THE EFFECTS OF LOCAL AND REGIONAL RAILROADS ON INTERMODAL AND INTRAMODAL COMPETITION

by

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UGPTI Publication No. 77

November 1989

THE EFFECTS OF LOCAL AND REGIONAL RAILROADS ON INTERMODAL AND INTRAMODAL COMPETITION

North Dakota Rail Services Planning Study

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This report has been prepared with funds provided by the Federal Railroad Administration of the United States Department of Transportation and the North Dakota State Highway Department. However, the data, methods, and findings presented herein do not necessarily reflect the views or policies of either agency, and are the sole responsibility of the Upper Great Plains Transportation Institute and the author.

HIGHLIGHTS

The organizational structure of railroads in the Upper Great Plains region is rapidly changing. Class I carriers such as the Burlington Northern are selling their branch lines to new rail operators. Line sales, on a significant scale, may affect traditional competitive relationships among railroads and between railroads and motor carriers. The purpose of this study is to assess the potential impacts of local and regional railroads on intramodal and intermodal competition in North Dakota.

A set of models is formulated in the study to project the cost of grain shipments for five combinations of railroads and modes: (1) BN origination and termination, (2) local railroad origination with BN interchange, (3) Soo Line origination and termination, (4) Soo Line/local railroad combination, (5) motor carrier. It is assumed in the study that the grain traffic originates on a branch line with a density of 21 cars per mile, and that each shipment travels approximately 43 miles on the branch.

The principal findings of the study are: (1) on the average, motor carriers cannot be cost-competitive with a BN/local railroad network at distances greater than 250 miles, (2) the sale of lines by the BN will significantly enhance their existing cost advantage over the Soo Line, and (3) reducing the Soo Line's crew consist from 4 to 2½ persons on branch-line trains will lower their on-branch costs by only five percent. Therefore, if the BN sells a substantial amount of branch-line track in North Dakota, the Soo Line will probably have to sell their lighter-density lines to local operators in order to remain competitive.

FOREWORD

This report is part of an integrated series of studies on the effects of local and regional railroads on rail transportation in North Dakota. The studies are funded by the North Dakota State Highway Department, with money originally provided by the Federal Railroad Administration of the U. S. Department of Transportation.

In addition to this report, Phase I of the rail services planning series contains reports on:

1. The Economics of Local and Regional Railroads
2. The Impacts of Local and Regional Railroads on Shipper Service Levels
3. The Impacts of Line Sales on Rail Labor
4. Short-Line and Class I Carrier Labor Costs
5. The Benefits and Costs of Local and Regional Railroads.

Phase II of the rail services planning study involves the development of an updated rail line benefit-cost model.

INTRODUCTION

The American railroad industry is in a state of transition. Since 1980, over 200 new railroads have been formed in the United States, most as a result of Class I carrier line sales to independent operators. Many of the new local and regional railroads are operating light-density branch lines which Class I carriers cannot operate profitably.

The growth of short-line and regional railroads has sparked debate over a variety of issues, ranging from branch-line economics to labor impacts. Many of these issues are addressed in various components of the North Dakota Rail Services Planning (RSP) Study.

In the economic component of the study, it was shown that substantial economies can be gained from operating rural branch lines as short-line railroads rather than as parts of Class I carrier systems[1]. Efficiency gains such as these benefit rail operators, shippers, and state and local governments. However, efficiency gains in one sector of the transportation industry can affect long-term competitive relationships throughout the system -- relationships among railroads, as well as between railroads and motor carriers. The purpose of this component of the Rail Services Planning Study is to analyze the potential impacts of local and regional railroads on intramodal and intermodal competition in North Dakota.

PROBLEM STATEMENT

North Dakota is a landlocked state, remote from many processing and exports centers. North Dakota producers, manufacturers, and shippers are dependent upon rail and truck transportation for physical distribution and supply. The promotion of competition between railroads and trucks, and among firms within the transportation industry, has always been an important part of transportation policy in North Dakota.

[1]See: Tolliver, Dooley, and Zink. Costs and Profitability of Light-Density Branch Lines: BN vs. Short-Line Ownership., UGPTI Staff Paper 85, July, 1987.

