THE CHANGING STRUCTURE OF THE NORTH DAKOTA COUNTRY ELEVATOR INDUSTRY AS A RESULT OF MULTI-CAR RATES: IMPLICATIONS FOR CONDUCT AND PERFORMANCE

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INTRODUCTION AND OBJECTIVES

North Dakota ships tremendous quantities of bulk agricultural commodities out of state. Nearly all of this volume is sent to major markets at the East, West, and Gulf Coasts - each nearly 1500 miles from North Dakota. Costs associated with moving this grain to market can amount to nearly 40 percent of the final delivered price. Because of the relative importance of transportation in the price of grain, the country elevator industry is closely tied to the transportation industry.

In December 1980 competition from motor carriers induced railroads to offer multi-car grain rates in North Dakota. These rates arrived in North Dakota several years after being introduced to other parts of the nation. These new rail rates allowed up to a twelve percent discount from single car rates. Since the introduction of these rates, changes have been occurring in the structure of the North Dakota country elevator industry. These new rail rates have caused, directly or indirectly, transformations that may lead to fewer firms marketing grain. Marketing proficiency, rail rate structure, and efficiencies gained by handling large volumes could all contribute to increasing concentration in grain handling. However, none of these would be possible without multi-car rates.

Several large subterminal[1] elevators have been receiving grain shipped from smaller satellite elevators for reshipment out of state. The efficiencies and rate savings offered by multi-car rates allows this double handling to be profitable. Efficiencies gained from multi-car shipments include economies in information systems, risk-pooling, storage, and transportation - including loading, switching, unloading, and other transport costs (Caves

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[1] Subterminals, as used in this paper, are those elevators that ship 26-car or 52-car unit trains.

and Pugel). Possible implications of this practice are many, and include higher prices to producers, increased farm trucking and storage, diminished importance of cash and central markets, and strengthened price competition between subterminals (Ming and Wilson).

It is hypothesized that multi-car rates have contributed to increasing concentration of grain shipments in North Dakota. Objectives of this paper are to:

1. describe recent structural changes in the North Dakota country elevator industry,
2. document the change in concentration of grain handling in the North Dakota country elevator industry before and after implementation of multi-car rates and
3. suggest implications of these changes.

Data on wheat shipped out of North Dakota destined for major markets will be used in the analysis.

METHOD OF ANALYSIS

The theory of industrial organization is used to review the conduct and performance of the North Dakota country grain marketing system. Data for the entire population of country elevators in North Dakota are available over several years. State law requires each country elevator in North Dakota to report monthly to the North Dakota Public Service Commission the quantity of grain shipped by commodity, mode and destination. The comprehensiveness of this data is uncommon and should accurately reflect actual conditions. While industrial organization theory is most applicable to manufacturing industries and not often applied to an industry such as country grain marketing, the implications of structural characteristics should be similar.

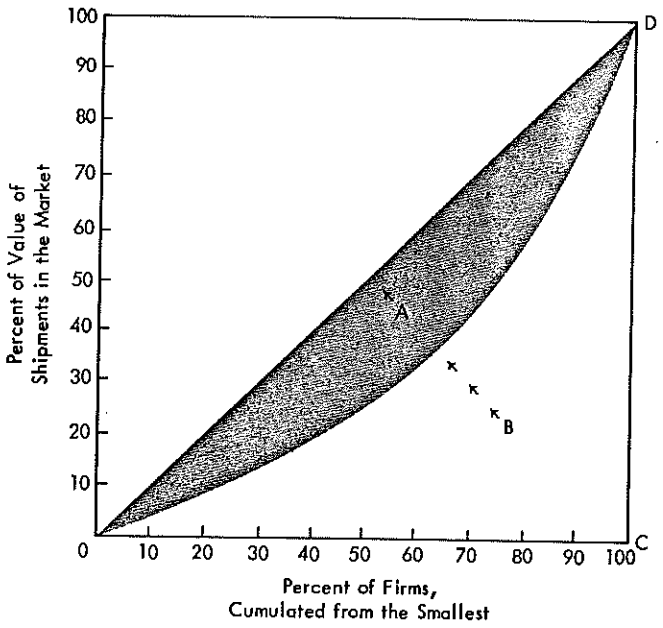
A portion of market structure analysis involves classifying industries as monopolistic, oligopolistic, or competitive. Each category is associated with a unique type of conduct and performance. In the case of grain elevators all three categories may exist simultaneously. An elevator may have a spatial monopoly within a small radius, a wider radius may be an oligopoly, and competition may exist for some products or services as the geographical scope of the market is expanded.

