LESS-THAN-TRUCKLOAD IN THE NORTHERN MOUNTAIN-PLAINS STATES

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ABSTRACT

This study examined LTL carriers in the mountain-plains region of North Dakota, South Dakota, Montana, and Wyoming. Many rural communities rely on the LTL industry for freight movements in and out of the region. The level of LTL service in the mountain-plains region is unknown in a post regulated environment.

A mail survey was sent to trucking firms in North Dakota, Montana, South Dakota, and Wyoming to determine the characteristics and the level of LTL service in the rural states. The survey was structured to determine the size of firms providing LTL service to the mountain-plains states. The survey also asked firms about their level of technology. The mail survey was sent to common carriers in the mountain-plains states. The survey group selection, survey design, and data analysis techniques were described.

This study determined that all sizes of carriers are performing LTL service in the mountain plains region. The level of service is undetermined, but it is clear that many companies are performing both TL and LTL services in the region. The level of technology is clearly more advanced in larger companies and larger carriers are likely to adopt all types of technology available. ITS/CVO is not used extensively in the region, but the majority of carriers thought that it will become more prevalent and does add efficiency to the industry.

Although all sizes of carriers are performing LTL service in the mountain-plains region, only a small portion of their revenue comes from the mountain-plains region. This indicates that even though they serve the area, they may link with other carriers to deliver in rural areas deemed less profitable.

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CHAPTER I. INTRODUCTION

The mountain-plains region of North Dakota, South Dakota, Montana, and Wyoming depends heavily on trucks to provide freight services to businesses and individuals. While the truckload industry is important, the performance of the less-than-truckload (LTL) industry influences the economics of the entire region. Many rural communities rely on the LTL industry for freight movements into and out of the region. The advocates for deregulation predicted that freedom would result in entry, lower rates, and better service. While this has occurred for most of the U.S. LTL industry, the effects of deregulation on the rate structure and service level in the mountain-plains region is uncertain.

The Motor Carrier Industry

The U.S. motor carrier industry has undergone a major transformation since deregulation by the Motor Carrier Act (MCA) of 1980. In a less-regulated environment, there was a possibility of lower rates and better service because of the natural competition that would develop. The hope of a more efficient industry has been clouded by probably the most prevalent occurrence in the LTL sector of the trucking industry, which is the large number of bankruptcies. Only 12 of the 50 largest LTL carriers in 1979 were still functioning as LTL carriers in 1992 (Rakowski, 1995). Although deregulation may have been disastrous for many trucking companies, many shippers have realized rate reductions because of the increased

competition in the trucking industry. Changes that have occurred in a deregulated environment include:

- Rate structure
- Concentration
- Service level
- Number of carriers
- Productivity

Regulation

In a regulated trucking industry, despite the large number of carriers, LTL rates were homogeneous, as rate bureaus were responsible for setting rates (Snow, 1975). Prior to deregulation the motor carrier industry contended that deregulation would increase competition and reduce profits to a point where the industry could not offer adequate freight service. Advocates of deregulation argued that in a regulated environment rates were too high, inflexible, irrational, and discriminatory. In addition the rate structure was too complex (Snow, 1975). Snow argued that rates were too high because of operating inefficiencies and suppressed competition. The setting of prices by rate bureaus led to collusion and collective pricing (Snow, 1975).

Deregulation

Advocates of deregulation in the late 1970's pointed to an experiment with deregulation that had occurred in the 1950's. The removal of economic regulation in the mid-1950s on poultry and fruits and vegetables resulted in a substantial reduction in rates. A study conducted by the USDA in 1958 reported a 33 percent drop in rates for these commodities in the deregulated environment (ICC, 1977). The ICC study estimated that in a totally deregulated environment there would be a 20 percent reduction in rates.

Much of the post deregulation literature has found rate reduction consistent with this hypothesis. Rate reductions have contributed to the large number of failures in the LTL sector of the trucking industry. The Motor Carrier Act (MCA) of 1980 deregulated the trucking industry and, as predicted by the industry, led to many financial failures and firm closings. Although the shakeout in the industry has left many firms out of business, the three largest LTL firms in 1979 remain in 1992 (Rakowski, 1995). The big three — Roadway, Consolidated Freightways, and Yellow Freight — not only are still in business, but continue to command a large portion of the LTL market.

Concentration

Nationally, the structure of the industry has moved toward higher concentration, with larger firms dominating and other firms finding a niche in regional markets. Smith, Corsi, and Grimm (1989) showed that the MCA of 1980 is not completely to blame for the failure of many carriers. A firms' abilities to adapt competitive strategies in reaction to deregulation has

determined survivors in the new environment. With rates being reduced and discounts given, cost control has become essential for a firms' survival.

One of the tactics employed by LTL firms is using other trucking firms with nonunion drivers, which may be less costly than their own trucks (McMullen, 1991). LTL firms also may use other modes of transportation and load consolidation from other firms with freight brokers or forwarders. The larger firms may have an advantage in cost savings because of their ability to use other modes. Firm size increases the ability to fill containers and trailers from a larger network system needed for use in intermodal transportation (McMullen, 1991). This large network may result in a competitive advantage for the firm. This advantage may be passed to the shipper through rate reductions and by providing quality shipping service.

Firms with nationwide services also have an advantage for obtaining business from shippers committed to limit their business to a select group. Shippers can realize rewards through lower rates using limited suppliers for freight or close relationships in association with electronic data interchange (EDI) (Emerson, Grimm, and Corsi 1991)

Although some LTL firms may benefit from partnering, the excess capacity of the trucking industry has allowed many large shippers to pressure LTL firms for discounts. Many LTL firms have been using discounts from published tariffs to retain or lure large volume shippers. In many cases, these discounts have been as high as 70 percent (Coyle, Bardi, and Novak, 1994). The results of large discounts, in some cases, has been firm failure. Some of the bankrupt carriers now have been filing undercharge claims against the shippers who

received the discounts. The implications of these claims are significant for all involved (Coyle et al., 1994). The validity of these claims still must be determined.