In general, intermodal and intramodal competition are desirable because they:

1. Create downward pressure on rates,
2. Stimulate productivity, innovation, and efficiency within the transportation industry,
3. Result in better services to shippers,
4. Provide shippers with flexibility and logistical options.

A carrier's ability to compete in a market is partly a function of its cost structure. In competitive markets, a carrier's rates will tend to gravitate toward long-run marginal costs over time. Even in oligopolistic or other types of markets, a carrier's market share and long-run viability are affected by its cost structure.

The Emergence of Short-Line/Trunk-Line Systems

Prior to 1987, two Class I carriers (the Burlington Northern and the Soo Line) competed with each other, and with exempt agricultural truckers, for the majority of grain and farm products originated in North Dakota. In May of 1987, BN sold 667 miles of track to the Red River Valley and Western (RRV&W) railroad. The RRV&W interchanges grain traffic exclusively with the BN. This arrangement is typical of many line sales, wherein the selling Class I carrier seeks to capture all of the traffic originated and terminated on the short-line network.[2]

In essence, line sales such as these create "short-line/trunk line" systems. These systems tend to maximize the economic advantages of each type of railroad. For example, the local or regional railroad, with its low labor and train-mile operating costs, handles the consolidation and delivery of traffic. This leaves the Class I carrier free to focus on yard-to-yard through train movements over high-density mainlines. On mainline movements, the Class I carrier's capital resources and level of technology help offset its higher labor costs. The bottom line is that the overall cost of handling grain traffic is reduced by the

[2]They accomplish this through gateway control, covenants, or other terms of sale.

short-line/trunk-line system.

As will be illustrated later, the cost structure of the selling Class I carrier is significantly changed by a line sale. Thus, if the level of technology and work rules remain the same within the rest of the transportation industry, long-run competitive relationships may shift. For example, if other Class I carriers keep their branch lines, they must continue to operate them under existing work rules, with four-to-five person crews, at historic wage rates. If this occurs, then cost relationships among railroads will tend to diverge over time[3].

Any reduction in branch-line costs will affect long-run cost relationships between truck and rail in a similar manner, provided that the level of motor carrier technology and size and weight regulations remain the same.

The Impact of Cost Structures on Long-Term Competitiveness

Changes in the cost structure of competing carriers or modes may not generate any noticeable short-run effects. However, in the long-run, they can affect the viability and competitiveness of a given mode or firm. There are two major reasons for this. First, rail costs tend to act as a price floor, limiting the downward pricing flexibility of carriers. Second, and perhaps more important, in markets where prices are set by competition or price leadership, a carrier or firm's cost structure helps determine its level of profits.

Transportation rates in North Dakota markets are generally determined through dominant mode price leadership[4]. In dominant mode price leadership, price changes are generally initiated by one of the Class I carriers serving the market. The other railroads

[3]Any competitive shift in North Dakota may pose a particular problem for the Soo Line, which has experienced low rates of return in recent years and lacks a single-line West Coast connection.

[4]See: Wilson, Griffin, Koo, and Wilson. Dominant Mode Price Leadership in Grain Transportation, Journal of the Transportation Research Forum, 1984.

then typically follow suit. If truckers can afford to match the price change, they too will follow. In a downward traffic spiral or rate war, a mode or firm with a cost advantage can maintain or expand its market share, thus ensuring its long-term viability.

There is another important concept involved here. Some level of profits or net income is necessary to renew equipment and plant over time. Low-cost carriers can usually implement the newest technology (which further increases productivity), perform normalized maintenance of way, and replace freight cars and locomotives as their useful lives expire. In contrast, high-cost carriers generally cannot afford the newest technology, must defer maintenance on light-density lines, and frequently postpone the replacement of aging, antiquated equipment. So, over time, the competitiveness (or even the viability) of high-cost carriers is open to question.