Two models from industrial organization are used in this analysis. The first is concentration ratios (Koch). Concentration ratios are only partial indicies - they consider only part of the industry. The market share of the largest five, ten, twenty, and fifty firms in volume of grain shipped will be reviewed. The second, a summary index including all firms, is the Lorenz curve (Koch). The Lorenz curve depicts the inequalities among firm sizes. If all firms in the market were the same size the Lorenz curve would be a straight 45 degree line (line A in Figure 1). Any disparities among firm sizes will make the curve more convex toward the lower right hand corner. The larger the disparities, the greater the curvature in the Lorenz curve (line B).

The recently introduced theory of market contestability will also be used to analyze elevators' markets. The theory of a perfectly contestable market is paraphrased by Bailey:

> A perfectly contestable market is defined as one in which entry and exit are easy and costless, which may or may not be characterized by economies of scale or scope, but which has no entry barriers, as discussed by Baumol and Willig. Potential entrants are assumed to face the same set of productive techniques and market demands as those available to incumbent firms. There are no legal restrictions on market entry or exit and no special costs that must be borne by an entrant that do not fall on incumbents as well.

Contestability offers an explanation for competitive behavior in industries that would otherwise be considered monopolies or oligopolies based on the number and size of firms.



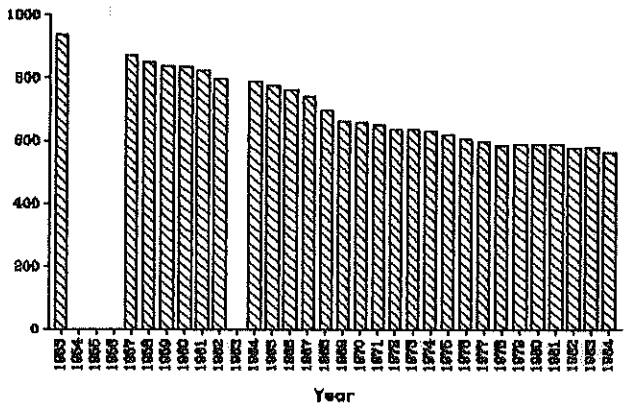
Source: Koch.

FIGURE 1. The Lorenz Curve.

STRUCTURAL CHANGES IN THE NORTH DAKOTA COUNTRY ELEVATOR INDUSTRY

A number of structural changes have been occurring in the North Dakota country elevator industry. Some of these are a direct result of change in the transportation system, while others are the result of longer term pressures for increased volume throughput and cost reduction.

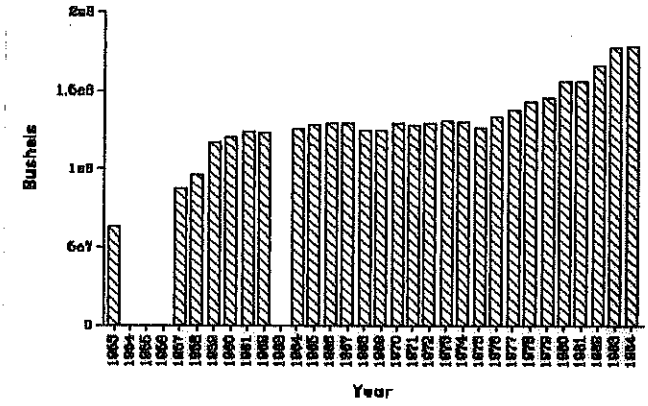
The first characteristics of the North Dakota country elevator industry to be explored are the number and size of firms. The number of elevators in the state has ranged from over 2,000 in 1915 to 563 in 1984. The decrease in the number of firms has been gradual and steady throughout the past 27 years (Figure 2). While a decreasing number of firms may be an indication of increasing concentration, the evidence of an impact from multi-car rates is not conclusive. There has been no rapid drop in the number of firms since December 1980 when multi-car rates were first introduced.



