Backhaul Opportunities for North Dakota Grain Truckers

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Preface

This document is one of several reports that was written as part of the North Dakota Rail Services Planning Study. Other reports which are or will be available from this study include:

Costs and Profitability of Light Density Branch Lines: BN vs. Short Line Ownership. UGPTI Staff Paper No. 85, July 1987.

Report on Rail Services Planning Study Light Density Railroad Costing Methodology. UGPTI Staff Paper No. 84, May 1987.

Operating Costs and Characteristics of North Dakota Grain Trucking Firms. UGPTI Pub. No. 67, Aug. 1988.

Short Line Railroad Development Impacts on Rail Labor (forthcoming).

Short Line Impacts on Inter- and Intramodal Competition. (forthcoming).

Short Line Impacts on Shipper Service Levels. (forthcoming)

Conditions and Terms of Short Line Sales. (forthcoming)

This project is being conducted with funds provided by the Federal Railroad Administration. Copies of any of the reports can be obtained from:

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EXECUTIVE SUMMARY

The performance of the North Dakota grain trucking industry has been mixed during the past decade. Grain shipments by truck have declined from 185 million bushels in 1978-79 to 128 million bushels in 1987-88. In relative terms, truck's modal share of grain traffic has declined steadily from 40.6 percent in 1978-79 to 24.6 percent in 1987-88. Much of the decline can be attributed to the introduction of multiple-car rail rates and the ensuing changes in the grain elevator industry.

The grain trucking firms which have survived the industry decline have improved operationally. Evidence suggests that grain trucking firms are having more success in getting backhauls than they did in the late 1970s. However, it is still very difficult to get backhauls from the Duluth/Superior market.

Large firms have more success in getting backhauls than small firms because of greater experience and a wider network of contacts. The most serious problems when seeking backhauls are low backhaul rates, high broker commission costs, lack of Interstate Commerce Commission operating authority, and long search times. Grain trucking firms, especially owner-operators must continue working to overcome these problems if they hope to be successful in the long run.

BACKHAUL OPPORTUNITIES FOR NORTH DAKOTA GRAIN TRUCKERS

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Frank J. Dooley, Leslie M. Bertram, and Wesley W. Wilson*

I. INTRODUCTION

The ability to obtain a backhaul is essential to operating a profitable grain trucking firm. Historically the ability to obtain a backhaul was restricted by Interstate Commerce Commission regulation (Dempsey and Thoms). Legal restrictions limiting opportunities to obtain backhauls were relaxed with the enactment of the Motor Carrier Act of 1980. The easing of restrictions has led to more opportunities for grain trucking firms to obtain backhauls and to more intensive utilization of equipment.

In this report, the effect of backhaul traffic on the motor carrier industry and the determinants of backhaul success are examined. The report is part of a series of reports comprising the Rail Services Planning Study. Specifically, this report provides part of the information required to assess the competitive environment which exists between railroads and motor carriers within North Dakota.

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Little information about the status of the backhaul market, how it has been changing, and why these changes have occurred is readily available. The overall objective of this report is to assist grain trucking firms manage their backhaul opportunities. The specific objectives of this report are to:

1. identify and define the industry backhaul characteristics of North Dakota grain truckers;
2. determine and describe what methods are being used to obtain backhauls;
3. determine what obstacles prevent firms from obtaining backhauls; and
4. identify the determinants of and estimate the probability for obtaining backhauls from various markets.

After discussing the data sources, general backhaul characteristics of North Dakota grain trucking firms are inspected. Results from personal interviews with grain truckers are included to provide a more complete picture of current backhaul practices. Next, probability estimates for obtaining backhauls from various markets are estimated. The report concludes by summarizing the changes which have occurred and the general trends in backhaul for the grain trucking industry.

II. DATA SOURCES

The information required to evaluate backhaul in the grain trucking industry was gathered from a variety of sources. Secondary sources of information included previous Upper Great

Plains Transportation Institute trucking studies and a literature review of backhauling. The primary sources of data were telephone and personal interviews of grain truckers and a mail survey of motor carrier firms hauling grain from North Dakota.[1]

The same survey was used for the telephone and personal interviews of grain truckers. The telephone and personal interviews were conducted in October 1988. The personal interviews were administered at Fargo truck stops. The survey was a seven page series of open-ended questions dealing with backhaul. The focal point of the survey was on methods used by the truckers to obtain a backhaul. Further inquires were made about the frequency of backhauls, the rates received, and the markets served.

The mail survey utilized a combination of fill-in-the-blank and open-ended questions. The survey was ten pages in length, consisting of 121 questions. Due to the length of the survey, a booklet format was chosen to encourage a higher response rate. The mail survey questions were divided into four major sections, each addressing a particular concern of the study.[2] Section one was designed to provide general background information about each of the trucking firms. The second section was written to obtain data about each firm's terminal markets. Section three was

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[1]See Appendices A and B for copies of the questionnaires.

[2]Drafts of the survey were reviewed by Jon Mielke, Director of Traffic, North Dakota Public Service Commission.

structured to collect information about firm's operating costs. Finally, section four was designed to obtain information on how backhauling affected individual grain trucker's business.

A total of 879 questionnaires were mailed to North Dakota grain truckers in two different increments. The first set of surveys was sent in August 1987 and the second set was mailed in September 1987. In an attempt to increase the response rate, follow-up phone calls were placed to a sample of non-respondents in December 1987.

The sample frame for the first increment was developed from the 1985 Grain Truckers Directory and consisted of 355 firms. Seventy-four completed surveys and 3 incorrectly addressed surveys were returned from the first sample. It was felt that the response rate might be low due to the length of the survey. Thus, a post card was also enclosed with the survey asking firms to indicate if they were still in the grain trucking business.[3] Post cards were returned from 107 truckers, of which 83 were grain truckers and 24 were not. Hence, 77.6 percent of the 278 non-respondents or 216 firms are expected to be grain truckers. The response rate for the first sample was 25.5 percent (74/(216 + 74)).

[3]This information was also used to develop the North Dakota Grain Trucking Directory, 1988 which is available upon request from the Upper Great Plains Transportation Institute.

The questionnaire was administered to a second, independent sample to increase the number of firms in the study. This information also provides for a more complete grain trucking directory. The sample frame for the second increment was provided by the North Dakota Motor Vehicle Department and consisted of 524 trucking firms licensed in North Dakota. The trucking firms selected were primarily located in smaller, rural communities. Thirty-three completed surveys, 35 post cards (of which 9 were grain truckers and 26 were not), and 1 incorrectly addressed survey were returned. Following the same methodology as above, 25.7 percent of the 490 non-responding firms or 126 firms are expected to be grain truckers. Thus, a total of 159 grain truckers are expected in the second sample (126 + 33). This yields a response rate of 20.8 percent for the second sample (33/(126 + 33).

Combining the expected number of grain truckers from the two samples results in a total of 449 expected grain truckers in the industry. The cumulative total of 107 completed surveys out of a potential 449 estimated respondents yielded a response rate of 23.8 percent. In a final attempt to increase the response rate, a sample of 30 non-respondent firms were phoned and asked to complete the survey. Eight firms returned completed surveys, bringing the final response rate up to 25.6 percent.

III. INDUSTRY CHARACTERISTICS

The grain trucking industry has been declining during the last decade in absolute and relative terms. In absolute terms, the number of bushels of grain shipped by truck dropped from 185.2 million bushels in 1978-79 to 127.6 million bushels in 1987-88 (Table 1). In relative terms, truck's modal share of grain traffic has declined steadily from 40.6 percent to 24.6 percent in 1987-88.

TABLE 1. North Dakota Grain Trucking Shipment Patterns, in Percent, 1978-79 and 1987-88

Market	1978-79		1987-88	
	Million Bu.	%	Million Bu.	%
Minneapolis/St. Paul	32.2	17.4	27.7	21.7
Duluth/Superior	110.5	59.7	19.5	15.3
Pacific Northwest	13.0	7.0	4.9	3.8
North Dakota processors	na	na	41.4	32.5
Other	29.5	15.9	34.1	26.7
TOTAL	185.2	100.0	127.6	100.0

na = not available

SOURCE: Olsen and Zink.

In 1987-88, North Dakota processors were the most common fronthaul destination for North Dakota grain truckers at 32.5

percent (Table 1). After North Dakota processors, the most common fronthaul destinations were between other destinations (26.7 percent), Minneapolis/St. Paul (21.7 percent), Duluth/Superior (15.3 percent), and the Pacific Northwest (3.8 percent) (Table 1). Other destinations include locations across the continental United States.