Rakowski has performed several studies on the LTL industry. The conclusion of these studies is that, except for a few, there has been failures and exodus from the LTL industry resulting in high concentration. The big three have survived and have realized large revenue growth. This revenue growth has not necessarily transformed into greater profits, but it has transformed into greater market share. It may be somewhat difficult to ascertain the real concentration in the industry because of the holding companies controlling many LTL firms, including the big three (Rakowski, 1995). However, Rakowski grouped the holding companies and associated revenue. The top three groups controlled 70 percent of the revenue generated by the top 25 groups. This concentration may be attributable to the large networks of the larger LTL firms and service these firms can provide to shippers because of the large terminal network.

While volume shippers have the luxury of truckload or large volume shipments, many smaller firms are at a distinct disadvantage. These smaller companies may ship only partial loads and must rely on LTL service. Where service may have improved for large parts of the United States after deregulation, the rural areas may have suffered because of a lack of freight and profitability associated with freight volume.

Rural LTL Service

Athearn studied LTL service offered in 14 western states prior to and after deregulation. He examined the effect of deregulation on small businesses and many rural communities. The study was based on LTL carriers in 14 western states, including North Dakota, South Dakota, Montana, and Wyoming. Comparing the LTL service at points in the years of 1976 and 1988, indicated that only 13.5 percent of the points with service in 1976 retained all of their service until 1988 (Athearn, 1989). By the end of 1988, 66 percent of the points had lost 100 percent of the carriers providing LTL service in 1979 due to abandonment or bankruptcy (Athearn, 1989).

Deregulation has allowed carriers to abandon areas deemed unprofitable and to serve only select markets or shippers. The change in the structure of the LTL industry in the mountain-plains region may have come not only at the expense of many financially distressed motor carriers, but also at the expense of many small businesses and rural communities in need of service. However, it is likely that many small businesses and rural communities have benefited from a reduction in truck rates and better service. Because of the rurality of the mountain-plains region and the lower LTL volumes in the region, the future of the LTL service in the region remains uncertain. This study profiles LTL firms serving the mountain-plains region.

Research Objectives

The purpose of this study is to obtain information on the current situation of the less-than- truckload industry in North Dakota, South Dakota, Montana, and Wyoming.

To achieve this purpose the specific objectives are:

1. Obtain information from LTL firms in North Dakota, South Dakota, Montana, and Wyoming.

2. Profile LTL firms serving the region and examine implication for future service in the region.

3. Gather information on the adaptation of technology (i.e., ITS-CVO) in the LTL industry in the mountain-plains region.

Research Methods

Information needed to evaluate the structure of the LTL industry in the mountain-plains region is gathered by survey. A literature review of the LTL industry is also conducted. Information gathered in the literature review defines objectives used in the survey in determining the profile of LTL firms in the mountain-plains region. This survey also serves as an indicator of the level of technology used by firms operating in the mountain-plains region.

Report Organization

The remainder of this report is organized in three chapters. The history of the trucking industry before and after deregulation is presented in Chapter 2. In Chapter 3 the research methods are discussed. The data analysis is developed and detailed in chapter 4. The report concludes with a summary and conclusions in Chapter 5.

CHAPTER II. THE LESS-THAN-TRUCKLOAD INDUSTRY

Many shippers and small businesses depend on the LTL industry to ship and receive goods in the rural communities of the mountain-plains region. The focus of this chapter is on the historical development of the LTL industry, a brief history of economic truck regulation and the effect of deregulation on the LTL sector, and the development of the Intelligent Transportation System (ITS) for Commercial Vehicle Operations (CVO).

Definitions

Less-than-truckload carriers provide service to shippers who do not meet the minimum requirements of a truckload. For instance, a shipment of less than 10,000 pounds is less-than-truckload for many kinds of freight (Coyle et al., 1994). Density determines freight weights, therefore no steadfast rule determines less-than-truckload.

Less-than-truckload operations of any magnitude require the use of a terminal network where freight is gathered, combined, loaded, moved, unloaded, sorted, loaded again, and delivered to the final destination. This process may involve moving the freight through several terminals. A trucking firm offering nationwide service may find it necessary to have network of up to 300 terminals or more to carry out the sorting and combining of freight. Regional LTL and intrastate firms offering service to a limited geographical area also may find it necessary to employ the use of terminals (Glaskowsky, 1986).

Carriers are split and categorized by revenue. Class I LTL carriers include carriers with revenues above $5.78 million and Class II carriers with revenues between $5.78 million and $1.16 million (Smith et al., 1989).

Development of the LTL Industry

The trucking industry evolved from the development of the internal combustion engine and the use of the motor car. The U.S. army tested the usefulness of the motor truck in 1912. A motor truck was overloaded and covered some 1500 miles. This innovative technological venture was deemed a success (Childs, 1985). Road improvements and development of the pneumatic tire promoted the growth of trucking industry more than any other development. The development of the interstate highway system provided an ideal venue for the motor carrier industry.

LTL is a result of the trucking industry competing with the railroads for less-than-carload (LCL) business, also known as high-value freight. The LTL industry grew out of the consolidated trucking efforts of the industry pioneers. Truckers viewed consolidation as a survival tool where cooperation allowed truckers to be more competitive, increasing service to shippers, and provided the advantage of scale economies (Childs, 1985). The trucking industry provided a better fit to high value freight over rail because of the multiple handling needed for shipping. The trucking industry cut into the LCL business because the LCL could not use the scale economies of the rail industry (Childs, 1985). Although the trucking industry first facilitated railway terminal service, it eventually competed directly with it

by eliminating the rail portion of the service. This now has gone full circle with the use of containers and trailers on flat cars. Large LTL firms consolidate loads and use the rail system to decrease costs for longer movements.

Regulation To Deregulation

Transportation legislation before 1935 mainly regulated the monopolistic industry of the railroad. Little attention was given to other developing modes until congress initiated the Motor Carrier Act (MCA) of 1935, which is viewed as the first major step at the federal level for regulating not only trucking, but other modes as well (Coyle, 1990). The Interstate Commerce Commission (ICC) in 1932 determined a need for motor carrier regulation. The commission concluded that the ease of entry, absence of regulation, and operator cost ignorance sentenced the industry to instability from excessive competition (Felton and Anderson, 1989). This unrestrained competition was summarized by the commission as follows:

1. An instability in charges for transportation affected by the competition, resulting in widespread and unjust discrimination between shippers and uncertainty as to the basis upon which business may be done.

