subsidy following reform either. One possible explanation is that congestion in more accessible areas may be increasing the cost of providing service in those areas. Another possibility is that the costs associated with providing service to less accessible communities may not be comparatively higher, contradicting traditional schools of thought (Shepherd, 1990). The parameter estimate for *Hiacdes* appears significantly positive prior to reform and negative for the year immediately following

Table 5.6 Regression Results from Highway Sections Combined
(TL Fabricated Material: Highways H401w and H17tb Combined)

		1983	1987	1988	1989	1991
Distance	Beta	0.483843	0.633304	0.624539	0.725868	0.623099
	T-score	48.225	29.07	24.228	52.436	25.837
	Stan.Beta	0.734323	0.688531	0.813824	0.992086	0.790532
Weight		0.91611	0.545258	0.353086	0.316055	0.582597
		24.352	8.29	4.312	7.217	6.226
		0.369841	0.212138	0.14821	0.133765	0.179031
Hiacorg		3.5E-05	4.3E-05	2.5E-05	3.9E-05	2.9E-05
		9.278	10.187	3.309	10.39	2.541
		0.238848	0.298899	0.124134	0.2264	0.114922
Hiacdes		-6.8E-05	2.1E-05	1.4E-05	-2.3E-05	-9.7E-06
		-8.39	3.028	2.098	-6.859	-1.438
		-0.21619	0.093535	0.076498	-0.13542	-0.06227
Constant		-1.29241	1.298417	3.354658	3.380935	1.041054
		-3.324	1.849	3.692	6.994	1.038
N		1377	686	484	531	515
Adj. R. Sq.		0.70061	0.62124	0.56762	0.84719	0.5998

reform. Although this suggests that the change in regulation may have had an influence on the rates for shipments to small (low access) communities, this result is not common throughout the data considered in this paper.

In table 5.7, the shipments between communities combined from H401w and H17nss are selected for analysis. The table contains three different versions of the model with the intent of illustrating a number of points. First, the improvement of model performance with the inclusion of either accessibility variable is evident in the TL segment but not the LTL segment. Secondly, the model performance with the more realistic accessibility measure (*Hiacorg*, *Hiacdes*) is only marginally better then the performance using the other. This marginal improvement was not apparent in every section.

Thirdly, the influence of the accessibility measures was the same in most cases although the examples in table 5.6 indicate some differences. For example, in the 1987 TL segment, *Orgacs* is significantly negative while *Hiacorg* is significantly positive. These differences can be attributed to the fact that the accessibility measures exhibit variations in their relative values. In general, highly accessible communities in the one measure were high in the second. However, there were certain communities which were placed considerably higher or lower in a ranking of provincial accessibility. The question which remains unanswered is which measure provides the most reliable representation of accessibility within the province? Work on addressing this question is

Table 5.7 Model Comparison: Combined Highway Section Regressions
(Highways H401w and H17nss Combined)

		1987						1991					
		III (End Products)			II (Fab. Mat.)			III			II		
Weight	Beta	0.406981	0.400026	0.41011	0.1377	0.45164	0.59169	0.45601	0.46134	0.47875	0.3033	0.32929	0.35108
	T-score	19.739	19.261	19.768	2.983	10.671	13.13	22.097	22.105	22.873	4.495	4.869	5.038
	Stan.Beta	0.647204	0.636144	0.65218	0.07522	0.24672	0.32323	0.63555	0.64298	0.66724	0.0846	0.09184	0.09792
Distance		0.343973	0.384084	0.33432	0.5588	0.5019	0.5248	0.40694	0.37147	0.39005	0.7103	0.70464	0.70032
		7.758	7.75	7.439	25.838	28.548	31.949	9.685	8.101	9.222	48.697	47.835	45.364
		0.254367	0.284029	0.24723	0.65149	0.58516	0.61186	0.27855	0.25427	0.26699	0.9166	0.90933	0.90376
Orgacs			-1.2E-05			-2E-05			-3E-06			5.9E-06	
			-1.97			-5.87			-0.456			1.788	
			-0.06489			-0.14866			-0.0132			0.04232	
Desacs			1.2E-05			4.6E-05			-1E-05			2.3E-06	
			1.634			24.646			-1.877			0.777	
			0.060109			0.55723			-0.0591			0.01807	
Hiacorg				-1E-05			4.6E-05			-4E-05			2.2E-05
				-1.338			19.975			-4.472			3.082
				-0.0437			0.43566			-0.1305			0.06962
Hiacdes				-9E-06			2.6E-05			-1E-05			5.6E-08
				-1.074			6.339			-1.252			0.013
				-0.0358			0.17237			-0.0364			0.0003
Constant		4.73362	4.611917	4.92931	6.24466	2.60933	1.28764	3.94279	4.4617	4.28973	3.5726	3.14889	3.02888
		19.421	12.15	18.357	13.337	5.495	2.792	16.008	11.596	16.003	5.014	4.356	4.092
N		461	461	461	919	919	919	619	619	619	478	478	478
Adj. R. Sq.		0.5089	0.51293	0.51003	0.45371	0.67461	0.69726	0.49001	0.4914	0.50515	0.8324	0.83465	0.83625