The volume of grain trucked to each market declined in absolute terms between 1978-79 and 1987-88. The most dramatic decline occurred in the Duluth/Superior market, where truck traffic decreased by 91 million bushels (Table 1). The volume of grain trucked to Minneapolis/St. Paul and the Pacific Northwest declined by 5 and 8 million bushels, respectively. The volume of grain trucked to other markets increased slightly to 34 million bushels. A major difference between crop years 1978-79 and 1987-88 was the growth of truck traffic to North Dakota processors. In 1987-88, 41.4 million bushels of grain and oilseeds were trucked from North Dakota elevators to North Dakota processors.

The shift in traffic away from the Duluth/Superior market has had serious ramifications upon the truck market. Historically, the Duluth/Superior market was the strongest truck market for North Dakota grain shipments. The decline of that market has had a significant and negative influence upon grain trucking firms. Surviving firms now must compete in markets with stronger rail competition.

Major changes in the rail and grain elevator industries underlie the decline in truck traffic. First, rail deregulation in 1980 gave railroads greater pricing and operating flexibility. As a result, railroads introduced multiple-car and contract rail rates. The shipping cost savings associated with multiple-car and contract rates has led many grain shippers to use rail more extensively and become less dependent upon truck.

Second, grain marketing patterns have changed towards longer haul markets. This has further lessened motor carriers ability to compete with rail for grain traffic. Motor carriers have an advantage for short haul movements while railroads have an advantage on longer hauls (Wilson). Over the last decade, grain traffic patterns have changed to favor the rail competitive long haul movements. In 1978-79, 75 percent of the grain and oilseeds shipped from North Dakota went to the short-haul markets of Minneapolis/St. Paul and Duluth/Superior (Olsen and Zink). In 1987-88, only 42 percent of the grain and oilseeds moved to these markets (Olsen and Zink). More grain moved via rail to long-haul markets in the Pacific Northwest and Gulf ports.

Faced with increased rail competition and changing marketing patterns, grain truckers have found it increasingly difficult to compete. Increasing the loaded miles becomes an important factor as trucking firms work to increase the utilization of their equipment. In the remainder of this section, various firm

characteristics affecting the backhaul decision are examined to determine how motor carriers have adapted to changes in the competitive environment. The characteristics examined are firm size, markets served, length of time in business, operating authority, and pricing incentives.

FIRM SIZE

In general, larger firms have a greater number of resources and contacts which can be utilized to obtain a backhaul. It was hypothesized that differences may exist in the backhaul practices of small versus large grain trucking firms. To test this hypothesis, the survey data was segmented into three size categories. Firms with one tractor are classified as owner-operators, firms with two to four tractors are medium firms, and firms with five or more tractors are large firms.

The backhaul percentage from the principal markets served by North Dakota grain truckers were calculated (Table 2). As expected, backhauling patterns differ across the three firm size categories. For nearly every market, the largest firms had a higher proportion of obtaining backhauls. The weighted average of backhauls for all markets was 77.6 percent for large firms (Table 2). This was in comparison to 61.4 percent for medium firms and 47.2 percent for owner operators.

TABLE 2. Percent of Backhauls Obtained, by Market, by Firm Size, 1986

Market	Firm Size			
	Owner Operator	Medium Firm	Large Firm	All
	----------Percent----------			
Duluth/Superior	21.4	28.8	37.9	25.8
Minneapolis/St. Paul	66.5	73.7	85.3	71.3
Pacific Northwest	100.0	100.0	99.9	99.9
North Dakota	12.7	16.5	-	14.3
Other Destinations	90.6	86.8	98.0	90.9
Weighted Average	47.2	61.4	77.6	55.2

Over time, the level of backhauling has been increasing. Overall, grain truckers obtained backhauls for 55.2 percent of their total trips in 1986. The importance of backhauling has increased significantly from previous studies. In 1979, only 29 percent of the trucker's return miles were loaded (Wilson, Griffin, and Casavant), while only 24 percent of the return miles were loaded in 1967 (Casavant and Nelson).

TERMINAL MARKETS

Backhaul opportunities also vary widely across markets served. The results reported in Table 3 are consistent with commonly held perceptions and previous research (see Wilson

(1986)). To assess backhaul on a market basis, terminal markets were segmented into three categories according to the average one-way distance. At an average distance of 108.9 miles, trips to North Dakota processors were classified as a local haul (Table 3). Trips to either Duluth/ Superior (382.1 miles) or Minneapolis/St. Paul (420.8 miles) were classified as short hauls. Trips to other destinations (784.8 miles) and the Pacific Northwest (1,019.0 miles) were classified as long hauls.

Long Haul Markets

The Pacific Northwest (PNW) consistently had a higher percentage of backhauls and a longer distance that truckers were willing to drive empty to obtain a backhaul than any other market (Table 3). Only one firm is not always loaded on return trips from the PNW (Table 3).

TABLE 3. General Backhaul Characteristics by Market, 1986

Market	Percent Backhaul	Number of Miles to Obtain Backhaul	Distance (one-way mi.)
Duluth/ Superior	25.8	103.2	382.1
Minneapolis/ St. Paul	71.3	92.3	420.8
Pacific Northwest	99.9	183.1	1019.0
North Dakota	14.3	48.3	108.9
Other	90.9	139.0	784.8

Distance is the most likely reason that a higher proportion of backhauls are observed for the PNW. The average one-way distance to the Pacific Northwest is 1,019 miles. Without a backhaul, a trucker returning empty to North Dakota from the PNW would incur large costs for fuel and labor alone. Consequently, firms driving to the PNW try to arrange backhauls before leaving North Dakota. They will also travel further out of their way to get a backhaul than they would if returning from the short haul markets of Duluth/Superior and Minneapolis/St. Paul. Thus, trucking firms put a greater emphasis on finding backhauls in the long distance markets.

The "other market" category includes markets from coast to coast, making it difficult to draw conclusions. In general, there were striking similarities between the other market category and the Pacific Northwest. The truckers who hauled to other markets also had a higher percentage of backhauls and were willing to drive farther empty to obtain a backhaul (Table 3).

Short Haul Markets

Although Minneapolis/St. Paul and Duluth/Superior are both classified as short haul markets, there are few similarities between the two markets. Minneapolis/St. Paul is the second most active backhaul market, with 71.3 percent of the return miles loaded (Table 3). In contrast, Duluth/Superior offered few

backhaul opportunities for grain truckers from North Dakota. In 1986, the percent of return miles loaded from Duluth/Superior was only 25.8 percent. On average, grain truckers will drive empty 103.2 miles from Duluth/Superior and 92.3 miles from Minneapolis/St. Paul to obtain a backhaul.

The principal difference between the two markets is the higher concentration of backhaul opportunities within the Minneapolis/St. Paul market. In general, many more backhauls can be obtained from a smaller radius in the Minneapolis/St. Paul market than the Duluth/Superior market. Many of the mail surveys included written comments stating that backhauls are not available from Duluth/Superior. The truckers added that they could not afford to haul grain without a backhaul. Some of the truckers who haul to Duluth/Superior drive down to Minneapolis/St. Paul to obtain a backhaul.

Obviously, grain is still being transported to the Duluth/Superior market. Ten grain elevator managers were contacted by telephone to ascertain how they ship grain to Duluth/Superior. Most of the elevator managers use local grain truckers to haul grain to Duluth/Superior. They forecast that the volume of grain trucked to Duluth/Superior will either remain constant or continue to decrease. The reasons offered for the decline of the Duluth/Superior market include low grain prices, labor problems, and short working hours at the port. Currently, the port is only

open from nine to five. Thus, it is nearly impossible for grain truckers to make it there and get unloaded in one day.

Local Markets

The local haul market within North Dakota had the lowest percentage of backhauls, 14.3 percent (Table 3). The short average fronthaul distance (108.9 miles) for movements within North Dakota does not lend itself to backhaul traffic. Thus, local service grain trucking firms concentrate on maximizing the number of trips made rather than on obtaining backhauls.

LENGTH OF TIME IN BUSINESS

The length of time a firm has been in business is one of the indicators of a company's stability. "Older established firms are less likely to go out of business because their revenue sources are more reliable than those of newer firms" (Wilson). Older firms' revenues are thought to be more stable because these firms have greater success in attracting backhauls.

The percentage of backhauls was found to increase slightly as length of time in business increased. The firms 16 years and older had the highest percentage of backhauls at 61.0 percent (Table 4).

At first glance, these findings do not support the hypothesis that the length of time in business and the backhaul

TABLE 4. Percent of Backhaul by Length of Time in Business, 1986

Length of Time in Business	Percent of Backhauls
Less than 5 years	50.9
5 to 10 years	57.2
10 to 15 years	49.9
More than 15 years	61.0

percentage are directly related.[4] However, the results over time may not be directly comparable because the average age of firms has increased sharply since the late 1970s. In 1979, the average trucking firm had been in business 8.5 years (Dooley, Bertram, and Wilson). By 1986, the average length of time that a firm had been in business climbed to 13.9 years.