2. The loss of much capital invested in both the railroads and the motor vehicles.

3. Radical changes in the railroad rate structure which, in the final analysis, may result in loading the traffic that is not affected by the competition with the utmost charges it is able to bear.

4. A tendency to break down wages and conditions of employment in the transportation industry.

5. Increase in the hazardous use of the highways.

The MCA of 1935 established for brokers and for-hire carriers a comprehensive set of regulations similar to those regulating the rail industry. These rules became Part II of the Interstate Commerce Act and the regulation's intent was to address discrimination, rate making, and provide adequate service (Coyle et al., 1994). Regulation of transportation began with the railroad in the 1800s and became inclusive of all modes until turnabout in the early 1950s with deregulation of fresh dressed and frozen poultry and frozen vegetables (ICC, 1976). The reversal trend continued in 1976 with the passage of the 4-R act, which empowered the ICC to exempt certain rail movements from economic controls (Coyle et al., 1994). Deregulation of other transportation modes was soon to follow.

Regulation and LTL

Regulation set the stage for the LTL industry. The LTL freight was moved by integrated motor carriers who were in the business of collecting freight for shippers in local trucks. The freight was unloaded at an origin terminal for consolidation into one trailer for motor carrier intercity movement. There was an option of assembly or disassembly at intermediate breakbulk terminals and finally the freight was unloaded, sorted, and delivered to the destination (Elzinga, 1994). Where the LTL operator had no operating authority it was necessary to use other regulated LTL carriers for completion of the movement. The end of regulation changed large portions of LTL traditional markets. Although some opponents of deregulation argued that deregulation would result in LTL carrier oligopoly power, this has not

happened. Deregulation has in many instances plunged the LTL sector of the industry into competition with the TL sector. It is now argued that under deregulation, and because of the environmental changes, many shippers and receivers are moving toward an integrated logistics operation. Thus, substitutability exists between TL and LTL (Elzinga, 1994).

Other competitive forces also exist in the trucking industry. The intermodal freight business has changed with the use of trailers on flat cars (TOFC) or containers on flat cars (COFC). As of 1988, 98 percent of the intermodal freight was originated by the LTL industry (McMullen, 1991). This statistic would bear the fears of the opponents of deregulation again in the form of concentration. The concentration, however; again has been uprooted by the entry of TL motor carriers who many times contract directly with rail lines or to freight forwarders and shipping associations. The competition from other entities for the same service has kept rates down and the availability of substitution protects against monopoly power being exercised by the larger LTL carriers (McMullen, 1991).

The MCA of 1980 brought many aspects of trucking regulation full circle with partial deregulation of motor carriers. This controversial act was opposed by many of the regulated motor carriers because regulation meant stability and in their view, "reasonable" competition, which they argued provided the public with reliable service and reasonable costs (Coyle, 1994). The goals of the new motor carrier legislation were to meet the needs of shippers, receivers, and consumers while allowing the price of motor carrier transportation to reflect competition in the industry. It was argued that in a regulated environment, rate-making allowed

inefficiencies to exist, which would have been competed away by efficient firms in an unregulated environment (Rakowski, 1988).

LTL Since Deregulation

Motor carrier deregulation has reshaped the LTL industry. Many failures have occurred in both the truckload and LTL industries. There have been many new entrants into the trucking industry, but almost without exception the entry has been in the truckload sector. The capital required to create a nationwide terminal system for the LTL sector is a natural barrier for new entrance (Baker, 1989).

Although the truckload sector may provide competition, large firms still may have an advantage in servicing customers for LTL service over a national network. These marketing economies enjoyed by larger firms allow them to obtain business from shippers through discounts and close relationships in the deregulated environment (Emerson et al., 1987). The three largest LTL providers prior to deregulation remain the big three, although the ranking has changed. However, of the 10 largest carriers in 1979 only the big three are still in business (Rakowski, 1994).

Rakowski (1994) found that except for the big three, there have been large changes in the 50 largest LTL carriers since 1979. This restructuring of the industry has allowed the big three in the industry to capture an increased market share. The percentage of revenue for the big three LTL carriers grew from 26 percent in 1979 to 41 percent in 1992 (Rakowski, 1994).

Concentration has grown in the LTL industry with larger LTL providers operating smaller LTL trucking companies through holding companies. For instance, Roadway owns the 2nd, 14th, 16th, 33rd, and 34th largest LTL carriers (Rakowski, 1994). Yellow Freight and Consolidated, the other two large LTL carriers, control or own smaller LTL providers (Rakowski, 1994). Smaller companies also are involved in the holding company business, although nowhere near the density of the big three. Of the 50 largest LTL firms in 1992, 18 firms were controlled by six holding companies. This amounted to 64.2 percent of total operating revenue for the top 50 firms (Rakowski, 1994).

LTL Service

A concern of opponents to motor carrier deregulation was the level of service that would be provided in rural and less populated areas of the country. A major concern is that small businesses tend to ship and receive in relatively small quantities, which is where LTL service plays a role. Large volume shippers have more transport options available including private carriage, contract or common carriers, and rail. Several studies were performed to measure impacts the MCA of 1980 would have on small businesses and rural communities (Athearn, 1989). In a deregulated environment LTL providers are able to pick service areas, and may choose not to provide service in unprofitable or low traffic areas.

Studies funded by the federal government, prior to and after deregulation, focused on the effects of deregulation on small business and rural areas. Athearn (1989) contended that

the toll on these areas took longer than anticipated, and early studies of impacts of deregulation did not reflect the long-term effects.

Athearn (1989) used a combination of the Rocky Mountain Motor Tariff Bureau Inc. rules and rate tariffs and survey and interview processes in an attempt to determine the change in LTL service areas in 14 western states as a result of deregulation. The study focused on abandoned service, because of bankruptcy, or just canceled service. Athearn (1989) found that in 11 western states (where service points were identified) that 66 percent lost all LTL service and 21 percent lost some service and 13 percent retained all service. This clearly shows that for some rural areas of the Western U.S. there has been significant decreases in the number of full-service common carriers capable of delivering LTL service. Part of the objective of this study is to determine the structure of the LTL industry in the mountain-plains region. This will include the level of service provided by the LTL industry and the level of technology of LTL firms. Technological changes may improve efficiency and increase the level of service that can be provided by an LTL carrier.

Information Systems

New technologies have greatly impacted many industry groups including transportation. Instantaneous information can be used in the place of labor and provide efficiency gains for firms willing to use the new technology.