ongoing. With respect to the research question here, the relative inconsistency of the results is apparent regardless of which accessibility variable is used.

5.5 Conclusion

The goal in this paper has been to investigate the impact of regulatory reform on rate levels in for-hire trucking on two fronts. First, has there been an overall decline in shipment rates, and secondly, have rates for shipments involving small communities increased? The data selected for analysis represent intra-provincial shipments in Ontario both before and after reform and the focus is on specific markets identified by commodity and highway corridor.

With respect to the first question, it does not appear that regulatory reform has resulted in an industry-wide decline in shipment rates. The truckload segment of the industry exhibits the most consistent decline in the period following reform when considering broad commodity groups and specific highway corridors. This was apparent in the descriptive analysis and confirmed in the regression results. The less-than-truckload segment exhibited no clear pattern of change. Within specific commodity groups, the trend also varied on a commodity by commodity basis.

The investigation into the impact of reform on rates for shipments to less accessible communities does not suggest that rates have increased for these areas. This

rate increase has been anticipated as firms lose the ability to cross-subsidize following reform. Although in some cases the parameter estimates for the variables introduced to test for the existence of cross-subsidy exhibited a pattern consistent with its reduction following reform, this was not true overall. In some markets (defined by highway corridor and commodity group), the model results suggest that rates to small, less accessible communities are comparatively lower than those for larger, more accessible ones both before and after regulatory reform. The overall inconsistency with respect to this question suggests that neither regulation nor its reform has had a significant influence on rates for service to small communities.

Certain additional points can be made which have arisen through the course of this research. The efforts directed at introducing more sensitive measures of market conditions through GIS generated accessibility measures have not born substantial improvements in our understanding of the cross-subsidy question. Although they are an improvement over more basic measures such as origin/destination population, the basic inconsistency in the relationship between shipment rates and community size and location remains.

The examination of specific commodities and specific traffic corridors has re-enforced the view that the influence of reform varies significantly. While the model results confirm declining fixed costs and/or excess profits for some markets in the truckload segment of the industry, the same is not true in the less-than-truckload

segment. While certain commodity groups exhibit significant declines in average rate levels in the years following reform, certain individual commodities within that group show significant increases. Shipment rates along the 401 appear to be at their lowest level in years, yet rates on other highway sections have remained fairly stable during the same period.

This inconsistency is not entirely surprising given the heterogenous nature of the trucking industry in general. However, if the arguments of the various interest groups involved in the regulatory debate are to be believed, then one would anticipate that significant changes were in store for the industry as a whole. This is not apparent in the results presented in this paper. Kaplan (1989) has suggested that the whole debate concerning economic regulation in Ontario has been a facade and that the system was never capable of having the kind of influence attributed to it in the debate. A review of studies on *intrastate* deregulation and regulation in the U.S. suggests that the impacts may have been overstated (Allen et al., 1993). It has also been suggested that it may be too early to determine the impact of economic regulatory reform (Slack, 1993). Additionally, the modelling effort could be subject to improvement by incorporating more realistic cost measures. However, these are often not available at the shipment level and are often held in confidence by the firms involved.

It would seem that if one is to gain understanding of the for-hire trucking industry regardless of questions of economic regulation, the first step would be to

identify specific markets and carry out a thorough analysis at that level. Specific information on firm activity and structure as well as market structure and dynamics would enhance efforts to understand things like the spatial variation of pricing for trucking service.