A comparison of these results suggests that the number of years that a firm has been in business is not significant anymore. Thus, newer firms may not be able to compete without being aggressive marketers and accessing the backhaul markets. The issue of length of time in business is explored in greater detail in the section which develops the empirical model.

[4]See Wilson (1986), Wilson (1987), and Wilson, Casavant, and Griffin (1982) for evidence that there is a relationship between these two variables.

OPERATING AUTHORITY

The ability to obtain a backhaul may also depend upon a motor carrier's operating authority. Carriers of agricultural commodities are exempt from Interstate Commerce Commission (ICC) or state authority (Dempsey and Thoms). However, having authority may increase the firm's ability to obtain a backhaul.

In 1986, 56.5 percent of North Dakota grain truckers had no operating authority, 23.5 percent had ICC authority, 4.3 percent had state authority, and 15.7 percent had both ICC and state authority (Table 5). The majority of large firms (85.7 percent) have some type of operating authority. In contrast, only 30.3 percent of the owner-operators and 51.4 percent of the medium firms have some type of authority.

TABLE 5. Type of Operating Authority by Firm Size, 1986

Type of Authority	Type of Firm			
	Owner-Op.	Medium	Large	All
	----------Percent----------			
None	69.7	48.6	14.3	56.5
ICC	19.7	28.6	28.6	23.5
State	4.5	5.7	0.0	4.3
ICC & State	6.1	17.1	57.1	15.7
TOTAL	100.0	100.0	100.0	100.0

The backhaul percentage does in fact vary by type of authority. Backhaul percentages are highest for firms with ICC and state authority (84.2 percent) and firms with ICC authority (61.1 percent) (Table 6). Firms with no authority have an average backhaul percentage of 48.8 percent while the backhaul percentage for firms with state authority is only 3.4 percent.

TABLE 6. Backhaul Percentage by Type of Operating Authority, 1986

Type of Authority	Type of Firm			
	Owner-Op.	Medium	Large	All
	----------Backhaul Percent----------			
None	46.9	54.8	40.0	48.8
ICC	46.9	71.7	80.7	61.1
State	3.3	3.5	-	3.4
ICC & State	85.0	81.8	85.5	84.2

In conclusion, firms with ICC and state operating authority are more successful in obtaining backhauls than exempt carriers are. Exempt carriers may consider obtaining ICC and/or state operating authority as a means to expand the base of commodities that they may legally carry. Since 56 percent of the grain truckers have no operating authority, this could be an important management strategy for many grain trucking firms.

PRICE INCENTIVES

Price incentives are an important form of price competition and play a major role in establishing and expanding a trucking firm's customer base. Discounting fronthaul rates when a backhaul is available is one of the more popular pricing incentives used by trucking firms. In 1986, the overall average discount rate offered by grain trucking firms was 12.6 percent. The discount rate ranged from 11.9 percent for owner-operators to 13.7 percent for medium firms, and 13.8 percent for large firms.

Trucking firms' use of discounted fronthaul rates has changed slightly since 1979. Overall the total percent of firms has dropped from 20.8 percent in 1979 to 19.4 percent in 1986 (Table 7). The use of discounting by different sized firms has changed more dramatically. The proportion of owner-operators offering discounts in 1986 was 21.3 percent compared with 11.1 percent in 1979 (Table 7). A higher percentage of large firms have also begun to offer discounts in 1986, 14.3 percent, versus 10.0 percent in 1979 (Table 7). However, fewer medium trucking firms offer discounts in 1986 (18.2 percent) than in 1979 (31.4 percent).

In conclusion, offering rate discounts may be an effective management strategy to attract more shippers. However, the added revenue gained from more shippers at a lower rate must be weighed against the cost of providing service. Individual trucking firms

TABLE 7. Incidence of Fronthaul/Backhaul Discount Rates by Firm Size, 1979 and 1986

Firm Size	% of Firms Offering Discounts	
	1979	1986
Owner Operator (1 tractor)	11.1	21.3
Medium Firm (2-4 tractors)	31.4	18.2
Large Firm (5 or more tractors)	10.0	14.3
OVERALL	20.8	19.4

hauling at capacity levels have little incentive to offer rate discounts. However, carriers with idle equipment may consider rate discounts as a way of increasing their equipment utilization.

IV. OBTAINING BACKHAULS

A series of questions was included in the mail survey to gather information about obtaining backhauls. Specifically, these questions assessed the methods used to obtain a backhaul and the cost of obtaining a backhaul. These findings were corroborated and enriched through personal interviews with grain truckers.

Information was obtained on the percentage of grain truckers that used a commodity broker, hauled under a lease with a regulated motor carrier (trip leased), or used an inhouse broker. Overall, commodity brokers were the most popular method used to obtain a backhaul (52.3 percent), followed by trip leasing (39.6 percent), and inhouse broker (23.9 percent) (Table 8).

TABLE 8. Method of Obtaining a Backhaul by Firm Size, 1986

Method of Obtaining Backhauls	Owner-Operator	Medium Firm	Large Firm	All Firms
	----------Percent----------			
Percent of Firms Who Use a Commodity Broker	40.6	60.6	85.7	52.3
Percent of Firms Who Operate Under Regulated Carrier Lease	29.7	45.5	71.4	39.6
Percent of Firms Who Use an Inhouse Broker	11.3	30.3	64.3	23.9

Although the order was the same for the three firm sizes, (commodity broker, trip lease, and inhouse broker), the usage varied widely. Large carriers are much more active in seeking backhauls than owner-operators. For example, when compared with owner-operators, large firms use twice as many brokers, two and

one-half times as many trip lease, and nearly six times as many use inhouse brokers (Table 8). Large firms may have a higher proportion of backhauls than owner-operators because they expend more resources and work harder seeking backhauls.

The truckers stated in the personal interviews that the method they used to obtain a backhaul depended primarily on the area they were searching for the backhaul. They might use a certain method in one part of the country, but a different method elsewhere. In addition to commodity brokers, trip leasing, and in-house brokers, grain truckers also obtain backhauls via personal contacts, ICC operating authority, and various forms of call boards. The advantages and disadvantages of using the various methods were also identified in the personal interviews.

BROKERAGE FIRMS

Brokerage firms are contacted more frequently by trucking firms that logged over 100,000 miles per tractor. Depending on the number of markets served, a trucking firm can associate with more than 100 brokerage firms in a year.

According to survey results, the average brokerage cost is 12.86 percent of the freight bill (Table 9). There is little difference in the broker's cost by firm size. This was corroborated in the personal interviews as most truckers stated that brokerage firms charge between 10 and 12 percent. However, some

TABLE 9. Cost of Using Various Methods to Obtain Backhauls by Firm Size, North Dakota, 1986

Item	Size of Firm			
	Owner-Operator	Medium	Large	All
Broker Percent Cost	13.17	12.24	13.17	12.86
Trip Lease Percent Cost	18.78	14.20	17.60	16.91

drivers claimed that they have paid as little as 5 percent and as much as 25 percent for a broker's services.

In spite of truckers' complaints about high brokers' fees, most felt that having a backhaul was worth the additional cost. All the drivers interviewed stated that they were paid by the brokerage firm, not by the shipper. In some cases, the broker will pay the company that an owner-operator is affiliated with, and after taking a cut, the company will pay the driver.

Brokerage firms can improve the utilization of trucking equipment by bringing shippers and carriers together. As some truckers stated, brokerage firms cut down on the time that a trucker has to spend looking for hauls. This gives the trucker more time to run loaded, thereby allowing the trucker to increase his volume of business. A private carrier executive expressed a similar sentiment, "brokers make private carriage operators more

efficient ... because they match demand for truck services with supply, at the lowest cost." (Cawthorne).

TRIP LEASING

Trip leasing is when a truck operates under the authority of another trucking firm which has ICC authority. Grain truckers, especially owner-operators and medium firms, stated in personal interviews that they try to avoid trip leasing because of the high costs. However, survey results indicate that almost 40 percent of all firms trip lease (Table 8). Large firms use trip leasing much more often than small firms. Over 71 percent of the large firms trip lease as opposed to only 29.7 percent of the owner-operators (Table 8). Small trucking firms apparently feel exploited while large firms view trip leasing as a method to increase equipment utilization.

The cost of trip leasing is higher than using a broker. According to survey results, the average trip lease cost is 16.12 percent of the freight bill as opposed to 12.86 percent for brokers (Table 9). This percentage of revenue is paid to the company with the ICC authority. Some truckers stated that they pay a flat monthly fee, ranging from 100 to 150 dollars.