Electronic Data Interchange

An important component of new technologies is electronic data interchange. Electronic data interchange (EDI) may reduce time spent billing and doing accounting procedures. EDI is direct computer-to-computer communication that can be processed by the receiver avoiding the errors associated with the re-keying of information. EDI facilitates the move toward efficiency in supply-chain management and motor carriers may be expected to provide EDI (Crum, Premkumar, and Ramamurthy, 1996).

EDI may be used to process freight bills, purchase orders, invoices, production schedules, and quick response initiatives. EDI is becoming more prevalent in the trucking industry. The importance of transportation in supply-chain management is pushing the industry to increase the use of EDI (Crum et al., 1996).

ITS-CVO

Another technological change affecting the trucking industry is the use of Intelligent Transportation Systems for Commercial Vehicle Operation (ITS-CVO). ITS-CVO may go a long way toward reducing delay times associated with meeting safety and weight regulations. Reducing the regulatory red tape for both the trucking industry and government agencies is an objective of the Federal Highway Administration. The program that has been introduced in many states is the Intelligent Transportation System for Commercial Vehicle Operation (ITS-CVO).

Historically, to enforce regulations in the trucking industry trucks stop at weigh stations in route to their destination. An official at the weigh station determines if the vehicle and driver are legally qualified to operate in that state. The objective of ITS-CVO is to clear a vehicle before departure for a particular corridor. This would mean that pre-cleared trucks could be scanned in- transit eliminating the previous procedure of stopping at weigh stations.

The national program for ITS has goals and objectives related to all forms of traffic and conditions of the surface transportation system. The goals of the ITS program are:

- Improve the safety of the nation's surface transportation system
- Increase the operational efficiency and capacity of the surface transportation system
- Reduce energy and environmental costs associated with traffic congestion
- Enhance present and future productivity
- Enhance the personal mobility and the convenience and comfort of surface transportation system
- Create an environment in which the development and deployment of ITS can flourish.

The above goals were set forth by the Intermodal Transportation Efficiency Act (ISTEA) of 1991. The goals are more than implementation of CVO, they are an integral part of the ITS plan. ITS is directed to the expansion and deployment of a collection of related user services. These services are bundled because of similarities that exist among them.

Table 2.1 shows the different bundles of proposed ITS initiatives. Some are in the planning stages and others are either being used or tested. This table is adapted from the National ITS Program Plan and is designed to show the bundles and associated services.

ITS/CVO would use communication and computer technology to track and provide information for both the regulatory agencies and the motor carrier. The carrier may be warned of bad weather and road conditions while the regulatory agency could determine origin and destination, cargo, weight, and driver information. The system should save time and transaction costs for the motor carrier and governmental regulatory agencies and reduce traffic hazards now created at weigh stations by trucks exiting and entering the roadway. Congestion problems also may be eluded in high traffic areas containing weigh stations.

Table 2.1 User Service Bundle

Bundle	User Service
1. Travel and Transportation Management	1. En-Route Driver Information 2. Route Guidance 3. Traveler Services Information 4. Traffic Control 5. Incident Management 6. Emissions Testing and Mitigation
2. Travel Demand Management	1. Demand Management and Operations 2. Pre-Trip Travel Information 3. Ride Matching and Reservation
3. Public Transportation Operations	1. Public Transportation Management 2. En-Route Transit Information 3. Personalized Public Transit 4. Public Travel Security
4. Electronic Payment	1. Electronic Payment Services
5. Commercial Vehicle Operations	1. Commercial Vehicle Electronic Clearance 2. Automated Roadside Safety Inspection 3. On-board Safety Monitoring 4. Commercial Vehicle Administrative Processes 5. Hazardous Materials Incident Response 6. Freight Mobility
6. Emergency Management	1. Emergency Notification and Personal Security 2. Emergency Vehicle Management
7. Advanced Vehicle Control and Safety System	1. Longitudinal Collision Avoidance 2. Lateral Collision Avoidance 3. Intersection Collision Avoidance 4. Vision Enhancement for Crash Avoidance 5. Safety Readiness 6. Pre-crash Restraint Deployment 7. Automated Highway System

Source: National ITS Program Plan (March 1995).

There are several concerns related to the implementation of ITS-CVO. Two of the concerns highlighted by Titus (1994) are mentioned below. First, the initiatives must satisfy the industry's data privacy concerns. The increased information being communicated may be

considered proprietary for carriers as well as for shippers, and keeping the information private may be of the utmost concern.

Second, ITS-CVO should promote efficiency without sacrificing safety. It should be a goal of government to assist industry to increase efficiencies for mutual gains to ensure global competition, customer satisfaction, and growth for the industry, while not adversely affecting safety. More importantly, while many regulatory initiatives are necessary to insure safety, they should be administered in a way that is least costly to all parties involved. Thus, the costs of implementing ITS-CVO operations must be weighed against the benefits of reduced individual firm compliance costs. Moreover, ITS-CVO must be examined from a societal welfare perspective. Although LTL firms may be completely in favor of ITS-CVO because of reduced firm operating, the change in total societal compliance costs must be weighed against the change in total operating costs. If given a choice, firms will choose the least cost method of compliance, either stopping at weigh stations, or ITS-CVO.

CHAPTER III. RESEARCH METHODS

In this chapter the data collection and analysis procedures are discussed. The section on data collection includes the survey group selection process and mailing. A summary to the response rate is also shown.

Data Collection

A mail survey was sent to trucking firms in North Dakota, Montana, South Dakota, and Wyoming to determine the characteristics and the level of LTL service in the rural states (Appendix A). The survey was structured to determine the size of firms, if regional or national carriers are providing LTL service, and also the level of technology employed by LTL firms. The survey also asked the managers' opinions on ITS-CVO, and if usage would increase. The survey group and analysis are further described in this chapter.

Selected Survey Recipients

Surveys were mailed to a population of trucking firms based on whether they provided service to the larger cities of North Dakota, Montana, South Dakota, or Wyoming. This was done by using the yellow pages for a listing of the companies. The larger cities in the states were also geographically chosen to get coverage of all areas of the states.

The North Dakota cities included Fargo, Grand Forks, Bismarck, Minot, Williston, and Dickinson. Montana cities included Billings, Sidney, Great Falls, Missoula, and Bozeman.