Source: North Dakota Grain Dealers Association, Velde.

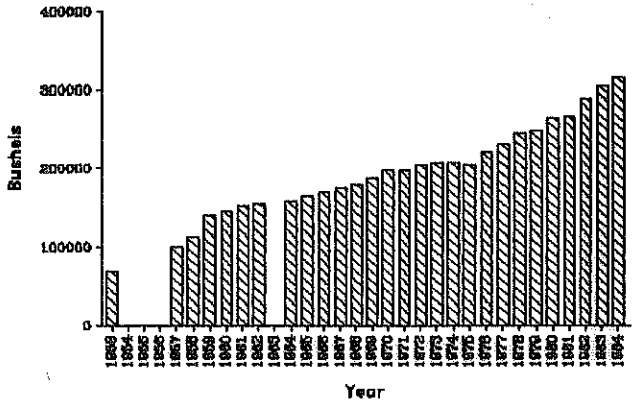
FIGURE 2. Number of Country Grain Elevators in North Dakota, 1953-1984, Available Years.

The variables used to measure the size of firms are total elevator capacity in the state and average capacity per elevator. Historical data for these variables are presented in Figure 3 and Figure 4, respectively. While elevator numbers have been decreasing, elevator capacity in the state and average capacity per elevator have been increasing. Once again however, the changes occurring are part of a long term trend and have not varied significantly since multi-car rates were introduced.



Source: North Dakota Grain Dealers Association, Velde.

FIGURE 3. Total Storage Capacity of All Elevators in North Dakota, 1953-1984, Available Years.

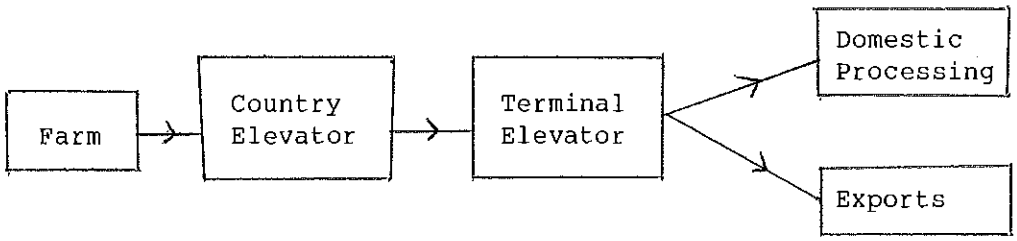


Source: North Dakota Grain Dealers Association, Velde.

FIGURE 4. Average Storage Capacity Per Elevator in North Dakota, 1953-1984, Available Years.

Changes in Patterns of Grain Marketing

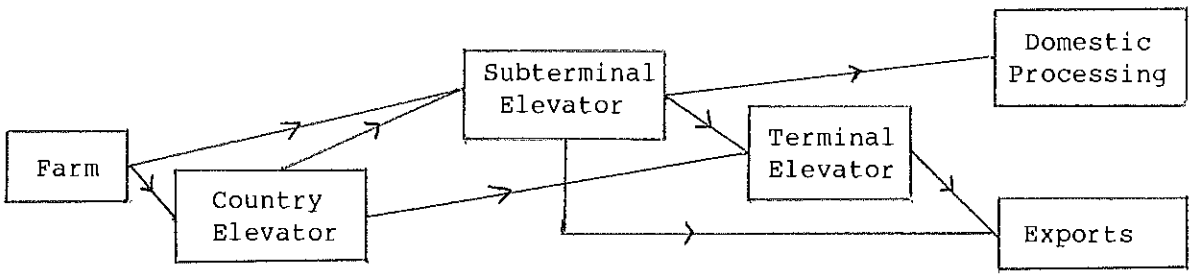
The implementation of multi-car rates and the subsequent development of subterminal systems has led to a change in the traditional flow of grain marketing. The typical pattern of grain flow in the past is shown in Figure 5.



Source: Ming and Wilson.

FIGURE 5. Traditional Flow of Grain Marketings From North Dakota.