INHOUSE BROKERAGE/PERSONAL CONTACTS

Approximately 24 percent of the grain trucking firms use inhouse brokers to obtain backhauls (Table 8). Over 64 percent

of the largest firms employ inhouse brokers as opposed to 30.3 percent of the medium firms and 11.3 percent of the owner-operators. The level of sophistication varies widely across firms.

Some large firms employ one or more persons who specialize in locating backhauls. The average annual inhouse brokerage cost for these firms is 19,333 dollars. Owner-operators and medium firms lack the resources to employ a full time inhouse broker. They are more likely to rely upon personal contacts.

All the truckers personally interviewed indicated that they either contact customers and/or their regular customers contact them when they need a backhaul. There are several advantages to using personal contacts. First, the trucker can keep a larger portion of the revenue earned on the haul with the elimination of the brokerage fees. Second, personal contacts are usually reliable and pay their bills. The truckers feel there is a certain security in using personal contacts that they do not have when dealing with unfamiliar shippers or brokers. Finally, when the customer contacts the trucker, the trucker is guaranteed a backhaul before he leaves. Many grain truckers stated that they would not haul grain unless they had a backhaul arranged before departure. Obviously, there is a greater chance that a trucker will return empty if he leaves before setting up his backhaul.

There were very few disadvantages in using personal contacts. The only complaint voiced was by truckers who did not have many personal contacts. These truckers said that trying to find a backhaul on their own was too time consuming. They were too busy to waste their time sitting around talking to people.

CALL BOARDS

Truckers who drive cross country commonly use call boards to find backhauls. Call boards are set up in a variety of mediums. Traditional bulletin boards are still found in truck stops. In some markets, television stations devoted to providing information on regional backhauls are gaining popularity. In addition, there are radio stations which give road conditions and report on available backhauls.

A recent innovation in call boards has been the development of electronic load-posting services such as Dial-A-Truck, Comvoy, and LoadMaster. Using airport style monitors, these systems list type of load, origin, destination, and other current market information. Industry experts estimate that 8,000 to 10,000 loads are posted and filled daily on computer call boards (Jubitz).

ICC OPERATING AUTHORITY

Technically, ICC operating authority is not a way to obtain backhauls. Nevertheless, having operating authority enhances a

firm's opportunities to haul goods, and thus may make it easier to obtain backhauls. With the passage of the Motor Carrier Act of 1980, it has become much easier to obtain ICC authority. If safety requirements are satisfied, the ICC routinely grants applicants authority to haul general commodities in 48 states. Most of the larger trucking firms have authority, which allows them to haul a wider variety of commodities. Since ICC authority gives carriers more options, it provides aggressive firms more opportunities to obtain backhauls.

One trucker stated that he pays his brokerage firm 100 dollars a month to use their authority. At that rate, he is not sure that it is really worth the cost. The cost of obtaining ICC operating authority is estimated to range between 750 and 1,000 dollars.

There was a general consensus amongst the personal interview participants that the government is out to get the trucking industry. Many grain truckers view ICC authority as yet another form of government interference. Many of the truckers interviewed said getting ICC authority was more of a bother than it was worth. Many drivers complained about the multiplicity of regulations and discrepancies among states. One of the truckers said, "I don't want to get any more involved with the government. I have too many rules to worry about now without getting screwed up with the ICC."

Despite the advantages of having ICC authority, many independent truckers illegally haul regulated commodities without ICC authority. One of the truckers stated, "I'll haul anything that I can get a hold of. Once I close the back door, anything I haul is legal as far as I am concerned." These truckers knew that they were taking a chance, but felt that in the long run they were probably saving money by not purchasing ICC authority. They felt that the amount that they got charged in fines would still be less than paying for ICC authority.

V. PROBLEMS ASSOCIATED WITH BACKHAULS

The survey also included a series of questions about factors that discourage trucking firms from obtaining backhauls. The most serious problems encountered by truckers when getting backhauls are low rates (49.4 percent) and obtaining ICC operating authority (38.8 percent) (Table 10). Additional problems include high broker costs (30.6 percent), too much time (30.6 percent), other concerns (16.5 percent), and equipment repair costs (3.5 percent) (Table 10). Other concerns include not having the proper equipment, the difficulty of obtaining a backhaul, and the multiplicity of state regulations.

The primary concern for truckers when arranging backhauls is the low backhaul rates. In the minds of many truckers, the term 'backhaul' has negative connotations. Several truckers stated

TABLE 10. Problems Associated with Obtaining Backhauls by Firm Size, 1986

	Firm Size			
	Owner-Operator	Medium Firms	Large Firms	All Firms
	----------Percent----------			
Low Rates	54.9	42.3	37.5	49.4
Obtaining Operating Authority	47.1	30.8	12.5	38.8
High Broker Costs	33.3	19.2	50.0	30.6
Too Much Time	27.5	34.6	37.5	30.6
Other Concerns	13.7	26.9	0.0	16.5
High Equipment Repair Costs	3.9	0.0	12.5	3.5

that they avoid the term 'backhaul' because it was usually a shipper's way of trying to get a lower rate. For example, if a shipper in Portland, Oregon may offer a very low rate if he notices North Dakota license plates. One trucker said, "I think of hauls to and from the base as primary hauls. I need good rates going both ways to make a profit."

The second area of concern about attempting to arrange backhauls is obtaining the proper ICC operating authority. Owner-operators and medium firms seem much more concerned with obtaining ICC operating authority than large firms. One possible

explanation is that most of the large firms have already obtained their operating authority; thus, it is no longer a concern to them.

The third area of concern is high broker costs. Truckers expressed several complaints about using brokerage firms during the personal interviews. Most of the comments were related to payment arrangements. First, the truckers resent the fee that the brokerage firms charge, feeling that it comes out of their profits. Two of the truckers stated that they would rather go empty than deal with a brokerage firm. They did not want to share their hard earned profits with someone who did nothing but make phone calls all day. Second, truckers also stated there were problems with receiving payment. The truckers said that the best defense against disreputable brokers was word of mouth. The truckers said that they will talk to other drivers and discuss which brokers to avoid. Finally, one of the truckers complained of getting charged by both the firm he worked for and an outside broker. The trucker was an independent operator who worked in association with a major broker, but sometimes he has to use an outside broker to obtain a backhaul. This individual paid a percentage of the money earned on the backhaul to both the firm he is affiliated with and also to the outside brokerage firm.

There have been two suggestions as how to improve the payment process between brokerage and trucking firms. The Senate

has considered regulating truck brokers (Cawthorne). However, there is little interest in additional regulation on Capitol Hill. The Transportation Brokers Conference of America (TBCA), the trade association representing the brokerage industry, and the American Trucking Association (ATA) have also proposed a solution. The proposal calls for the ATA to develop a credit reporting organization for carriers having problems with brokers (Cawthorne). This self-help measure would enable carriers to evaluate the background of a brokerage firm before getting involved with them.

The final major concern is the time associated with getting a backhaul. "Finding backhaul traffic can be costly both in terms of search costs and in terms of opportunity costs." (Wilson). In other words, a trucking firm must compare the cost associated with the time spent searching for a backhaul and the cost of running empty.

VI. AN ECONOMETRIC MODEL OF BACKHAUL DETERMINANTS

The descriptive analysis of backhaul provides a foundation for an econometric backhaul model. Based on firm and market data, this model can be used to identify factors which are statistically significant in explaining backhaul levels. For each firm, the data set includes firm and market characteristics and the proportion of trips that a firm is loaded by market and

in total. The expected value of the proportion loaded return miles (p_i) (or the probability of a backhaul) differs across firms depending upon the specific characteristics (x_i) of a firm.

A general model of a firm's backhaul decision is expressed:

(1) BACKHAUL = f(SIZE, YEARS, AUTH, DEADHEAD, DIST, BHSETUP)

where:

BACKHAUL	=	the percentage of loaded return miles;
SIZE	=	the number of the tractors;
YEARS	=	the length of time the firm has been in business, in years;
AUTH	=	a binary variable which equals one if the firm has ICC or state operating authority, and zero otherwise;
DEADHEAD	=	the distance that a firm will travel empty to find a backhaul, in miles;
DIST	=	the one-way distance to the terminal market, in miles; and
BHSETUP	=	a binary variable which equals one if the firm arranges a backhaul before departing, and zero otherwise.

Large firms are expected to have greater success in obtaining backhauls than small firms simply because of their greater size (SIZE). With more resources, large firms can employ individuals who specialize in getting backhauls. Similarly, firms are expected to have greater success in obtaining backhauls the longer they have been in business (YEARS). As firms have been in business longer, they gain experience in obtaining

backhauls and develop a broader network of contacts.