The Wyoming cities included Rock Springs, Sheridan, Gillette, Casper, and Cheyenne. South Dakota cities included, Rapid City, Belle Fouche, Pierre, Watertown, and Sioux Falls. These cities were chosen because of their size and geographical location in each state. The goal was to cover all areas of a state. Common carriers were chosen because they offer their services to the public and would more likely be LTL carriers. Surveys were mailed to all common carrier firms listed in the Yellow Pages for the selected cities.

Mailings

A total of 221 surveys were mailed.. A reminder postcard was mailed to every firm on the original mailing list two weeks later. Six surveys were returned undeliverable. In addition, four firms indicated they were no longer in business. Of the surveys returned, 37 contained usable information for a usable response rate of 17 percent.

Survey Design

The survey included 24 questions. It contained a combination of open-ended and multiple choice questions (see Appendix A for the complete survey). The survey contained three main topic areas. The first section was to determine the characteristics of the firm. The design of the 14 questions determined firm size, type of carrier, and the service area.

The second section of the survey asked respondents about the technology level of the firm and the use of intelligent transportation systems for commercial vehicles (ITS/CVO) used

by their firm. This section also queried the availability and types of ITS/CVO features in the states serviced by their firm.

The last section of the survey asked the firm's opinion about ITS/CVO. These questions were presented in a scaled format and included a range of five choices for each particular question. This section determined how a trucking firm manager perceives ITS/CVO and whether managers believe that ITS/CVO adds value to the industry.

The last page of the survey provided a space for comments from the respondents. A cover letter was included with the survey and outlined the objective of the research.

Data Analysis

Data were entered into Lotus 1-2-3 for analysis. Averages and total respondents were computed. The data also was categorized by firm size, whether or not a firm provided LTL service, and technology characteristics. The following chapter describes the results of this analysis.

CHAPTER IV. SURVEY RESULTS

This chapter presents overall results and the results of individual questions. Discussion of question results also are presented.

Mail Survey

The mail survey was used to gather information about LTL carriers in the mountain-plains region (Appendix A). The survey reflected many size differences among companies serving the region. Some of the ITS-CVO (intelligent transportation systems for commercial vehicle operations) questions went unanswered. This may be because of the lack of the firms' knowledge of ITS-CVO or lack of availability of ITS-CVO in certain areas.

Respondent Firm Size and Characteristics

Respondents to the survey included all classes of motor carriers (Table 4.1). Small firms with less than $1 million in revenue made up 18.9 percent of all respondents. The second group, between $1 and $2 million in revenue, made up 16.2 percent, while the group between $2 and $3 million consisted of 10.8 percent. The groups of $3 to $4 million and $4 to $5 million each made up 5.4 percent of respondents. Large firms with greater than $5 million in revenue made up the greatest percentage of respondents at 43.2 percent. When adding groups together, firms with revenue of less than $4 million represented 51.3 percent of all respondents and firms with more than $4 million in revenue made up 49.7 percent of respondents.

Table 4.1. Percent of Respondents Based on Revenue Levels

Revenue Level	*Number of Respondents*	*Percent of Respondents*
Less than $1,000,000	7	18.9%
$1,000,001 to $2,000,000	6	16.2%
$2,000,001 to $3,000,000	4	10.8%
$3,000,001 to $4,000,000	2	5.4%
$4,000,001 to $5,000,000	2	5.4%
Greater than $5,000,000	16	43.2%
Total	37	100%

Respondents also were categorized by whether or not they provided LTL service. The question asked respondents to indicate the percentage of revenue from LTL service or to enter a range (Appendix 1, Question 2). Respondents reporting no LTL service were 35 percent. Twenty-seven percent of the respondents reported less than 20 percent of their revenue was produced from LTL service. Firms reporting between 21 to 40 percent was 5.4 percent. A small number of respondents, 2.7 percent each, received 41 to 60 percent and 61 to 80 percent of their revenue from LTL. The last two groups of respondents, 81 to 100 percent and 100 percent LTL, each made up 13.5 percent of the respondents (Table 4.2). More than 60 percent of respondents reported less than 20 percent of their revenue from LTL service.

Table 4.2. Percent of Revenue from Less-Than-Truckload

Less-than-truckload Service	*Number of Respondents*	*Percent of Respondents*
None	13	35.1%
Less than 20 percent	10	27.0%
21 to 40 percent	2	5.4%
41 to 60 percent	1	2.7%
61 to 80 percent	1	2.7%
81 to 100 percent	5	13.5%
100 percent	5	13.5%
Total	37	100%

Twenty-seven percent of respondents reported more than 80 percent of revenue from LTL service. The total revenue received from LTL service for all respondents was 33 percent.

The third and fourth questions also were a measure of firm size. Question three asked the respondent to indicate the number of power units owned and leased. The number of respondents that owned 30 power units or less was 64 percent, while 36 percent owned 50 or more. No respondents reported owning between 30 and 50 power units. A smaller number of respondents reported leasing power units than owning them. Of the respondents that reported leasing, 59.1 percent leased 30 or fewer power units and 40.9 percent reported leasing 31 or more power units.

A small number of respondents reported operating straight trucks or delivery trucks that all are in a single unit. Of the respondents operating straight trucks, 46 percent operate five or less. Fifteen percent of respondents reported owning more than 100 straight trucks. Only two

respondents reported leasing straight trucks and both reported less than five straight trucks leased.

Question five categorized respondents based on the types of equipment operated (Table 4.3). Dry van was the most popular trailer used, followed by flatbed and refrigerated van, intermodal and finally tanker. Other equipment used included hopper bottom, car carriers, livestock trailers, and heavy haul or equipment hauling trailers.

Table 4.3. Percent of Respondents and Equipment Type

Equipment	*Number of Respondents*	*Percent of Respondents*
Dry Van	23	67.6%
Flatbed	14	41.2%
Refrigerated Van	14	41.2%
Tanker	1	2.9%
Intermodal	2	5.9%
Others	8	23.5%

Percentages in Table 4.3 do not add to 100 percent because of firms using multiple types of equipment.