The issue of the influence of policy continues to play an important role in the for-hire trucking industry. The majority of U.S. states still regulate intra-state trucking as do a number of Canadian provinces. Economic regulation is not something that seems willing to die even though evidence in recent years suggests that the trucking industry is not one in which it need play a significant role. If positive economic analysis suggests that the Public Interest Theory of regulation as it applies in this context is no longer a valid one, then perhaps research should focus on the interest groups involved. The results here suggest that this may be a path in the future to follow. It is hoped that those individuals or groups review the type of analysis presented here before charting new policy directions.

Endnotes

1. Woudsma and Kanaroglou (1994), Chow and Caravan (1991), and McRae and Prescott (1982) offer reviews of previous Canadian research with respect to rate levels.

2. The Motor Vehicle Transport Act (1987) was passed as part of a national reform of transportation policy and is directed at inter-provincial trucking. However, it is up to the provinces to comply with this change and although a number have relaxed their control, Ontario is the first to introduce a legislative response.

3. The remaining highway segments are two lane paved highways although some have 4 lane segments. However, these 4 lane sections are relatively small in comparison to the length of the corridors under review and hence, they remain considered as two-lane highways.

4. A paper presenting a detailed discussion of this problem is available from the authors on request.

5. Other variable specifications have been tested which are designed to account for market conditions. These include a general population measure, population density, manufacturing employment levels, and a discrete classification of communities based on their size and relative position within the urban hierarchy (after Chow, 1983). Preliminary work suggests that the accessibility measure is more consistent than those listed here.

6. The rates are adjusted for inflation using the Implicit Price Index published by Statistics Canada. Significant testing was performed on yearly differences in average rates within groups as well differences between groups.

7. As discussed previously, the interpretation of the results for the research questions is the same if revenues or rates are the focus.

References

Allen, B.J., Maze, T.H., and C.K. Walter (1993) "Intrastate Trucking Deregulation: Have Both The Negative and Positive Impacts Been Overstated?", *Transport Journal*, 33, pp. 30-39

Beilock, R., and J. Freeman (1987) "The Effect on Rate Levels and Structures of Removing Entry and Rate Controls on Motor Carriers", *Journal of Transport Economics and Policy*, 21, pp. 167-188.

Bonsor, N.C. (1978). "The Development of Regulation in the Highway Trucking Industry in Ontario." in *Government Regulation: Issues and Alternatives*. Toronto: Ontario Economic Council.

_____ (1984) *Transportation Economics; Theory and Canadian Policy*, Toronto: Butterworth & Co.

Boucher, M. (1990) "The Impact of Deregulation on the Quebec Trucking Industry: A Preliminary Assessment", *Proceedings of the 25th Annual Meeting of the Canadian Transportation Research Forum*, University of Saskatchewan Press, Saskatoon, pp. 123-133.

Chow, G. (1982) *Rate and Cost Analysis of For-Hire Trucking: Provincial Comparisons*, Toronto: Research Branch; Bureau of Competition Policy, Consumer and Corporate Affairs Canada, Research Monograph 13

_____ (1983). "An Evaluation of Less-than-Truckload Transport in Small Rural Communities of Western Canada." *The Logistics and Transportation Review* 19, 225-244.

_____ (1991). "U.S. and Canadian Trucking Policy" in *Transport Deregulation: An International Movement*, K.Button and D. Pitfield eds., Macmillan Academic and Professional Ltd, London UK p. 141-170

Chow, G, and J. Caravan (1991) *Concentration, Market Share, and Rates in Canadian LTL Trucking*, Vancouver: Policy and Coordination, Economic Analysis, Transport Canada, Report TP 11068-E

Erb, W. (1994), Personal Correspondence, July 10, 1994.

Hoyle, B.S. (1993). "Transport in Canada: Patterns, Issues, and Trends", *Journal of Transport Geography* 1, 147-149.

Kanaroglou, P.S. and C.G. Woudsma (1994) "Regulatory Reform and the Structure of For-Hire Motor Carrier Revenues in Ontario: 1987-1989", *Geographical Analysis*, 23(3), pp. 246-260

Kaplan, H. (1989) *Policy and Rationality: The Regulation of Canadian Trucking*, Toronto: University of Toronto Press

Lord, R.J., and J. Shaw (1980). "A Comparative Examination of the Impact of Regulation on the Operations and Costs of Intra-Provincial Trucking Firms." In *Studies in Trucking Regulation Vol. 2*, edited by Economic Council of Canada, pp. 100-179. Toronto: Economic Council of Canada.