Regulatory operating authority continues to be an issue. Assuming that Interstate Commerce Commission regulation restricts the supply of interstate trucking, the effect of not having authority is expected to be negative. That is, firms without authority have a lower probability of obtaining a backhaul. Empirically, AUTH takes a value of one if the firm has ICC authority and zero otherwise. For intrastate traffic, the ICC authority variable is replaced by state operating authority.

The distance a firm will travel empty to obtain a backhaul (DEADHEAD) is expected to have a positive effect on the probability of obtaining a backhaul. More backhaul opportunities are available the further a firm is willing to drive empty to obtain a backhaul. Therefore, the higher the probability getting a backhaul rises as DEADHEAD increases.

The one-way distance to market (DIST) is expected to have a positive influence on the probability of getting a backhaul. Specifically, there is a profit motive for firms to search more intensively for a backhaul as the distance to market increases (Beilock and Kilmer (1986) and Wilson (1987)).

Related to distance, many truckers attempt to arrange their backhauls before departing, especially in the long haul markets. Firms following a strategy of making round trip as opposed to one-way decisions may have greater success in obtaining

backhauls. Hence a binary variable, BHSETUP, is included which equals one if the backhaul is arranged in advance and zero otherwise. Since the arrangement of a backhaul before making the trip in essence guarantees a loaded return trip, two sets of results are presented. Model 1 includes the six independent variables found in equation (1), while Model 2 excludes BHSETUP.

A logit model was specified to investigate the significance that these variables affect backhaul probabilities.[5] The probability of a backhaul (BACKHAUL) is given by

$$(2) \quad E(p_i|x_i) = \text{Prob}(\text{BACKHAUL}|x_i) = 1/(1 + e^{-x_i\beta})$$

To obtain estimates of β, Zellner and Lee suggest the following specification:

$$(3) \quad \ln(p_i/(1 - p_i)) = x_i'\beta + \mu_i$$

Using equation (3), the parameters of the backhaul probability equation were estimated using OLS. The results for the two models are reported for all destinations (Table 11) and for each of the individual markets (Table 12). The individual markets include Duluth/Superior, Minneapolis/St. Paul, other destinations, and North Dakota destinations. Pacific Northwest

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[5]See Judge et al., pp. 521-522, and the associated references for a more complete description of the estimation procedure employed.

TABLE 11. Overall Backhaul Probability Function Estimates[a]

Independent Variable	Model 1	Model 2
Constant	-6.307*	-3.540*
	(1.157)	(1.039)
SIZE	-0.078	-0.058
	(0.105)	(0.114)
YEARS	0.073**	0.091*
	(0.038)	(0.042)
AUTH	1.967**	2.483*
	(1.031)	(1.113)
DEADHEAD	-0.002	0.010
	(0.010)	(0.010)
DIST	0.006*	0.004**
	(0.002)	(0.002)
BHSETUP	4.983*	NA
	(1.175)	
R^2	35.62	23.05
Sample size	99	99

[a]The standard errors are in (), a * and ** represent significance at the 5 and 10 percent levels, respectively.

results are not reported since only one of the 26 firms that traveled to the PNW was not always loaded on the return movement. That firm, however, was loaded for 99 percent of the return movements. Thus, there is not enough variation in the PNW data to explain what factors influence backhauls to the PNW.

TABLE 12. Backhaul Probability Function Estimates by Market[a]

Independent Variable	Duluth/Superior 1	Duluth/Superior 2	Minneapolis/St. Paul 1	Minneapolis/St. Paul 2
Constant	-10.668*	-11.884*	-11.268*	-6.027*
	(3.348)	(4.820)	(2.679)	(2.526)
SIZE	0.358**	0.580*	0.272*	0.201
	(0.179)	(0.255)	(0.119)	(0.127)
YEARS	-0.079	-0.078	0.102*	0.089**
	(0.052)	(0.075)	(0.042)	(0.045)
AUTH	1.004	2.683	0.718	1.205
	(1.532)	(2.182)	(1.127)	(1.208)
DEADHEAD	-0.010	-0.011	0.009	0.014
	(0.010)	(0.015)	(0.008)	(0.009)
DIST	0.009	0.021	0.013*	0.014*
	(0.009)	(0.013)	(0.005)	(0.006)
BHSETUP	9.565*	NA	6.351*	NA
	(1.331)		(1.574)	
R^2	64.76	25.19	29.94	17.68
Sample size	53	53	100	100

[a]The standard errors are in (), a * and ** represent significance at the 5 and 10 percent levels, respectively.

Inspection of all results reported in Tables 11 and 12 suggests that if a variable is significant, it is also of the expected sign. The single most consistent result is that firms which have backhauls arranged before departing have a higher likelihood of obtaining a backhaul.

TABLE 12. Backhaul Probability Function Estimates by Market--Continued[a]

Independent Variable	North Dakota 1	North Dakota 2	Other Destinations 1	Other Destinations 2
Constant	-9.050*	-8.181*	-1.952	4.014
	(1.463)	(1.867)	(3.553)	(4.074)
SIZE	0.080	-0.001	0.205	0.049
	(0.574)	(0.738)	(0.162)	(0.204)
YEARS	-0.027	-0.006	-0.129	0.014
	(0.069)	(0.089)	(0.122)	(0.150)
AUTH[b]	0.984	0.017	0.370	0.263
	(1.895)	(2.423)	(2.153)	(2.827)
DEADHEAD	0.042*	0.070*	0.004	0.016
	(0.016)	(0.020)	(0.015)	(0.020)
DIST	0.000	0.006	0.005*	0.002
	(0.008)	(0.010)	(0.002)	(0.003)
BHSETUP	6.370*	NA	8.487*	NA
	(1.322)		(2.464)	
R^2	65.16	40.64	51.64	10.67
Sample size	40	40	21	21

[a]The standard errors are in (), a * and ** represent significance at the 5 and 10 percent levels, respectively.
[b]For North Dakota markets, the operating authority variable was represented by state as opposed to ICC authority.

All variables in the overall model except firm size (SIZE) and miles driven empty to find a backhaul (DEADHEAD) were significant at least at the 10 percent level (Table 11). The results for the individual markets suggest that different factors affect backhaul in different markets.

Size of firm (SIZE) has a positive effect, but is only significant in the overall market and Duluth/Superior and Minneapolis/St. Paul. The number of years that a firm has been in business (YEARS) has a positive and significant effect in the overall and Minneapolis/St. Paul market. The effect of operating authority is positive and significant only in the overall results. The number of miles that a firm is willing to drive empty to get a backhaul (DEADHEAD) is positive and significant only in the North Dakota market. Distance to market (DIST) is positive and significant in the overall, Minneapolis/St. Paul, and other markets. Finally, BHSETUP is positive and significant for the overall and each individual market.

VII. SUMMARY AND CONCLUSIONS

The objectives of this report were to: (1) identify and define the industry backhaul characteristics of North Dakota grain truckers; (2) determine and describe what methods are being used to obtain backhauls; (3) determine what obstacles prevent firms from obtaining backhauls; and, (4) identify the determinants of and estimate the probability for obtaining backhauls from various markets.

Overall, the grain trucking industry has been in a general decline during the past decade. Much of the decline in truck traffic can be attributed to changes in the rail and grain

elevator industries. Rail has become more competitively priced with truck since the 1980 Stagger's Act. The grain elevator industry has taken advantage of lower rail rates by building multiple-car elevators which are typically more dependent on rail than truck.

Overall, the percentage of loaded return miles climbed from 29 percent in 1979 to 55 percent in 1986. An analysis of firm size suggests that large firms have greater success obtaining backhauls than small firms do. In 1986, the average backhaul was 47.2, 61.4, and 77.6 percent for owner-operators, medium firms, and large firms, respectively. Large firms may get more backhauls because they have more experience and a wider network of contacts.

Major differences exist in backhaul opportunities by market. Backhaul percentages are highest in the long haul markets. The backhaul percentage was 99.9 percent for the Pacific Northwest and 90.9 percent for other destinations. The short haul market of Minneapolis/St. Paul also had a high backhaul percentage at 71.3 percent. However, the backhaul percentage for the other short haul market of Duluth/Superior was only 25.8 percent. Finally, the backhaul percentage was 14.3 percent in the local North Dakota market.

Distance appears to be the most crucial factor affecting backhaul in the long distance markets. There are few

similarities between the short haul markets of Minneapolis/St. Paul and Duluth/Superior. As a major regional distribution center, many backhauls are available from Minneapolis/St. Paul. In contrast, backhaul opportunities are limited from Duluth/Superior, a port that focuses on exporting commodities. Given the lack of backhauls in the local market, most grain truckers concentrate on maximizing the number of trips made rather than searching for backhauls.

The average age of grain trucking firms has increased over the past decade. In 1979, the average firm had been in business for 8.5 years. By 1986, the typical firm had been in business almost 14 years. The percentage of loaded return miles varies little by length of time in business.