Respondents were provided ranges to indicate the average length of haul (Table 4.4). Responses were relatively evenly distributed across the ranges. The most common range for average length of haul was 900-1,200 miles, while the lowest number of respondents had an average length-of-haul between 400 and 900 miles (Table 4.4)

The next question asked for the annual tonnage of the firm. This question is another indicator of company size. Of the 17 respondents, 47 percent had annual tonnage of less than a

100 thousand tons, 29.3 percent had annual tonnage of between 101 and 500 thousand tons and 23.5 percent of firms haul more than 500 thousand tons annually.

Table 4.4. Length-of-Haul

Range in miles	*Number of Respondents*	*Percent of Respondents*
0-300	6	17.1%
300-600	7	20.0%
600-900	5	14.3%
900-1200	10	28.6%
Greater than 1200	7	20.0%
Total	35	100.0%

Question eight asked respondents for total annual miles. Respondents reporting one million annual miles or less were 22.2 percent, and respondents reporting one million to five million annual miles were 38.9 percent. The percentage of respondents with greater than 5 million annual miles also was 38.9 percent. .

Questions nine and ten also related to firm size. Question nine asked respondents about their annual operating costs, while question ten asked them to report capital costs. There was a smaller response to these questions than to questions about annual revenue and the number of trucks operated by the firm. Responses to question nine showed that 15 percent had less than $1 million in operating costs, 60 percent had less than $4 million in operating costs, and 40 percent of respondents reported more than $5 million in operating costs. In contrast, 46.7

percent of respondents had less than $500 thousand in annual capital costs and 80 percent had $3 million or less, leaving 20 percent with greater than $5 million in annual capital costs.

Question 11 queried respondents for the top three commodities hauled and the percentage of revenue for each. The commodity most often listed was food which made up 41 percent of the responses followed by general freight at 29 percent and building material at 21 percent. Respondents listed a total of 33 different freight items.

Question 12 ask respondents their percentage of revenue derived from the mountain-plains states of North Dakota, Montana, Wyoming, and South Dakota (Table 4.5). North Dakota had the highest average percent of revenue with 19 percent, while South Dakota had the highest number of respondents providing service. Wyoming had the least number of respondents providing service and also the lowest percentage of revenue for the respondents. Although the average percent of LTL revenue of firms providing service to the mountain-plains states was 14.7 percent, the 5 largest carriers reported that less than five percent of their total revenue was generated in the mountain-plains states.

Table 4.5. Amount of Revenue from North Dakota, Montana, South Dakota, and Wyoming

State	*Number of Respondents*	*Average Percent of Revenue*
North Dakota	29	19.0%
Montana	26	18.5%
South Dakota	30	13.9%
Wyoming	20	7.3%

Respondents also were asked if they were national or regional carriers and of the 34 respondents, 19 were national and 15 considered their firm to be regional. Other states served by the regional carriers included Minnesota, Iowa, Kansas, Illinois, Nebraska, Mississippi, Missouri, Oklahoma, Texas, and Colorado.

Technology Characteristics

Question 16 asked respondents if they used EDI (electronic data interchange). Of the 36 respondents, 44.4 percent responded yes and 56.6 percent responded no. A recent study reported that in 1990 only about 30 percent of motor carriers were using EDI, but expected an increase in the next five years (Crum, Premkumar, and Ramamurthy, 1996). The next question asked with what percentage of customers do the respondents use EDI. If the respondent answered no to question 16 the next three questions were irrelevant.

Of the 15 respondents to question 16, the average use of EDI was 14 percent. This ranged however from a low of 2 percent to a high of 75 percent. The median of the range was 5 percent, which indicates that there was a small number of customers using EDI with the respondents.

Question 17 examined the type of computer hardware the respondents were using for EDI (Table 4.6). Networks and mainframes were the most popular hardware option for respondents, with 42.8 percent using networks and 37.5 percent using mainframes.

Table 4.6. Hardware Use for EDI

Hardware Type	*Number of Respondents*	*Percentage of Respondents*
Mainframe	6	37.5%
Minicomputer	2	12.5%
Microcomputer	1	6.3%
Network	7	43.8%
Total	16	100.0%

The types of EDI features that a firm may use with a customer varies. A firm could use all or a portion of the features. These features include invoices, purchase orders, freight bills, production schedules, and quick response initiatives or just in time. Table 4.7 shows that freight bills are the most commonly used EDI service. The nine respondents used EDI freight bills with an average 28 percent of their customers.

Table 4.7. Percent of Customers Using an EDI Service

EDI Services	*Number of Respondents*	*Percentage of Customers*
Invoices	5	21.0%
Purchase orders	3	8.6%
Freight Bills	9	28.0%
Production Schedules	4	11.5%
Quick Response Initiatives	5	8.2%

The next question in the survey is if a firm uses satellite tracking for freight or satellite communications. Of the 36 respondents 16.7 percent indicated they used satellite tracking. Of the firms using satellite technology, 66.7 percent also indicated using EDI. This may be an indication of the technological progressiveness of firms using EDI.

The next five questions in the survey queried respondents about ITS-CVO (Intelligent Transportation Systems for Commercial Vehicle Operations). Question 20 asked if the respondent used ITS-CVO. Of the 36 respondents, only 11.1 percent indicated using ITS-CVO.

The next question examined whether ITS-CVO was available in the companies service area. There were 27 respondents and 48.1 percent indicated that ITS-CVO was available in their service areas. Although firms indicated that ITS-CVO was available in their service area, the survey failed to recognize the exact states where ITS-CVO was offered.

Question 21 inquired about the features of ITS-CVO available to companies operating in areas where ITS-CVO is available. Electronic clearance was the most available feature for ITS-CVO with 5 firms reporting it being available (Table 4.8). Only a small number of respondents reported on the type of ITS-CVO features available in their service area.

Table 4.8. ITS-CVO Availability to Trucking Companies

ITS-CVO Features	*Number of Respondents*	*Percentage of Respondents*
Commercial Vehicle Electronic Clearance	5	50%
Automated Roadside Safety Inspection	2	20%
On-board Safety Monitoring	0	0%
Commercial Vehicle Administrative Process	1	10%
Hazardous Material Incidence Response	1	10%
Freight Mobility	1	10%
Total	10	100%

Opinions on Current Policies and Future Trends for ITS-CVO

Respondents also were asked their opinion on ITS-CVO. The first question inquired whether or not the respondent thought that ITS-CVO would become more or less prevalent in the trucking industry (Table 4.9). The respondents were asked to circle a number of one through five, with one being less prevalent and five being more prevalent. Among the respondents 63.3 percent circled four or above and leaned toward ITS-CVO becoming more prevalent in the future.