METHODS

At present, there are three possible avenues for transporting North Dakota grain to market:

1. Class I carrier
2. A combined Class I carrier/regional railroad system
3. Truck.

The only line sale in the state thus far has been initiated by the Burlington Northern. Other BN line sales have been rumored, but none have materialized to date. However, the BN has made clear its desire to sell the remainder of its branch lines in North Dakota.

In the first part of the analysis, the potential impacts of BN line sales on the Soo Line and trucks are evaluated. For purposes of analysis, the remainder of the transportation network (with the exception of the BN) is assumed to be static.

This is the situation which currently exists in North Dakota. So, the results of the first part of the analysis should provide a baseline picture of future rail restructuring if current arrangements continue over time. Later in the analysis, the no-sell restriction will be lifted from the Soo Line, and potential changes resulting from Soo network sales evaluated.

It is not possible to analyze every BN or Soo Line branch line in the state, and compute the cost changes that occur on each individual line. This would require a great deal of resources, and even then, the data would not be perfect. So an alternative method has been devised for this study. For purposes of cost comparison, a hypothetical rail line has been defined which typifies light-density grain branch lines. The abstract line is 43 miles long (the mean for ND branch lines). The traffic density is 20 cars per mile (or roughly 150,000 gross ton miles per mile). Capacity costs for the hypothetical line (e.g. normalized maintenance of way and return on roadway investment) have been computed from economic-engineering formulas. The costs reflect typical roadway or track assets and operating conditions for lines with less than 1 million gross ton miles per mile (MGTMM). Property taxes have been estimated directly from North Dakota Property Tax Department reports and local mill levies. Other branch-line costs for the BN and Soo Line have been estimated using a procedure described in a technical paper by the author[5]. Highlights of the methodology are presented in the following paragraphs of the report.

In the first step of the costing procedure, a set of on-branch unit costs are computed from each carrier's R-1 report. The on-branch unit costs include:

1. Locomotive repairs and maintenance
2. Locomotive depreciation
3. Locomotive return on investment
4. Locomotive overhead and administration
5. Locomotive fuel and servicing
6. Car ownership
7. Crew wages
8. Train operations (i.e. signals, crossings, dispatching, etc.)
9. Transportation administration and overhead
10. Yard operations
11. General administration and support services.

[5]See: Tolliver, Class I Carrier Light-Density Costing Methodology., UGPTI, 1989.

12. Other expenses.

Most of the locomotive unit costs are expressed on an hourly basis. Time-sensitive transportation costs (such as crew wages and administration) are computed on the basis of train-hours of operation. The remaining transportation items are calculated on the basis of train-miles. Car ownership costs (including repairs, depreciation, and return on investment) are estimated from data contained in Schedules 415, 710, and 755 of the carrier's R-1 report. The expenses are allocated among car miles and car days in accordance with standard ICC procedures.

Branch-line unit costs have been estimated for local and regional carriers from national survey data, and from actual Red River Valley & Western operating data. For a list of the data sources and methods used in the short-line costing procedure see: Tolliver, Dooley, and Zink (1988), and Tolliver and Lindamood (1989).

On-branch costs for the BN, the Soo Line, and local railroads are estimated via a two step process: (1) the number of annual service units (e.g. locomotive hours) required on the branch are estimated, and (2) the service units are multiplied by the unit costs to derive annual expenses. Off-branch costs are computed using a modified Rail Form A (RFA) procedure, which is described in a technical paper the author[6].

It is assumed that the hypothetical line will be maintained at FRA class II standards, at a level sufficient to handle unit train traffic. This translates into a normalized maintenance of way cost of approximately $8,880 per mile for Class I carriers and $7,100 for local and regional operators. Because of greater work rule flexibility and lower wage rates, normalized maintenance costs tend to be lower for local and regional carriers. However, some of the wage and productivity gains are offset by their lower level of capital and technology. Local and regional carriers generally do not possess the

[6]See: Tolliver, Denver. Class I Carrier Light-Density Costing Methodology,UGPTI,1989.

specialized, high-cost equipment that Class I carriers do. Furthermore, they face diseconomies of scale in the acquisition of materials and supplies. These disadvantages tend to negate some of the wage and productivity savings.