Grain traditionally moved from farms to country elevators to terminal elevators to domestic processors or export markets. However, with the advent of subterminals and unit train shipments a new step has been added (Figure 6). Instead of moving directly from country elevator to terminal elevator, a farmer or a country elevator manager has the option to sell through a subterminal. Subterminals have also been selling directly to domestic and export markets, bypassing the terminal market entirely.



Source: Ming and Wilson.

FIGURE 6. Pattern of Grain Marketing With Subterminal Elevators Included.

This added step may mean several things. First, the role of central markets, such as Minneapolis or Chicago, may be reduced. Unit trains may be shipped directly from country subterminals to export ports or domestic processors (Ming and Wilson). Second, the incidence of grain being hauled against the market may increase. Lastly, the extra step could partly cause the demise of the smaller country elevators. Buyers that need grain might prefer going to one large subterminal for a shipment rather than calling several smaller elevators and coordinating their shipments. Also, railroads may decide to discontinue service to smaller elevators when larger subterminals are in the area. It may also mean a more efficient, lower cost haul for railroads. Once railroads have the grain loaded, it will be a single, direct

shipment to its destination with no switching, loading, or unloading stops on the way.

Rail Rate Structure

After 108 years of single-car rates in North Dakota, the Burlington Northern railroad introduced 26-car multiple origin, 26-car single origin, and 52-car single origin rates on wheat to the Pacific Northwest on December 1, 1980. North Dakota was the last major grain producing region to acquire multi-car rates. When first implemented the spreads between these rates were a 16 cent discount from the single-car rate for 26-car multiple origin shipments, another 5 cent discount for 26-car single origin shipments, and an additional 5 cent discount for 52-car single origin shipments for a total of 26 cents discount between single-car and 52-car rates (Table 1). For the next 16 months this spread varied only a cent or two, rising to 28 cents by the beginning of 1982. In April of 1982, however, the overall spread increased to 49 cents with a 23 cent spread between the 26-car single origin and the 52-car single origin rates alone. Spreads between the single/26-car multiple origin and 26-car multiple origin/26-car single origin did not vary nearly as significantly as the 26-car single origin/52-car spread, as is shown in Table 1.

TABLE 1. Historical Multi-Car Rate Spreads for Wheat Shipments from Minot, North Dakota to the Pacific Northwest.

Date	Single / 26-Car MO	26-Car MO / 26-Car SO	26-Car SO / 52-Car SO	Single / 52-Car SO
	(cents/cwt.)			
12/01/80	16¢	5¢	5¢	26¢
06/05/81	16¢	5¢	5¢	26¢
07/01/81	16¢	5¢	5¢	26¢
10/01/81	16¢	6¢	5¢	27¢
01/01/82	17¢	6¢	5¢	28¢
04/19/82	19¢	7¢	23¢	49¢
07/20/82	14¢	7¢	15¢	36¢
02/01/84	14¢	12¢	15¢	41¢
02/05/84	14¢	8¢	15¢	37¢

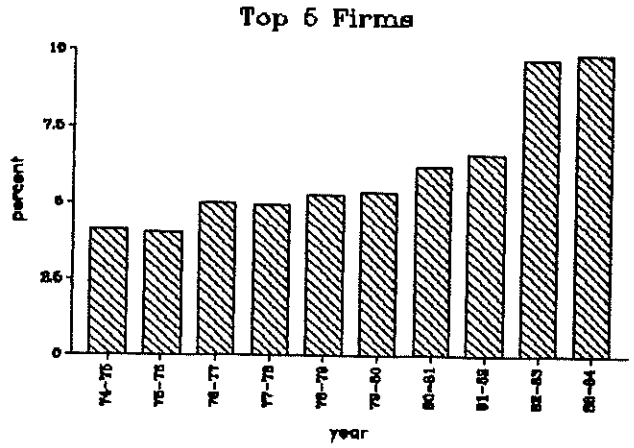
Source: Griffin and Mielke, North Dakota Public Service Commission.