Table 4.9. Respondent's Opinion on Whether ITS-CVO Will Become More or Less Prevalent

Mean	Will become less prevalent				Will become more prevalent
	1	2	3	4	5
3.73	3.3%	3.3%	30.0%	43.3%	20.0%

Respondents were then asked whether or not ITS-CVO adds efficiency to the trucking industry. The respondents were again asked to circle a number of one through five, with one least efficient and five as most efficient. The response was exactly the same as for the previous question and indicates that if a respondent feels it will become more prevalent, ITS-CVO also will add efficiency (Table 4.10).

Table 4.10. ITS-CVO Adds Efficiency or Does Not Add Efficiency to the Industry

Mean	*Does Not Add Efficiency*				*Does Add Efficiency*
	1.00	2.00	3.00	4.00	5.00
3.73	3.3%	3.3%	30.0%	43.3%	20.0%

Firm Size and Technology

A high percentage of respondents offered LTL service and more than 80 percent of these firms with 50 or more power units reported using EDI (Table 4.11). This also may be true with ITS-CVO, although only large firms claim usage of ITS-CVO. Only respondents with more than 100 power units are using ITS-CVO. This may reflect high capital costs associated with the ITS-CVO technology.

Table 4.11. Company Size and Technology

Number of Power Units	*Percent of Respondents Offering LTL Service*	*Percent of Respondents Using EDI*	*Percent of Respondents Using ITS-CVO*
1-10	70.0%	20.0%	0.0%
11-25	83.3%	0.0%	0.0%
26-50	85.7%	28.6%	0.0%
51-100	66.7%	83.3%	0.0%
More than 100	87.5%	87.5%	25.0%

Summary

Respondents to the survey indicated performing both TL and LTL service. Large companies that claimed they serve the mountain-plains states, only reported a small portion of their revenue from these states. Larger companies are more likely to use EDI or ITS-CVO, but more companies may adopt these technologies as they become easier to use and with increased availability, However, to the extent that the higher use of EDI or ITS-CVO technology reflects high capital costs, ITS-CVO may present a new source of economies of scale. This would suggest another round of restructuring in the trucking industry.

CHAPTER V. SUMMARY AND CONCLUSIONS

This study examined LTL carriers in the mountain-plains region of North Dakota, South Dakota, Montana, and Wyoming. Many rural communities rely on the LTL industry for freight movements into and out of the region. The level of LTL service in the mountain-plains region is unknown in a post-regulated environment.

A new environment emerged in the motor carrier industry after deregulation of the trucking industry in 1980. Probably the most prevalent occurrence in the LTL sector of the trucking industry is the large number of bankruptcies. These bankruptcies were caused by different reasons for different companies. Many firms failed to adjust to the competitive environment under deregulation. Although deregulation may have been disastrous for many trucking companies, many shippers have realized rate reductions because of the increased competition in the trucking industry.

In this study, a mail survey was sent to trucking firms in North Dakota, Montana, South Dakota, and Wyoming to determine the characteristics and the level of LTL service in the rural states. The survey was structured to determine the size of firms that are providing LTL service to the mountain-plains states and their level of technology. Chapter IV presented the overall results of the survey. Some of the findings and conclusions included the following.

Characteristics of Respondents

Respondents were mainly either small or large firms with only a few intermediate size firms responding. Firms with less than $2 million in annual revenue accounted for 35 percent of respondents and 43 percent of respondents had more than $5 million in annual revenue. The group between $2 million and $5 million in annual revenue made up 22 percent of respondents. More than 60 percent of respondents reported less than 20 percent of annual revenue from LTL service, however 20 percent of respondents reported more than 80 percent of their annual revenue from LTL service.

Approximately 64 percent of respondents reported owning less than 30 power units, while 36 percent reported owning 50 or more power units. Of respondents leasing power units, 60 percent leased 30 or less and 41 percent reported leasing 31 or more. A small number of respondents reported operating straight trucks. Dry vans were used by 68 percent of the respondents, and flatbeds and refrigerated vans were both reported being used by 41 percent of respondents. Many other equipment types also were reported.

The length-of-haul was evenly distributed with the highest number of respondents reporting 900-1,200 miles at 29 percent. Respondents reporting less than 300 mile hauls were 17 percent, while 20 percent of respondents reported hauling greater than 1,200 miles. Respondents reporting hauling less than 100 thousand tons annually were 47 percent. Twenty-three percent reported hauling more than 500 thousand tons.

Technology Characteristics

Only 44 percent of all survey respondents reported using EDI. They reported using EDI with an average of 14 percent of their customers. The percentage of customers using EDI with respondents ranged from a low of 2 percent to a high of 75 percent with a median of 5 percent.

Networks and mainframes are the most popular types of computer hardware being used by respondents for EDI with 43 percent using networks and 38 percent using mainframes.

The most popular EDI feature between respondents and their customers is the freight bill. Respondents using EDI for freight bills, reported using it with 28 percent of their customers. The next most popular EDI feature is invoices, which are reported as being used with 21 percent of customers.

The number of respondents reported using satellite tracking is 17 percent. Of the firms using satellite technology, 67 percent also reported using EDI. This may indicate that the technological sophistication of firms using EDI also may be representative of firm size.

Only 11 percent of respondents indicated using ITS-CVO and only 48 percent of respondents indicated that ITS-CVO was available in their service area. In reporting opinions about ITS-CVO, 63 percent thought that ITS-CVO would become more prevalent in the future and would add efficiency in the trucking industry. Only carriers with 100 or more power units reported using ITS-CVO.

Conclusion

This study found that there are a wide range of carrier sizes performing LTL service in the mountain plains region. The level of service is undetermined, but it is clear that many companies are performing both TL and LTL services in the region. The level of technology is clearly more advanced in larger companies and larger carriers are likely to adopt all types of technology available. ITS-CVO is not used extensively in the region, but the opinion of the majority of carriers is that it will become more prevalent and does add efficiency to the industry.