McRae, J.J., and D.M. Prescott (1982) *Regulation and Performance in the Canadian Trucking Industry*, Ottawa: Government of Canada, Economic Council Of Canada Report No. 23,

Ontario Ministry of Transportation and Communication (OMTC) (1983). *Trucking Services to Small Communities*. Toronto: OMTC.

Ontario Ministry of Transportation and Communication (OMTC), (1991), *Final Report of the Advisory Committee on Truck Transportation*, Toronto: Ontario Ministry of Transportation and Communication

Posner, R.A. (1971) "Taxation by Regulation", *The Bell Journal of Economics and Management Science*, 2, pp. 22-50

Shepherd, W.G. (1990) *The Economics of Industrial Organization*, Toronto: Prentice-Hall Canada, Inc.

Slack, B.S. (1993). "The Impacts of Deregulation and the US-Canada Free Trade Agreement on Canadian Transportation Modes". *Journal of Transport Geography* 1, 150-155

Sloss J. (1970). "Regulation of Motor Freight Transportation: A Quantitative Evaluation of Policy." *The Bell Journal of Economics and Management Science* 1. 327-366.

Statistics Canada (1994) *Trucking in Canada: 1991*, Ottawa: Surface and Marine Division

Woudsma, C.G. and P.S. Kanaroglou (1994) "Deregulation of the Motor Carrier Industry: A Canadian Example", *Environment and Planning A*, 26, pp. 343-360

Chapter Six

Conclusion

6.1 Introduction

The goal of this concluding chapter is to draw out and summarize the most important findings from the four chapters which form the core of the research conducted. Since this is a summary, the specific research findings from each chapter will not be presented. Instead, the framework for this summary will be the three research objectives outlined in the introductory chapter.

6.1.1 Objective 1

The first research objective concerns the general activity and structure of trucking in Ontario. The findings are drawn from industry statistics provided by Statistics Canada for the 1987-1989 period.

1.There was a general decline in the number of Class 1 and 2 firms in Ontario.

2.There was no change in the number of employees for Class 1 and 2 firms as well as no change in industry output.

3.Bankruptcy statistics for the transportation and communication sector were no different than those in other sectors of the Canadian and Ontario economy.

4. There was a relative increase (5 percent) in the amount Class 1 and 2 firms spent on brokers, purchased transportation, and rental equipment.

5. There was no change in the amount Class 1 and 2 firms spent on administration, licenses, or taxes.

In relation to the question of the impact of regulatory reform, these findings suggest that the industry may becoming more concentrated. Fewer firms with the same overall employment and output levels would suggest that certain firms are expanding and capturing more market share. It is impossible to say from the statistics reviewed which segments of the industry this trend is affecting. Chow and Caravan (1991) reported a similar finding in their study of the Canadian LTL trucking industry while the growing concentration in the LTL market in the U.S. following reform in 1980 is well documented (Rakowski, 1988; Kling, 1990). It is possible that this may be occurring in the case of Ontario as well.

The review of bankruptcy statistics does not indicate that regulatory reform has increased the number of bankruptcies in the Ontario trucking industry. In contrast, industry lobbyists maintain that trucking bankruptcies have risen dramatically because of regulatory reform (OMTC, 1991). One explanation for this discrepancy is the size of the firms involved. Many of the new entrants into the trucking industry have been small trucking firms or owner-operators which are single truck operations. For example, in the 1987-1989 period, there was a 50 percent increase in the number of Canadian firms which earned between 100,000 and 250,000 in yearly revenues; from

12,106 to 18,229 firms (Statistics Canada, 1992). These firms may not be included in the bankruptcy statistics revealed by the financial division of Statistics Canada. The fact that most of the new entries seem to be of smaller firms and since it is accepted that they generally don't engage in LTL service, the concentration in the Ontario LTL market discussed above seems more likely.

The increase in spending on brokers, rental equipment and purchased transportation suggests that Ontario firms may be expanding into new markets which may have been closed to them before. This finding would seem to relate well to the growing concentration of the industry. The increased reliance on brokers is one of the unanticipated structural changes noted in the United States following deregulation (McMullen, 1987).