Firms with Interstate Commerce Commission and state operating authority are more successful in getting backhauls than exempt carriers are. Firms with ICC and state authority have an average backhaul percentage of 84.2 percent. In contrast, firms with no operating authority have a backhaul percentage of 48.2 percent.

Over 52 percent of the firms use commission brokers, 39.6 percent trip lease, and 23.9 percent have inhouse brokers. Other methods of getting backhauls include personal contacts and various types of call boards. Larger carriers are much more active in searching for backhauls than small firms. Compared to

owner-operators, large firms use twice as many brokers, two and one-half times as many trip lease, and nearly six times as many use inhouse brokers.

The most serious problems encountered when seeking a backhaul are low rates, getting ICC authority, high broker costs, and too much search time. Many grain truckers feel that shippers try to position loads as backhauls to put downward pressure on rates. Owner-operators and medium firms seem much more concerned with obtaining ICC operating authority than large firms. One possible explanation is that most of the large firms have already obtained their operating authority; thus, it is no longer a concern to them.

Many truckers continue to complain about excessive brokerage fees. Some of the same truckers also complain that it takes too much time to search for backhauls. Grain truckers, especially owner-operators, do not seem to understand or appreciate the role of brokers. Some firms have also had problems receiving payment. This problem is not limited to grain truckers.

Econometric estimation of backhaul percentage identified variables that significantly affected backhaul for the overall market and for individual markets. This model can also be used to estimate backhaul percentages for particular markets.

In the overall market, length of time in business, operating authority, distance to front haul market, and arranging backhauls

before departure were all significant. For individual markets, the single most consistent result is that firms which have backhauls arranged before departing have a higher likelihood of obtaining a backhaul. In addition, firm size, firm age, and distance was significant in the Minneapolis/St. Paul market. The only other significant variable in Duluth/Superior was size. The number of miles that a firm would deadhead was significant in North Dakota, while no other variables were significant in the other markets.

In conclusion, grain trucking firms are more successful in obtaining backhauls than they were in the late 1970s. In particular, the larger firms appear to have clear management strategies for obtaining backhauls. In contrast, many smaller firms are still learning how to manage backhaul strategies. Workshops conducted across the state may be useful in helping the smaller firms learn how to best obtain backhauls.

BIBLIOGRAPHY

Beilock, R., P. Garrod, and W. Miklius. "Freight Charge Variations in Truck Transport Markets: Price Discrimination or Competitive Pricing?" Amer. J. of Agr. Econ., 68(2):226-236, 1986.

Beilock, R. and R.L. Kilmer. "The Determinants of Full-Empty Truck Movements." Amer. J. of Agr. Econ., 68(1):67-76, 1986.

_____. "Regulations and Empty Mileage." ICC Practitioner's J., 50(4):433-439, 1983.

Casavant, K.L. and D.C. Nelson. An Economic Analysis of the Costs of Operating Grain Trucking Firms in North Dakota." Agr. Econ. Report No. 54. Dept. of Agr. Econ., Agr. Exp. Station, North Dakota State Univ. Fargo, 1967.

Cawthorne, D.M. "Trucker Re-Regulation: an Issue Whose Time Has Gone." Traffic World, July 18, 1988, pp. 18 & 23.

Cosgriff, J.C. The Cost and Operations of Exempt Motor Carriers in North Dakota. UGPTI Report No. 33. Upper Great Plains Transp. Institute, North Dakota State Univ., Fargo, 1978.

Dempsey, P.S. and Wm.E. Thoms. Law and Economic Regulation in Transportation. New York: Quorum Books, 1986.

Dooley, F.J., L.M. Bertram, and W.W. Wilson. Operating Costs and Characteristics of North Dakota Grain Trucking Firms. UGPTI Publication No. 67. Upper Great Plains Transp. Institute, North Dakota State Univ., Fargo, 1988.

"Interstate Carriers Study Broker Abuse." Transport Topics, July 11, 1988, p. 2.

Johnson, M.A. and G.C. Griffin. Commodity Exemptions and Relaxed Market Entry: New Opportunities for Motor Carrier Backhauls. UGPTI Staff Paper No. 48. Upper Great Plains Transp. Institute, North Dakota State Univ., Fargo, 1983.

Jubitz, F. "Truckstops Looking for Better Ways to Serve Drivers." Transport Topics, February 6, 1989, p. 14.

Judge, G.A. et al. Introduction to the Theory and Practice of Econometrics. New York: John Wiley & Sons, 1982.

Lewis, W.A. Overhead Costs. New York: Augustus M. Kelley, 1970.

Locklin, D.P. Economics of Transportation, 7 ed. Homeward, Illinois: Richard D. Irwin Inc., 1972.

Miller, E. "Effects of Regulation on Truck Utilization." Transportation J., 13(1):5-14, 1973.

Olsen, B.M. and D.L. Zink. North Dakota Grain and Oilseed Transportation Statistics, 1987-88. UGPTI Rep. No. 71. Upper Great Plains Transp. Institute, North Dakota State Univ., Fargo, 1988.

Pederson, L.E., R.C. Mittelhammer, and K.L. Casavant. "Factors Affecting Interstate Backhauling of Exempt Agricultural Commodities by Regulated Motor Carriers: A First Look." Transportation J., 18(4):46-52, 1979.

Profitable Trucking. Washington, DC: National Accounting & Finance Council, 1981.

Taff, C.A. "A Study of Truck Brokers of Agricultural Commodities Exempt from Economic Regulation." Transportation J., 18(3):5-15, 1979.

Wilson, W.W. An Analysis of the Regulated Motor Carrier Industry in North Dakota. UGPTI Report No. 40. Upper Great Plains Transp. Institute, North Dakota State Univ., Fargo, 1981.

_____. "The Exempt Trucker: Rent-Seeking in Backhaul Markets." Mimeo, Dept. of Agr. Economics, Washington State Univ., Pullman, 1987.

_____. "Transport Markets and Firm Behavior: The Backhaul Problem." J. of the Transportation Research Forum, 28(1):325-332, 1986.

_____. "Transport Markets and Firm Behavior: The Backhaul Problem." Ph.D. Dissertation, Department of Economics, Washington State University, Pullman, 1986.

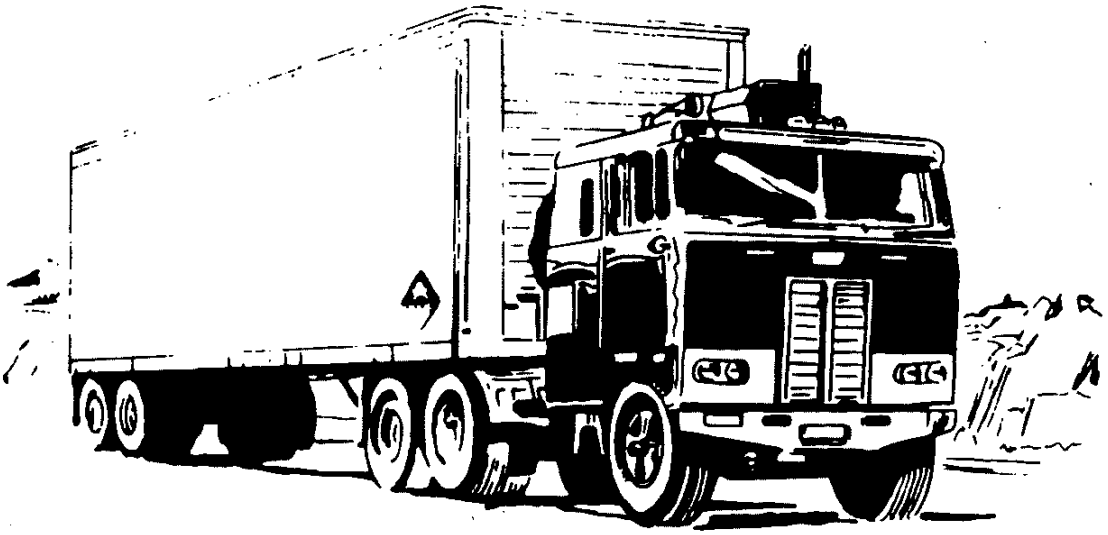
Wilson, W.W., G.C. Griffin, and K.L. Casavant. Costs and Characteristics of Operating Interstate Motor Carriers of Grain in North Dakota. UGPTI Report No. 46. Upper Great Plains Transp. Institute, North Dakota State Univ., Fargo, 1982.