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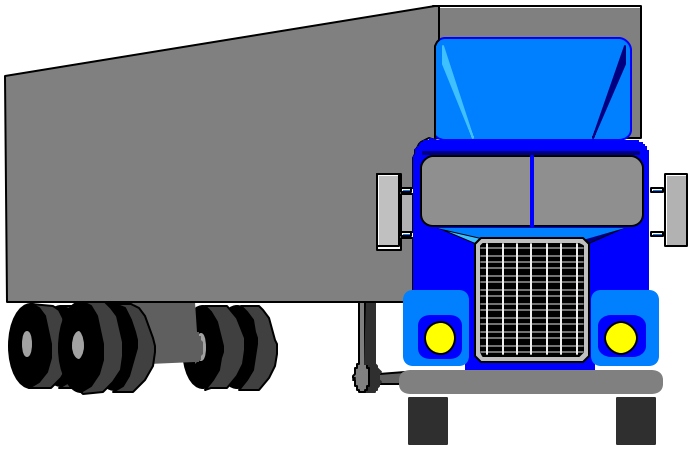
APPENDIX A

Survey of Regional LTL Carriers

STRUCTURE OF REGIONAL LTL CARRIERS



May 1997

The Upper Great Plains Transportation Institute
North Dakota State University
P.O. Box 5074
430 IACC Building
Fargo, North Dakota 58105-5074

Instructions

1. **Please read and answer all questions carefully.**

2. **Select the response that best represents your feelings. There is no right or wrong answer.**

3. **When you have finished, place this survey in the business reply envelope. You do not need a stamp to mail this.**

4. **Please return this survey within 2 days after receiving it.**

5. **Feel free to use any white space as well as the back of this survey for any comments you may have.**

ALL RESPONSES AND COMMENTS ARE ANONYMOUS

WE WILL NOT REPORT ANY INDIVIDUAL FIRM'S RESPONSES

THANK YOU FOR YOUR HELP

If you have any questions or concerns regarding this survey, please call Mark Berwick with the Upper Great Plains Transportation Institute at NDSU, phone number (701) 231-9594.
My e-mail address is *mberwick@plains.nodak.edu* and is checked daily.

FIRM CHARACTERISTICS

This section asks you to provide some basic information about your company. This will be useful to determine services offered by company size and location.

Q-1. Please indicate your revenue level.

$_____

If not indicating an exact revenue level, then please indicate a revenue range.
____ Less than $1,000,000
____ $1,000,001 to $2,000,000
____ $2,000,001 to $3,000,000
____ $3,000,001 to $4,000,000
____ $4,000,001 to $5,000,000
____ Greater than $5,000,000

Q-2. Please indicate the percentage of your revenues that are from less-than-truckload services (LTL).

_____%

If not indicating an exact percentage, then please indicate a range of LTL.

_____ None
_____ Less than 20 percent
_____ 21 to 40 percent
_____ 41 to 60 percent
_____ 61 to 80 percent
_____ 81 to 100 percent
_____ 100 percent

Q-3. Please indicate the number of power units you operate.

_____ owned

_____ leased

Q-4. Please indicate the number of straight trucks you operate.

_____ owned

_____ leased

Q-5. What types of trailers do you use? (Circle all that apply)

1. Dry van
2. Flatbed
3. Refrigerated van
4. Tanker
5. Intermodal
7. Other (specify): _____

Q-6. **Please indicate your average length of haul.**

_____miles

Q-7. **Approximately how many tons does your firm haul annually?**

_____tons

Q-8. **Approximately how many miles does your equipment drive annually?**

_____miles

Q-9. **What are your approximate annual operating costs?**

$_____

Q-10. **What are your approximate annual capital costs?**

$_____

Q-11. **Please list the top three commodities and their percentage of your revenue.**

Commodity Type	**Percentage**
_____	_____%
_____	_____%
_____	_____%

(Must add to less than 100%)

Q-12. **Please list the percentage of your revenue generated in the following states:**

_____% in North Dakota
_____% in Montana
_____% in South Dakota
_____% in Wyoming

Q-13. **Would you consider your company national or regional?**

1. **National**
2. **Regional**

Q-14. **If you consider your company a regional carrier, please list the states you serve.**

_____

_____

_____

TECHNOLOGY CHARACTERISTICS

This section asks you to please provide some information on technology used by your firm.

Q-15. Do you use Electronic Data Interchange (EDI)? (Circle number)

1. No
2. Yes

If you answered YES to Q-15, please continue to Q-16. If you answered NO to Q-15, please go on to Q-19 .

Q-16. With what percentage of your customers do you use EDI?

_____ %

Q-17. What type of hardware are you using for your EDI system? (Circle all that apply)

1. Mainframe
2. Minicomputer
3. Microcomputer
4. Network

Q-18. What percentage of your customers use the following EDI features. (Enter percentage from 0 to 100 percent)

_____Invoices
_____Purchase Orders
_____Freight Bills
_____Production Schedules
_____Quick Response Initiatives or JIT
(May add to more than 100%)

Q-19. Do you use satellite tracking or communication systems? (Circle answer)

1. No
2. Yes

Q-20. Do you use any intelligent transportation systems for commercial vehicle operations technology (ITS/CVO)? *(See Q-22 for a sample of technologies)*

1. No
2. Yes

Q-21 Is ITS/CVO available for use in the corridors traveled by your firm?

1. No
2. Yes

Q-22 **What features of ITS/CVO, if any, are available for use by your firm?** ***(Circle all that apply)***

1. **Commercial Vehicle Electronic Clearance**
2. **Automated Roadside Safety Inspection**
3. **On-board Safety Monitoring**
4. **Commercial Vehicle Administrative Process**
5. **Hazardous Materials Incidence Response**
6. **Freight Mobility**

OPINIONS ON CURRENT POLICIES AND FUTURE TRENDS FOR ITS/CVO

This section asks you to provide opinions about some trends affecting ITS/CVO and the LTL sector of the trucking industry.

Q-23. **Do you feel ITS/CVO will become more or less prevalent in the trucking industry?** ***(Circle number)***

Will become less Prevalent				Will become more Prevalent
1	2	3	4	5

Q-24. **Do you feel ITS/CVO adds efficiency or does not add efficiency to the trucking industry?** ***(Circle number)***

Does not provide Efficiency				Does provide Efficiency
1	2	3	4	5

(Please turn to back cover)

Additional Comments

THANK YOU!