Normalized maintenance of way (NMOW) is an idealized concept or standard. It denotes the annualized sum necessary to maintain a track at some predefined level. NMOW cost may never agree with actual track expenditures during a given year. Actual expenditures are subject to budgetary constraints and management priorities. In the short-run, carriers can (and do) defer normalized maintenance. However, over a longer period of time, the cumulative effects of deferred maintenance will require rehabilitation of the line, or will lead to its abandonment. Nevertheless, it is important for the reader to understand that normalized maintenance of way costs are not reflected in short-term rail costs or profits[7].

Truck unit costs have been estimated from North Dakota survey data using economic-engineering methods. The methods and data are detailed in Dooley, Wilson, and Bertram (1989). In the study, truck costs per mile were estimated to each major market. The unit costs from the Dooley, Wilson, and Bertram study have been updated to current levels and used in this analysis.

Both truck and rail costs are computed on a loaded mile basis. Therefore, a consistent method of estimating costs for the return portion of a movement is needed. Rail empty return costs have been calculated by applying an empty return ratio to the loaded train miles[8]. Similarly, the empty truck mileage attributable to the loaded grain shipment has been computed by multiplying the loaded trip mileage by a factor of one minus the loaded backhaul percent.

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[7] A net liquidation value of $9,443 per mile has been used in the study.

[8]Rail empty return ratios for each type of car are computed from the carrier's latest R-1 report, Schedule 755.

Truck costs unit costs do not vary significantly with the commodity or type of service[9]. However, rail costs do. Rail costs have been computed separately for each commodity, and for each of three levels of service:

1. Single-car
2. 26-car
3. 52-car.

The purpose of this section of the paper has been to highlight the methods and data sources employed in the analysis. The general findings and conclusions of the study are discussed in the following pages of the report.

RESULTS

The results of the analysis are summarized in two major ways. First, the on-branch and off-cost costs for each mode (or combination of modes) serving the hypothetical branch line are evaluated. Second, the cost per cwt-mile is computed for each mode, and displayed graphically. The objective of the latter approach is to identify the breakeven distance (that point at which rail costs and truck costs are equal), and show how the breakeven distance is affected by local and regional railroads.

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[9]In this study, it assumed that all commodities load up to the maximum legal limit of 80,000 pounds. Through the use of sideboards and extensions, this is generally feasible for lighter-loading commodities.

Intermodal and Intramodal Cost Comparisons

The results of the single-car scenario are shown in Table 1[10]. As Table 1 depicts, the total cost to the Burlington Northern of handling the traffic originated or terminated on the line is 72 cents per cwt. Even on a branch line of median length (43 miles), BN's on-branch cost per cwt is greater than its off-branch cost. Under Class I ownership, BN's projected revenue-to-cost ratio is 150 percent.

TABLE 1. Comparison of Rail and Truck Cost per Cwt Assuming Single-Car Service

(a)	(b) Revenue Per Cwt	(c) Off-Branch Cost Per Cwt	(d) On-Branch Cost Per Cwt	(e) Total Cost Per Cwt
BN	$1.08	$.34	$.38	$.72
BN/Local	$1.08	$.34	$.29	$.63
Soo Line	$1.08	$.43	$.38	$.80
Truck	$1.08	--	--	$1.02

If the branch line is operated as part of a short-line railroad system, then the on-branch costs are reduced by 24 percent. As a result, the cost of handling the traffic on the short-line/trunk-line system is reduced by nine cents per cwt.

After the line has been sold, the Burlington Northern no longer incurs the on-branch cost shown in column (d) of Table 1. Instead, the costs are absorbed by the local operator. Yet, BN retains the traffic on its system. In other words, BN's cost of handling

[10]Both the revenues and costs shown in Table 1 represent weighted averages of the commodity mix and market distribution. The underlying costs and revenues were actually computed on a commodity and market basis. From the sector estimates, weighted means were computed. The rail costs reflect the on-branch mileage plus the distance from the division point to terminal market. Truck costs reflect the highway miles from each branch-line shipping point to final destination. Both costs reflect the empty miles of transportation equipment in each market.

the traffic has been reduced by 38 cents per cwt. If BN gives the local railroad $300 per car as a division, it is foregoing approximately 17 cents of the revenue per cwt. Thus, the Class I carrier is increasing its net revenue by 21 cents per cwt. Perhaps this explains, in part, BN's desire to sell branch lines in North Dakota.