The lack of change in the amount spent by firms on administration, and licenses and taxes suggests that regulatory reform has not had an impact in this area. It is possible however, that while firms spent less on licenses and other regulatory activities, they spent more on taxes. It is also possible that because firms are expanding into new markets, they are spending more on licenses. Even though they may be spending less on each application, they are applying more often and subsequently, the overall expenditure in this area has not changed. It is not possible to substantiate these possibilities with the data available from Statistics Canada. In general, this finding stands in contrast to Bonsor's (1984) suggestion that millions would be saved through a

reduction in activities associated with regulatory compliance.

6.1.2 Objective 2

The purpose of this objective is to investigate a number of rate related hypotheses associated with regulatory reform. Briefly, the three hypotheses are; 1) rates will decline following reform, 2) value-for-service pricing will decline following reform and 3) rates for service to small communities will increase. The method of investigation involved a descriptive analysis of rate changes in various markets defined by commodity group and individual commodity, shipment type (LTL, TL), and a classification of origins and destinations as either metropolitan/non-metropolitan, small-remote/non small-remote, and by traffic corridor. This descriptive analysis was followed by application of the model of analysis with the intent of explaining the variation in shipment revenues (rates) by accounting for variable costs, market conditions (demand/supply), fixed costs, and excess profits. The hypothesis related to value-for-service pricing could not be investigated with the model because of data limitations; specifically, detailed information related to the value of specific commodities. The findings for each hypothesis will be summarized in turn, beginning with the question of decreasing overall rates.

The argument for the anticipated decline in rates following the introduction of regulatory reform is related to the anticipated increase in competition associated with open industry entry. It is argued that regulation has created inefficiencies in the

production and management of trucking services which has resulted in prices being higher than expected. Additionally, it is argued that firms enjoying protection from competition may have been able to enjoy higher than expected profit levels (excess profits). The findings with respect to this hypothesis are:

1.The descriptive analysis indicates that average rates in the truckload segment of the industry declined in the years following reform. This was particularly true for the majority of commodity groups in the 1991 data. This result was substantiated by modelling results which indicated that decreases in fixed costs and/or excess profits associated with these shipments, were significant in all truckload commodity combinations. This result was evident in the pooling of 1983 and 1991 data but not in the data for 1988 and 1989 combined.

2. The pattern of rate changes evident in the LTL segment of the industry is inconsistent with both significant increases and decreases following reform. In the year immediately following reform (1989) the majority of commodity groups exhibited rate declines while in 1991, the majority exhibited increases. The results from the application of the model to this segment conflicted with the observed rate changes. When differences in the constant term were tested, they were generally found to be insignificant, or indicate a significant increase.

3.With respect to the question of the timing of rate changes, there were significant declines in average rates in the years leading up to regulatory reform in some TL segments of the industry. Increases in rates for the LTL segment prior to reform were evident.

4. The analysis of highway corridors revealed a general consistency in rate levels in the periods examined. One exception was a noted decline in the average rates for truckload shipments on H401w to a level below that observed in 1983. This result was substantiated in the results from the model of application.

5. Changes in average rate levels following reform which were observed at the commodity group level were not found to be consistent through all commodities which comprised that group.

Overall, the evidence with respect to the anticipated decline in rates suggests a

trend of reduced rates for the truckload segment of the industry. This segment is generally regarded as comparatively easier to enter than the LTL segment (Bonsor, 1984). There was a substantial increase in the number of license applications before the OHTB in the years immediately following reform (OMTC, 1991). It is likely that the majority of these were for firms engaging in truckload service. Therefore, the idea that competitive pressure would increase under reform appears reasonable with the modelling of shipment revenues (rates) suggesting significant declines in the level of fixed costs and/or excess profits for TL shipments. However, this trend was not evident in the LTL segment of the industry, nor in the comparison of 1988-1989 TL shipment rates.

The results associated with Objective 1 suggest that the Ontario industry may be more concentrated following reform. In general, higher levels of concentration may be associated with higher shipment rates because of oligopolistic forces (Shepherd, 1990). The relative increases in shipment rates for the LTL segment of the industry following regulatory reform may be an example of this fact. However, Chow and Caravan (1991) have found a negative relationship between the level of concentration and price in their study of Canadian LTL markets.