APPENDIX A -

A SURVEY OF NORTH DAKOTA GRAIN TRUCKING FIRMS

A SURVEY OF NORTH DAKOTA

GRAIN TRUCKERS



Upper Great Plains Transportation Institute
North Dakota State University
Fargo, North Dakota 58105
August 1987

I. YOUR RESPONSES TO THE FOLLOWING QUESTIONS WILL HELP US DESCRIBE THE GENERAL CHARACTERISTICS OF NORTH DAKOTA'S TRUCKING INDUSTRY. WE GUARANTEE THAT ALL INFORMATION WILL BE KEPT CONFIDENTIAL.

1. What county do you live in? _____

2. How long have you operated in North Dakota? _____ YEARS

3. What elevators do you serve on a regular basis?

_____ _____ _____

_____ _____ _____

4. How many tractors do you operate?
   OWN _____
   LEASE _____
   TOTAL _____

5. How many trailers do you operate?
   OWN _____
   LEASE _____
   TOTAL _____

6. How many miles nationwide did your trucks log in 1986?
   _____ MILES

   What percentage of these were loaded? _____ %

7. What percent of your loads originate in North Dakota?
   _____ %

8. What is the average weight of your loads? _____ POUNDS

9. What percent of your income is earned from:

HAULING EXEMPT COMMODITIES	_____ %
HAULING REGULATED COMMODITIES	_____ %
OTHER SOURCES	_____ %
TOTAL	100 %

10. What percent of your trips hauling grain are to:

DULUTH/SUPERIOR	_____ %
MINNEAPOLIS/ST. PAUL	_____ %
PACIFIC NORTHWEST	_____ %
BETWEEN ELEVATORS IN NORTH DAKOTA	_____ %
OTHER (please specify) _____	_____ %
TOTAL	100 %

II. THE NEXT SET OF QUESTIONS WILL HELP US UNDERSTAND MORE ABOUT TRUCKING GRAIN TO VARIOUS TERMINAL MARKETS. PLEASE ANSWER THE QUESTIONS **ONLY** FOR THE DESTINATIONS YOU SHIP TO.

1. Do you haul grain to Duluth/Superior?
   _____ YES (please answer the questions on this page)
   _____ NO [turn to page 3]

   A. What is the one-way distance to Duluth/Superior?
      _____ MILES

   B. What is the average rate you receive for

      WHEAT? _____ CENTS/CWT
      BARLEY? _____ CENTS/CWT
      SUNFLOWER? _____ CENTS/CWT

   C. How often do you return from Duluth/Superior with a backhaul? _____ PERCENT OF THE TIME

   D. How far out of the way will you drive to obtain a backhaul? _____ MILES

   E. What product do you backhaul most often from Duluth/Superior? _____

   F. Where do you typically haul this product to? _____

   G. What is the average rate you receive for a loaded backhaul? _____ CENTS/CWT

   H. Are your backhauls from Duluth/Superior set up before you leave North Dakota?
      _____ YES _____ NO

   I. On average, how much time will you spend waiting or looking for a backhaul from the time you are unloaded at your fronthaul destination to the time you are ready to return with the backhaul?

      _____ HOURS _____ MINUTES

   J. On average, how many possible backhaul loads do you hear about when searching each trip? _____

   K. On average, how long do you wait to unload at Duluth/Superior terminal elevators?

      _____ HOURS _____ MINUTES

2. Do you haul grain to Minneapolis/St. Paul?

_____ YES (please answer the questions on this page)
_____ NO [turn to page 4]

A. What is the one-way distance to Minneapolis/St. Paul?
_____ MILES

B. What is the average rate you receive for

WHEAT? _____ CENTS/CWT
BARLEY? _____ CENTS/CWT
SUNFLOWER? _____ CENTS/CWT

C. How often do you return from Minneapolis/St. Paul with a backhaul? _____ PERCENT OF THE TIME

D. How far out of the way will you drive to obtain a backhaul? _____ MILES

E. What product do you backhaul most often from Minneapolis/St. Paul? _____

F. Where do you typically haul this product to? _____

G. What is the average rate you receive for a loaded backhaul? _____ CENTS/CWT

H. Are your backhauls from Minneapolis/St. Paul set up before you leave North Dakota?
_____ YES _____ NO

I. On average, how much time will you spend waiting or looking for a backhaul from the time you are unloaded at your fronthaul destination to the time you are ready to return with the backhaul?

_____ HOURS _____ MINUTES

J. On average, how many possible backhaul loads do you hear about when searching each trip? _____

K. On average, how long do you wait to unload at Minneapolis/St. Paul terminal elevators?

_____ HOURS _____ MINUTES

3. Do you haul grain to the Pacific Northwest (Portland, Seattle, Snake River, etc.)?

_____ YES (please answer questions on this page)
_____ NO [turn to page 5]

Please identify which Pacific Northwest market you haul to.

_____

A. What is the one-way distance to this destination?
_____ MILES

B. What is the average rate you receive for

WHEAT? _____ CENTS/CWT
BARLEY? _____ CENTS/CWT
SUNFLOWER? _____ CENTS/CWT

C. How often do you return from the Pacific Northwest with a backhaul? _____ PERCENT OF THE TIME

D. How far out of the way will you drive to obtain a backhaul? _____ MILES

E. What product do you backhaul most often from the Pacific Northwest? _____

F. Where do you typically haul this product to? _____

G. What is the average rate you receive for a loaded backhaul? _____CENTS/CWT

H. Are your backhauls from the Pacific Northwest set up before you leave North Dakota?
_____ YES _____ NO

I. On average, how much time will you spend waiting or looking for a backhaul from the time you are unloaded at your fronthaul destination to the time you are ready to return with the backhaul?

_____ HOURS _____ MINUTES

J. On average, how many possible backhaul loads do you hear about when searching each trip? _____

K. On average, how long do you wait to unload at Pacific Northwest terminal elevators?

_____ HOURS _____ MINUTES

4. Do you haul grain to other markets?

_____ YES (please answer questions on this page)
_____ NO [turn to page 6]

Please identify this market. _____

A. What is the one-way distance to this destination?

_____ MILES

B. What is the average rate you receive for

WHEAT? _____ CENTS/CWT
BARLEY? _____ CENTS/CWT
SUNFLOWER? _____ CENTS/CWT

C. How often do you return from this destination with a backhaul? _____ PERCENT OF THE TIME

D. How far out of the way will you drive to obtain a backhaul? _____ MILES

E. What product do you backhaul most often from this destination? _____

F. Where do you typically haul this product to? _____

G. What is the average rate you receive for a loaded backhaul? _____ CENTS/CWT

H. Are your backhauls from this destination set up before you leave North Dakota?
_____ YES _____ NO

I. On average, how much time will you spend waiting or looking for a backhaul from the time you are unloaded at your fronthaul destination to the time you are ready to return with the backhaul?

_____ HOURS _____ MINUTES

J. On average, how many possible backhaul loads do you hear about when searching each trip? _____

K. On average, how long do you wait to unload at this destination terminal elevators?

_____ HOURS _____ MINUTES

III. NEXT, OPERATION COSTS CONTINUE TO INCREASE EACH YEAR AND VARY FROM FIRM TO FIRM. PLEASE PROVIDE INFORMATION ABOUT YOUR COMPANIES COSTS AND OPERATIONS FOR THE YEAR 1986.

A. 1986 Trucking Expense

1. On average, how much did these items cost per truck in 1986?

$_____ STATE LICENSE FEES PER TRUCK
$_____ INSURANCE COST PER TRUCK
$_____ MAINTENANCE AND REPAIRS PER TRUCK (batteries,grease, oil & filters, tune-ups, tarps and other minor repairs)

2. How are your drivers paid? (check all that apply)

_____ A. RATE PLUS $10
_____ B. PER MILE HOW MUCH? _____ ¢/TRIP
_____ C. PER TRIP HOW MUCH? _____ $/TRIP
_____ D. PERCENT OF FREIGHT BILL HOW MUCH? _____ %
_____ E. OTHER (please specify) _____