Single-car service is the most inefficient Class I operation. More switching time is required, and the scheduled way trains are typically smaller than under multi-car service. Table 2 shows the projected cost comparison's for 26-car branch-line traffic. As the table depicts, both the on-branch and off-branch costs per cwt have declined. But since the Class I carrier is more efficient under multiple-car service, the per cwt reduction from short-line operation is less (seven cents). Nevertheless, the reduction is quite significant. The carrier is giving up 17 cents in revenue in exchange for 32 cents in cost savings.

TABLE 2. Comparison of Rail and Truck Cost per Cwt Assuming 26-Car Service

(a)	(b) Revenue Per Cwt	(c) Off-Branch Cost Per Cwt	(d) On-Branch Cost Per Cwt	(e) Total Cost Per Cwt
BN	$.92	$.31	$.32	$.63
BN/Local	$.92	$.31	$.25	$.56
Soo Line	$.92	$.41	$.32	$.73
Truck	--	--	--	$1.02

The projected branch-line costs for the BN and Soo Line are quite similar under both scenarios. Under single-car service, the projected on-branch cost is $715 for the BN as opposed to $697 for the Soo Line. However, on a cwt-basis, the difference is not significant. The real difference between the two carriers surfaces in the off-branch costs. The BN operates long through and unit trains over high-density mainlines. The Soo Line's density is much less. To be precise, in 1988 the BN system-average traffic density (in millions of gross ton miles per mile of track) was 17.17 MGTMM[11]. In comparison, the Soo Line's mean traffic density in 1988 was 7.22 MGTMM[12]. In 1988, the average BN through train consisted of 81 cars; the mean was 82 in unit train service[13]. In contrast, the average Soo Line through train contained 70 cars. Longer trains generally result in lower costs per ton mile as relatively fixed crew wages, locomotive capacity, and train administrative costs are spread over a greater number of revenue-generating units.

The sale of the hypothetical branch line to a local operator changes the intramodal competition picture dramatically. As Table 1 shows, a local rail operator can originate branch-line traffic at a cost of nine cents per cwt less than the Soo Line (or the BN for that matter). Given its existing work rules and train crew arrangements, the Soo Line cannot achieve the same cost structure as the new local carrier. Furthermore, the cost differential is likely to increase over time, as the short-line/trunk-line system builds its capital resources and implements newer technology[14].

As Tables 1 and 2 suggest, motor carriers are even less cost competitive with the new short line. The projected motor carrier costs are approximately equal to the rail 26-

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[11]Source: Line 6, Column (c), Schedule 720, 1988 R-1 report.

[12]Ibid.

[13]Computed from Schedule 755 of the 1988 R-1 report.

[14]An interesting side note should be made here regarding the data in Tables 1 and 2. The projected long-run branch-line cost (including normalized maintenance of way) exceeds the typical revenue division of $300 per car. In fact, at a density of 20 cars per mile, the normalized maintenance of way cost alone ($284 per car) is nearly equal to the revenue division. And this comparison does not consider the remaining on-branch cost elements.
As pointed-out earlier, NMOW does not reflect actual expenditures by the carrier. The local railroad may be performing normalized maintenance on some lines and deferring maintenance on others. With a revenue division of $300 per car, a grain branch line must generate at least 35 cars per mile in order for the local or regional carrier to perform normalized maintenance and make a profit on the traffic originated and terminated on the line. Again, NMOW or deferred maintenance costs are not reflected in short-term expenses or profits. However, over time, accumulated deferred maintenance will require large catch-up or rehabilitation expenditures, or else the line will be abandoned.

car grain rate. So, in any downward traffic spiral or price war, motor carriers may become uncompetitive in long-haul grain transport.