The finding related to the lower TL shipment rates on the section of highway 401 examined was evident before and following reform. This finding substantiates industry claims that rates on this corridor were the lowest they had been in a decade

(Foster, 1989). In general, although there were indications of rate declines prior to the introduction of reform, these were not evident in the majority TL commodity groupings. This tends to place the suggestion that the industry began reacting early to plans of regulatory reform (Boucher, 1990[1]) in some doubt. Furthermore, the fact that only 2 out of 12 groupings indicated a significant decline in fixed costs and/or excess profits in the 1988-89 comparison may suggest that it is too early to establish the influence of regulatory reform.

As a final note regarding the findings above, there was considerable variability in terms of rate changes from year to year observed in the data. The more disaggregate examination of specific commodities and corridors tended to confirm the inconsistency observed at higher levels of aggregation. It has been suggested that the application of regulatory control varied within the Province of Ontario (Chow and Button, 1982). It has also been suggested that economic regulation has had little influence on trucking rates which instead, are argued to be market driven (Kaplan, 1989). Given the level of inconsistency in the relationship between regulatory change and rate levels, the support would tend towards the lack of significant influence of economic regulation on rate levels.

The second rate related objective concerns the presence of discriminatory, or value-for-service pricing. It has been suggested that this type of pricing has been possible because of monopolistic powers enjoyed by firms under regulation. It is

therefore anticipated that following regulatory reform, firms' ability to price in this manner will be reduced (Beilock and Freeman, 1987). The findings with respect to this hypothesis are as follows.

6. Rate analysis indicates a consistent trend of higher rates associated with commodity groups with a higher value added component in the LTL segment of the industry both before and after reform. In TL, the higher rates are associated with live animals and end products commodity groups.

7. There appears to be less variation in TL rates following reform along specific highway corridors in the province, indicating a reduction in the level of price discrimination.

The results with respect to this rate hypothesis were not tested with an application of the model. Specific information on the market value of commodities would need to be incorporated in order to establish a relationship between trucking rates and the value of commodities. The results are similar to those observed in Arizona's experience with deregulation (Beilock and Freeman, 1987) suggesting a lack of regulatory influence on this type of pricing activity.

The final rate related hypothesis is that rate levels for shipments to small communities are expected to increase following regulatory reform. The argument is similar to that expressed with respect to hypothesis 2. In this case, the price discrimination is with respect to the size and relative location of the market being served. If firms were engaged in cross-subsidy of shipments to small communities, it is argued that they would lose the ability to continue this following reform. Competition would deny them the ability to deviate from marginal cost pricing. Since

it has been suggested that small communities are more costly to serve, rates would increase following regulatory reform.

8. The range of commodities in and out of small communities in the north and south revealed a fairly consistent pattern of resource commodities coming out and essentials like fuel and food going into these areas.

9. Both the metropolitan/non-metropolitan, and small remote area/non-small remote area classification reveals a consistent pattern of lower rates for the non-metropolitan and small remote areas. This pattern is consistent both before and after regulatory reform.

10. Shipment rates on northern traffic corridors were observed to be lower than those on southern corridors for the commodity groups examined both before and after reform.

11. Model results based on parameter estimates for the series of variables introduced to address the small community question were for the most part insignificant in the LTL segment of the industry.

12. With respect to the TL segment, the model results reveal a general pattern of inconsistency with results pointing to cross-subsidy in some markets prior to reform and not in others. Some industry segments appeared to move to a regime of more cross-subsidy following reform while others moved to less cross-subsidy.

13. Model results show that at least one of the northern highway segments exhibited a trend from cross-subsidy prior to reform to a reduction in cross-subsidy following reform.

Overall, there is little evidence to support the hypothesis that rates for service to small communities increased following regulatory reform. The inconsistency between the observed rates and the model results suggests that either the model is unable to capture the rate differences based on community size and location or that they are insignificant. It is possible that including more specific information on commodity

value and shipment costs would reveal more insight into this question but the constant inconsistency suggests there was no systematic cross-subsidy prior to regulatory reform.