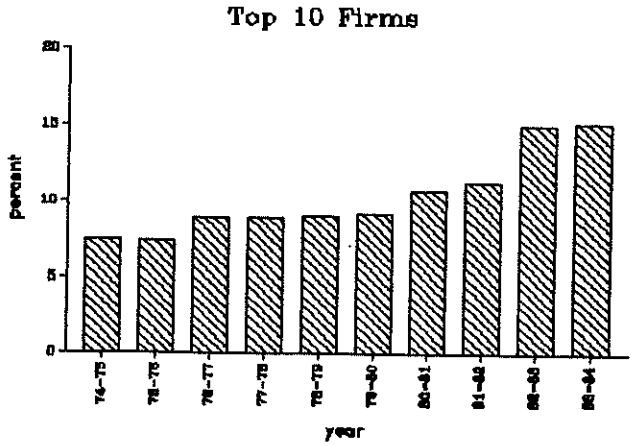
The rate adjustments of April 19, 1982 started a new era of grain movement in North Dakota. These rates gave new direction to the growth and development of the country elevator industry. Multi-car shipping, particularly from 52-car facilities, suddenly became profitable for many locations. Development of the subterminal system, then, is sensitive to rate spreads. When multi-car rates were first introduced, with a 26 cent single-car/52-car discount, subterminal development was slow. But when this spread increased to 49 cents, subterminal development became feasible for many elevators. By October 1984, twenty-eight 52-car shippers had been identified (Zink).

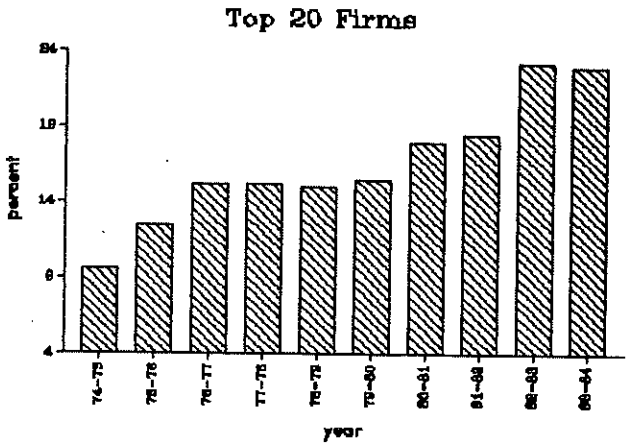
MEASURES OF CONCENTRATION APPLIED TO THE NORTH DAKOTA COUNTRY ELEVATOR INDUSTRY

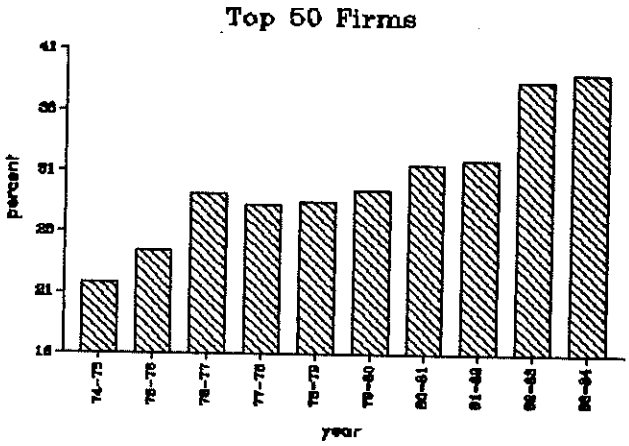
The concentration ratios of the North Dakota elevator industry show a marked change since the introduction of multi-car rates. Market shares of the top five, ten, twenty, and fifty firms are shown in Figure 7. Significant increases in concentration are displayed in the years 1982-83 and 1983-84,

especially in the top five firms. However, there is a time lag from the introduction of multi-car rates to these increases in market share. This lag is presumably tied to the rate spreads between single car rates and multi-car rates. When first implemented in December 1980 the single-car/52-car rate spread was 26 cents at one North Dakota station. In April 1982 this spread was increased to 49 cents with a 23 cent spread between the 26-car single origin and 52-car rates alone. These new rate spreads quickly made many upgrade, construction, and merger decisions attractive, leading to an abrupt increase in number of multi-car and trainload shippers. The ability to offer attractive grain prices to producers from this relatively small number of shippers has led to annual volume increases from these stations and hence, increases in the concentration ratios.









Source: North Dakota Public Service Commission

FIGURE 7. The Five-, Ten-, Twenty-, and Fifty-Firm Concentration Ratios of the North Dakota Country Elevator Industry, 1974-75 to 1983-84.