3. How many full time drivers work for you? _____

4. What was your total labor cost for all drivers in 1986?

$_____

5. What is your approximate total subsistence cost for each driver in 1986? (like meals, lodging, etc.)

hired drivers _____ DOLLARS
owner _____ DOLLARS

6. Do you pay your drivers for idle time? (waiting for loading or unloading) _____ YES _____ NO

7. What rate do you use? _____ DOLLARS/HOUR

B. 1986 Trucking Operations

1. What was the average miles driven per truck in 1986?
_____ MILES PER TRUCK

2. What is the average speed your truckers drive?
_____ MPH

3. What was the average price paid for diesel fuel in 1986? _____ $/GALLON

4. How many miles per gallon do you average when you are loaded with grain?
_____ MILES/GALLON

5. How many miles per gallon do you average when empty?
_____ MILES/GALLON

6. What is the average price you pay for tractor tires?
_____ $ PER TRACTOR TIRE

7. How many miles will tractor tires last? _____ MILES

8. What is the average price you pay for trailer tires?
_____ $ PER TRAILER TIRE

9. How many miles will trailer tires last? _____ MILES

10. On average, in what year were your tractors manufactured? 19__

    On average, in what year were your trailers manufactured? 19__

11. From the time you bought your last tractor and trailer, how long would you expect them to last?

    trailers: _____ MILES _____ YEARS
    tractors: _____ MILES _____ YEARS

12. Assume you will be trading in one of your tractors and trailers in August 1987:

    A. What year and model is the tractor?
    _____ YEAR _____ MODEL

    B. What year and type is the trailer?
    _____ YEAR _____ TYPE

    C. What is the trade-in value of the tractor?
    $_____

    D. What is the trade-in value of the trailer?
    $_____

    E. What do you estimate it would cost to purchase a new tractor? (not including trade-in value)
    $_____

    F. What do you estimate it would cost to purchase a new trailer? (not including trade-in value)
    $_____

D. OTHER COSTS

1. What is your average annual total cost of management and supervising personnel? _____ DOLLARS

2. What is your annual total cost of administrative help? (includes clerks, mechanics, typists, warehouse laborers, etc.) _____ DOLLARS

3. Do you advertise? _____ YES _____ NO

   If yes, how much does it cost in an average year?
   $_____

4. Do you own or lease any communication equipment? (C.B., etc.)
   _____ YES _____ NO

   If yes, what does this cost you per year on an average?
   _____ DOLLARS

5. Are your trucks stored indoors?
   _____ YES, IN A BUILDING I OWN
   _____ YES, IN A BUILDING I RENT
   _____ NO

6. If you own your truck garage:

   A. How much of the building is used for truck storage? _____ PERCENT

   B. What did the building cost you?
   _____ DOLLARS

   C. What does the insurance cost you on your building?
   _____ DOLLARS PER YEAR

   D. What is the approximate total annual taxes on the garage? _____ DOLLARS

   E. How long will your garage last? _____ YEARS

   F. If you rent, how much is rent per month?
   _____ DOLLARS PER MONTH

7. What was your total equipment leasing cost in 1986?
   $_____

8. Has your use of leased equipment increased or decreased in recent years?
   _____ INCREASED
   _____ DECREASED
   _____ NO CHANGE

IV. FINALLY, OUR GOAL IS TO ENCOURAGE AND HELP TRUCKERS OBTAIN MORE BACKHAULS. IN ORDER TO DO THIS WE NEED TO BETTER UNDERSTAND FRONTHAULS, BACKHAULS, AND THE RATES INVOLVED.

1. How are most of your fronthaul loads set up?
   _____ ELEVATOR CALLS ME.
   _____ I CALL THE ELEVATOR.
   _____ COMMISSION FIRM CALLS ME.
   _____ I CALL THE COMMISSION FIRM.
   _____ A BROKER CALLS ME.
   _____ I CALL A BROKER.
   _____ OTHER, PLEASE SPECIFY. _____

2. How often do you have a backhaul? _____% OF MY TRIPS

3. Do you ever use a broker to set up backhauls?
   _____ YES _____ NO

   If yes, what is the brokers percentage charge? _____%

4. Do you ever operate under a lease with a regulated carrier for backhauls? _____ YES _____ NO

   If yes, what percent of the revenue do you receive?
   _____%

5. Does your company have a person who specializes in setting up loads? _____ YES _____ NO

   If yes, how much is this person paid per year? $_____

6. What factors discourage you from obtaining a backhaul?

   _____ THE PROCESS OF OBTAINING OPERATING AUTHORITY
   _____ TIME INVOLVED IN SETTING UP A BACKHAUL
   _____ LOWER RATES
   _____ HIGH BROKER COMMISSIONS
   _____ EQUIPMENT PROBLEMS
   _____ OTHER, PLEASE SPECIFY _____
   _____

7. Do you charge lower rates on the fronthauls when backhauls are available?
   _____ YES _____ NO

8. If yes, typically how much lower? _____% LOWER

9. Do you have operating authority from the ICC?
   _____ YES _____ NO

   IF YES, FOR WHAT COMMODITY? _____
   WHAT GEOGRAPHIC AUTHORITY? _____

10. Do you have operating authority from any state agency?
_____ YES _____ NO

IF YES, FOR WHAT COMMODITY _____
WHAT GEOGRAPHIC AUTHORITY _____

11. Who are your regular customers?

ELEVATORS	_____%	
FARMERS DIRECTLY	_____%	
OTHER (PLEASE SPECIFY)	_____%	_____
TOTAL	100%	

12. Finally, what do you feel are the most important issues and concerns facing exempt truckers today?

APPENDIX B -

A SURVEY OF NORTH DAKOTA GRAIN TRUCK DRIVERS

BACKHAULING

My name is Leslie Bertram, and I am a Research Assistant at the Upper Great Plains Transportation Institute. Currently, I am conducting a survey concerning the role that backhauls are playing in today's trucking industry. Your responses will be completely confidential. If you could spare a few moments of your time, your input would be greatly appreciated.

Trucker Interviews

I General Information

A. Do you haul grain?

B. Where is your firm's base located?

C. How many years has your firm operated in North Dakota?

D. How many tractors do you operate?

Own _____
Lease _____
Total _____

E. How many trailers do you operate?

Own _____
Lease _____
Total _____

F. On average, how many miles did you log per truck in 1986? _____

F. What percent of your firm's revenue is earned from:

Hauling exempt commodities	_____%
Hauling regulated commodities	_____
Other sources	_____
Total	100.0%

What types of regulated commodities do you haul?

What are your other sources?

G. What percent of the time do you have a return (back) haul?

H. What percent of your trips hauling grain are to:

Duluth/Superior	_____%
Minneapolis/St. Paul	_____
Pacific Northwest	_____
North Dakota Destinations	_____
Other (please specify)	_____
Total	100.0%

II 1. How do you obtain hauls when returning to North Dakota? Do you consider the term "backhaul" to be out dated and if so what term do you consider more appropriate?

2. Have you ever used a/an:

Broker	_____
Commission Firm	_____
Trip Lease	_____
Elevator	_____
Other (please specify)	_____

3. What other methods do you use?

A. Brokers
Describe how you use a broker to obtain a backhaul?

How many brokerage firms do you use? _____

What are the benefits of using a brokerage firm?

Have you had any problems using brokerage firms? _____
If yes, what type?

What is the broker's percentage charge? _____

Do you use an inhouse broker? _____
If yes what is the cost to the firm?

How are you paid? (by broker or shipper)

Broker _____ Shipper _____

Does your broker/brokers help you obtain authority when necessary?

Yes _____ No _____

B. Commission Firm
Does the commission firm arrange backhauls or is that your responsibility? _____

C. Trip Lease
How are your trip leases arranged?

What are the benefits of trip leasing?

What problems have you experienced with using trip leasing?

How much does it cost per trip to trip lease? _____

D. Elevator
Do you contact the elevator or do they contact you about loads?
_____

III. Backhaul Background Information

A. What is the average one-way distance to Your Destination from your firm's base station? _____

B. What is the average rate you recieve for

Fronthaul

Wheat _____ cwt
Barley _____ cwt
Sunflower _____ cwt

C. What product do you return with most often?

D. Where do you typically haul this product to?

E. What is the average rate you recieve for a haul you return with?

F. Are your return hauls arranged prior to your departure?

G. Have you ever attempted to find a FRONTHAUL after obtaining a RETURN HAUL?

H. How long are you willing to invest in searching for a return haul?

I. On average, how many return hauls per trip do you hear about?

K. If greater than one, why don't you take the first return haul offered?

III. Other Backhaul Markets

1. Do your methods for obtaining return hauls differ amongest various destinations, such as Duluth or the Pacific Northwest?

If yes, which destinations differ and how?

2. Have you noticed a change in the importance of the backhaul (return haul) market from year to year? (EX: freq, revenue, commodities)

If yes, what types of changes have you witnessed?

Have you ever turned down a return haul?

If yes, why?

Have low return haul rates been a factor in your decision to obtain return hauls?

3. Authority
Do you have ICC Authority?

Yes ——— No ———

If yes: How much did it cost? ———
How long have you had it? ———
What commodities can you haul? ———
———
Over what geographical region? ———
———

What benefits do you feel there are associated with having ICC Authority?

What problems have you experienced with obtaining and/or using your ICC Authority?

Do you have State Authority?

Yes ——— No ———

If yes: How much did it cost? ———
How long have you had it? ———
What commodities can you haul? ———
———
Over what geographical region? ———
———

What benefits do you feel there are associated with having State Authority?

What problems have you experienced with obtaining and/or using your State Authority?

If you do not have either ICC or State Authority do you know how to obtain them?

ICC:	Yes _____	No _____
State:	Yes _____	No _____