Changes in Cost Relationships with Distance

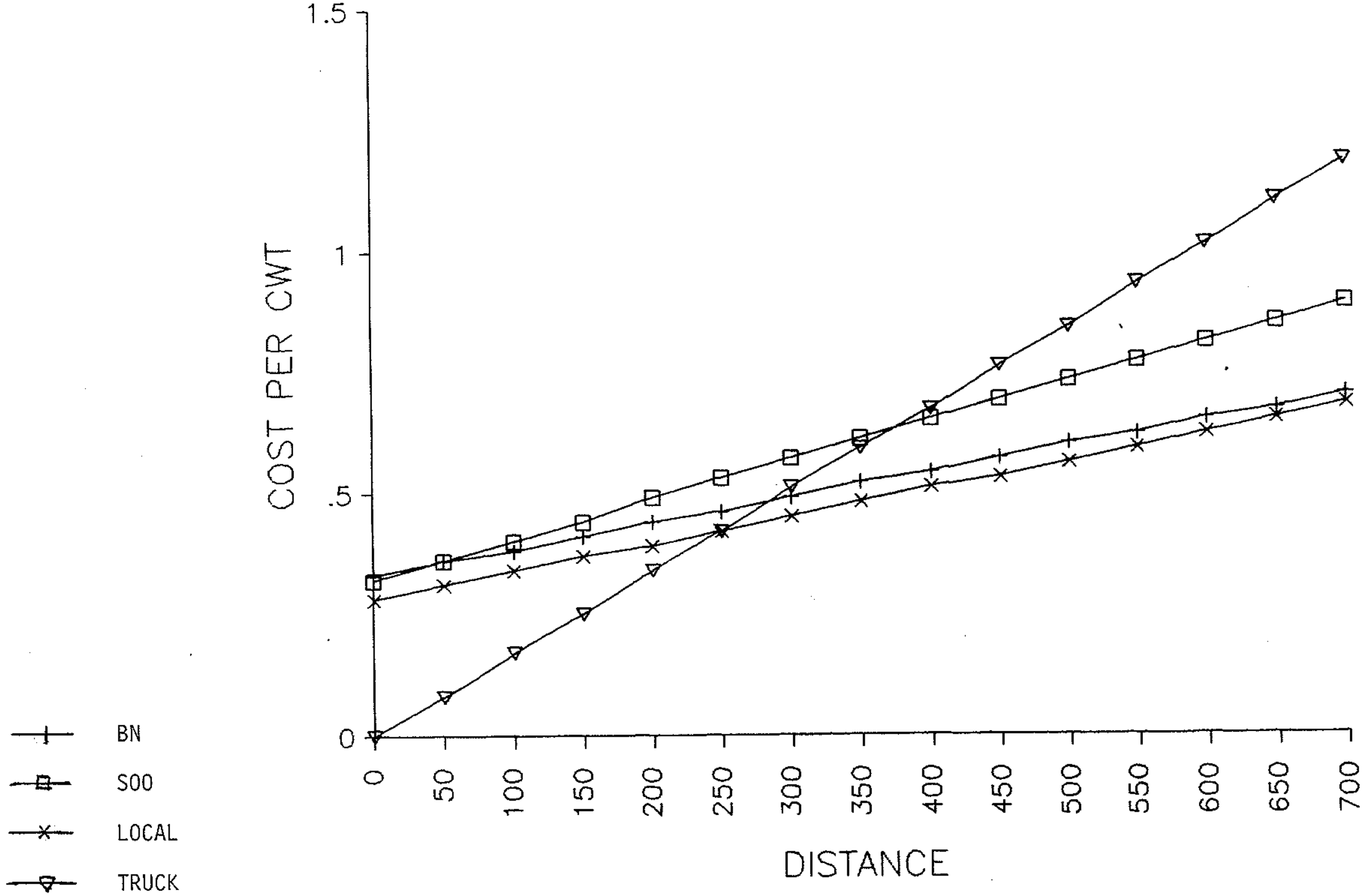
The costs presented in the preceding section reflect the weighted-mean distance from the hypothetical branch line stations to various markets, as well as the weighted distribution of shipments among commodities. In the following paragraphs, the costs from the case study are expressed on a distance scale.