6.1.3 Objective 3

The focus of this objective was to enhance the modelling effort through the development of more sensitive measures of market conditions and to establish a framework for analysis in other jurisdictions. The model performs well and responded to changes in the survey universe and data selections. The bulk of the work was directed at introducing more sensitive measures of market conditions. The two accessibility measures calculated with the aid of a GIS package performed better than population density, and the small/remote area classification in the majority of cases. The effort to enhance the reality of the accessibility variable through the implementation of the Ontario highway network did not increase the explanatory power of the model. Other measures, such as the relative proportion of manufacturing employment in a community, were also tested. These variables were not significant in the majority of cases examined.

6.2 Summary

The goal of this research has been to determine the influence of regulatory

reform with respect to the trucking industry in Ontario by comparing the situation before and after reform. A number of structural changes were observed following reform and there is evidence to suggest significant rate declines in the truckload segment of the industry following reform. However, there were rate declines in this segment prior to the introduction of reform and little evidence indicating rate declines in the less-than-truckload market. There was also little evidence to support the hypothesis that regulatory reform has led to higher rates for shipments to small communities. Overall, this would suggest that the change in regulation has not had a substantial or widespread impact on the industry.

This conclusion can be qualified by a number of factors. It is possible that a more comprehensive study which examines firm-specific cost and rate information and detailed supply and demand influences in specific markets might reveal a different result. The interplay between the structure, conduct, and performance of an industry is influenced by a range of factors of which government regulation is but one. For example, the difficulty in separating the influence of regulation from changes in the overall economic climate has been identified as a persistent problem (Chow, 1991). It has also been suggested that it may be too early to determine the results of deregulation (Slack, 1993).

In contrast, Kaplan (1989) has presented a view of trucking regulation as being an ineffective policy instrument. Accepting this view could be warranted based on the

results presented here. Additionally, Allen, Maze, and Walter (1993) report that studies of similar changes in other jurisdictions have tended to overstate the impacts of regulation and its removal.

During 1990 and 1991, truckers in Ontario protested government policies like deregulation and taxation by blocking major border crossings. Subsequently, in April of 1991 a two year moratorium on the issue of new trucking licenses was introduced. This action was taken to stabilize the industry which was suffering from oversupply and low demand in the economy. The review committee formed to examine the impact of the regulatory change in Ontario did not support this temporary return to entry control. However, it represented an easy political solution to the Transport Minister at the time.

The point of describing this chain of events is summarized in the following quote:

> Regulation, deregulation, competition and Crown ownership all exist side by side in the Canadian economy. An attempt to change from one regime to another is an attempt to make new rules so as to obtain a larger share of society's wealth. Only when we understand it in that way can we begin to ask who is trying to do what, to whom, and for what gain. Who will be the new winners and losers? Stripped of economic theory and ideological wrappings, naked self-interest is much easier to understand (Roman, 1990, p. 243).

The point of this research has not been to determine winners or losers but to determine the impact of regulatory reform in Ontario. If other jurisdictions are considering deregulation, the evidence presented here would suggest that the impacts of change will not be substantial or widespread. However, whether deregulation occurs or not will

likely depend on the interest groups involved and what they stand to gain or lose.

6.3 Directions For Future Research

There are a number of strategies which could be pursued to enhance the determination of the impacts of reform. In the case of the research presented here, the inclusion of more detailed information on the demand for trucking services may have been of benefit. Related to this would be the inclusion of more specific information on the level of competition in well defined markets (Chow and Caravan, 1991; Boucher, 1993). One way to obtain this information would be to survey firms directly. Although firm financial and structural information is available from Statistics Canada, confidentiality rights prevents this information from being linked with the TOD firm output data.

Additional research areas which could be investigated include the level of concentration in Ontario trucking markets, the productivity and efficiency of firms, and the influence of economies of scale or scope (Rakowski, 1988). These areas tend to be the more traditional factors investigated with respect to the influence of regulation and its removal.

The Chicago School Economic Theory of Regulation and its emphasis on the political nature of regulation also provides a basis for future study. This research

would be concerned with trying to establish the level of income transfers between the various groups involved. In the case of U.S. deregulation, unionized labour was identified as being one of the prime beneficiaries of regulation (Joskow and Rose, 1989). Prentice (1994) has suggested that the role of information, particularly on trucking rates, is an area for future study with respect to trucking markets in general.

The Ontario trucking industry has changed dramatically in the last twenty years and it faces a number of new challenges in the future. The reduction in the importance of manufacturing in the Ontario economy and the reliance on just-in-time production methods are two factors which are of concern. The recent trade agreements present new challenges and opportunities for Ontario firms who are becoming more international in scope. Given the role of geography implied in these challenges, it is hoped that the trucking industry is not overlooked as a research area for geographers.