Figure 1 shows the cost per cwt of each of the four alternatives for a range of distance intervals. If the branch line is operated as part of BN's system, the breakeven distance is roughly 300 miles. At this distance, the service cost of the BN and motor carriers are roughly equal. When the branch is sold to a local operator, the breakeven distance decreases to approximately 250 miles.

Even a modest reduction in the breakeven threshold of 50 miles can be significant from an intermodal perspective. Highway distances from many of the major shipping points in the eastern part of the state to Minneapolis are in the 300 mile range. The truck share of the Minneapolis market has already dropped from 40 percent in crop year 1979-1980 to 22 percent in 1987-1988. A similar drop in truck share has occurred in the Duluth

Figure 1

MODAL COST RELATIONSHIPS



market, falling from 34% in 1979-80 to 21% in 1987-88. If the range of motor carrier's cost advantage decreases even by 50 miles, trucks may be hard pressed to compete in the Minnesota markets.

One possible conclusion that may be drawn from the data is that trucks may be relegated to local or intrastate transportation of grain in the future if railroads parlay cost advantages into price changes. As illustrated by the statistics presented above, the role of trucks in North Dakota has already been changing over time. Trucks have increased their market share on intrastate traffic, handling the satellite-to-subterminal elevator traffic and much of the movement to instate processors. The introduction of local and regional railroads could expedite the transformation, pushing truckers out of interstate markets.

As noted earlier, future line sales in North Dakota may inolve Soo Line as well as BN track. The potential implications of Soo Line sales are discussed in the following paragraphs.

As depicted in Figure 1, the breakeven distance is slightly higher for the Soo Line than for the BN. Truck and Soo Line costs are equal at around 350 miles. A Soo Line/local railroad combination would roll back the breakeven distance to approximately 305 miles, and make the Soo more competitive with BN local carriers. If the data in Table 1 are restated, the combined cost of a Soo Line-local railroad system, serving the hypothetical branch line, is estimated at 72 cents per cwt. Interestingly, the projected cost for a Soo Line-local network is exactly equal to BN's projected cost of handling the branch-line traffic.

Instead of selling their branch lines, one potential option for the Soo Line is to negotiate reduced crew consists on branch lines. Both the BN and the Soo are currently operating with four-person crews over most of their systems. The average crew size for local and regional railroads nationwide is approximately 2.5[15]. The Soo may be able to operate safely on some branch lines with a two-person crew. On others, three crew members will probably be required. So, the nationwide average of 2.5 may be representative of a reduced crew agreement. Reducing the size of the average train and engine crew from four to 2.5 persons would decrease Soo Line's on-branch cost by two cents per cwt. This is a significant reduction. But it is not sufficient, in and of itself, to make Soo branch-line operations competitive with those of local railroads.

SUMMARY AND CONCLUSIONS

The purpose of this report is to evaluate the potential impacts of line sales on intramodal and intermodal competition in North Dakota. The data developed in the study suggest that if branch lines are sold to local carriers, the competitive advantage of railroads will increase. The selling Class I carrier will be able to eliminate its branch-line cost and yet retain the traffic on its system. Furthermore, branch-line costs will be reduced under local railroad operation due to lower labor and train operating costs. Thus, trucks will be less cost competitive at distances of 300 miles, and therefore, may find themselves unable to compete effectively in traditional eastern markets (particularly from western parts of the state).

The data also show that the selling Class I carrier will gain a significant cost advantage over other railroads in the market (if those carriers do not also sell their branch lines to local operators). If all of the line sales in the state are Burlington Northern spin-offs, then the long-run cost relationship between the BN and the Soo Line could change significantly over time. This shift may have serious consequences for the Soo Line network in North Dakota. Soo branch lines may become less viable as their traffic base

[15]Source: nationwide survey conducted by the UGPTI.

erodes and deferred maintenance accumulates over time. Therefore, one of the conceivable outcomes of railroad restructuring in North Dakota is that the development of local BN carriers may force the sale of Soo Line's branch-line system.

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