Endnotes

1. Boucher later confirms that the Quebec industry waited until the last possible minute before reacting to regulatory changes associated with the MVTA (Boucher, 1993).

References

Allen, B.J., Maze, T.H., and C.K. Walter (1993) "Intrastate Trucking Deregulation: Have Bothe The Negative and Positive Impacst Been Overstated?" *Transport Journal* 33, 30-39

Beilock, R., and J. Freeman (1987). "The Effect on Rate Levels and Structures of Removing Entry and Rate Controls on Motor Carriers." *Journal of Transport Economics and Policy* 21, 167-188.

Bonsor, N.C. (1984). *Transportation Economics; Theory and Canadian Policy*. Toronto: Butterworth & Co..

Boucher, M. (1990). "The Impact of Deregulation on the Quebec Trucking Industry: A Preliminary Assessment." *Proceedings of the 25th Annual Meeting of the Canadian Transportation Research Forum*, University of Saskatchewan Press, Saskatoon, 123-133.

Boucher, M. (1993) "The Behaviour of Quebec Trucking Firms Since the 1988 Regulatory Reform", in *Proceedings of the 28th Annual Meeting of the Canadian Transportation Research Forum*, B.G. Bisson ed., University of Saskatchewan Press, Saskatoon, 282-295.

Chow, G. (1991). "U.S. and Canadian Trucking Policy" in *Transprt Deregulation: An International Movement*, K.Button and D. Pitfield eds., Macmillan Academic and Professional Ltd, London UK p. 141-170

Chow G., and K. Button (1982). "The Economic Regulation of Road Haulage (Trucking) in Canada and the United Kingdom." *Proceedings of the Transportation Research Forum*, 23. 642-652.

Chow, G, and J. Caravan (1991). *Concentration, Market Share, and Rates in Canadian LTL Trucking*. Vancouver, Policy and Coordination, Economic Analysis, Transport Canada, Report TP 11068-E

Foster, C., (1989) "Courting Competition", *Canadian Transportation and Distribution Management*, Jan. 1989, pp. 31-33

Joskow, P.L. and N.L. Rose (1989). "The Effects of Economic Regulation" in the *Handbook of Industrial Organization Vol. II*, Schmalensee, R., and Willig, R.D. eds., North-Holland Publishers, Amsterdam, p.1449-1506

Kaplan, H. (1989). *Policy and Rationality: The Regulation of Canadian Trucking.* Toronto: University of Toronto Press.

Kling R.W. (1990). "Deregulation and Structural Change in the LTL Motor Freight Industry." *Transportation Journal* 29. No.3 47-53.

McMullen B.S. (1987) "The Impact of Regulatory Reform on U.S. Motor Carrier Costs." *Journal of Transport Economics and Policy*. 307-319.

OMTC, Ontario Ministry of Transportation and Communication, (1991), *Final Report of the Advisory Committee on Truck Transportation*, Toronto: Ontario Ministry of Transportation and Communication

Prentice, B.E. (1994) "The Stability/Efficiency Regulatory Trade-off: Policy Implications for For-Hire Trucking", *Proceedings of the 29th Annual Meeting of the Canadian Transportation Research Forum*, University of Saskatchewan Press, Saskatoon, pp. 494-507

Rakowski J.P. (1988) "Marketing Economies and the Results of Trucking Deregulation in the Less-Than-Truckload Sector." *The Transportation Journal* 27. No. 3 11-22.

Roman, A.J. (1990) "Regulation, Deregulation, Competition and Privatisation: The Canadian Experience", in Richardson, J. (ed), Privatisation and Deregulation in Canada and Britain, Brookfield U.S.A.: Dartmouth, p. 229-244

Shepherd, W.G. (1990) *The Economics of Industrial Organization*, Toronto: Prentice-Hall Canada, Inc.

Slack, B.S. (1993). "The Impacts of Deregulation and the US-Canada Free Trade Agreement on Canadian Transportation Modes". *Journal of Transport Geography* 1, 150-155

Statistics Canada (1992). *Trucking in Canada 1990.* Surface and Marine Division Cat. No. 53-222. Ottawa: Statistics Canada.