Detail of the information contained in Figure 7 is shown in Table 2. Data in this table reveal that less than one percent of the firms (5 out of 563) held almost ten percent of the market in 1983-84. The top 10 percent of the firms (50 out of 563) held almost 40 percent of the market during the same year. In some manufacturing industries this would be considered only moderate concentration. However, considering the spatial nature of the elevator industry, this concentration may have significant implications for the performance of the industry.

TABLE 2. The Five-, Ten-, Twenty-, and Fifty-Firm Concentration Ratios of the North Dakota Country Elevator Industry, 1977-78 to 1983-84.

	Top 5 Firms	Top 10 Firms	Top 20 Firms	Top 50 Firms	Total Volume of Grain Handled
	percent				bushels
1977-78	4.91	8.93	15.12	28.26	358,604,000
1978-79	5.28	9.01	14.96	28.53	456,234,000
1979-80	5.34	9.17	15.46	29.42	476,064,000
1980-81	6.17	10.73	17.89	31.52	401,085,000
1981-82	6.62	11.29	18.47	32.04	461,862,000
1982-83	9.70	15.01	23.17	38.51	491,671,000
1983-84	9.90	15.15	22.92	39.16	573,018,000
percent change 1979 to 1983	85%	65%	48%	33%	

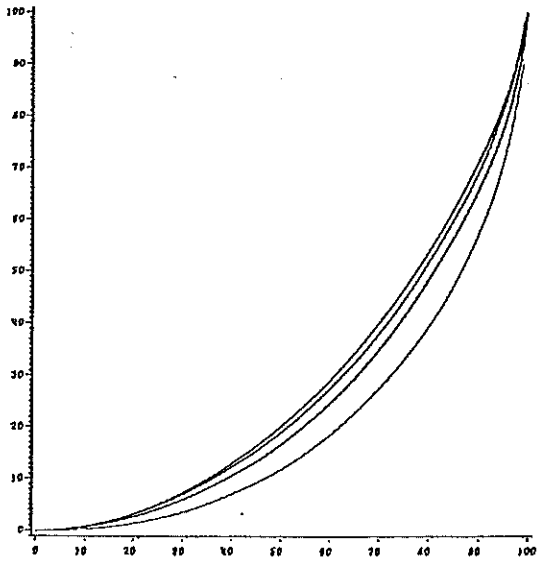
Source: North Dakota Public Service Commission.

Since multi-car rates were introduced in 1980 the concentration ratios have increased significantly. The ratio of the top five firms in 1983-84 is 85 percent higher than in 1979-80. The ratio of the top ten firms has increased 65 percent, and the concentration ratios of the top 20 and 50 firms have increased 48 and 33 percent, respectively, over the same 5 year period. The ratio of the top ten firms has increased twice as fast as the top 50 firms. This rapid increase in concentration is attributed to the construction and upgrading of facilities to handle unit trains. Also, many elevators have

merged or consolidated to secure the grain drawing capacity required by unit trains. These mergers have decreased the number of grain marketing firms but made each one larger.

The total volume of grain handled, as shown in Table 2, should also be noted. Total volume has been increasing steadily since 1980. This increase means the volume associated with each percentage point is also increasing. For example, for the 85 percent increase in market share of the top five firms from 1979-80 to 1983-84, actual bushels shipped increased 123 percent. The concentration ratios therefore deemphasize the increase in volume associated with each percentage point.

A family of Lorenz curves for the North Dakota country elevator industry is shown in Figure 8. The Lorenz curve had been slowly growing more convex to the lower right-hand corner from 1974-75 to 1980-81. However, the latest year shown, 1983-84, shows a significant increase in the rate of growth. This reflects the increasing disparity between the largest and smallest firms due to multi-car rates.



Source: North Dakota Public Service Commission.

FIGURE 8. Lorenz Curves for the North Dakota Country Elevator Industry for Years, From Left, 1974-75, 1977-78, 1980-81, and 1983-84.

Another indication of concentration is that the identity of the top five firms in this industry has remained fairly stable, especially since multi-car rates were implemented. If the identity and market share of these firms is constantly changing it is considered an indication that competition exists among these firms. Since this turnover is lacking in North Dakota's elevator industry, a significant degree of concentration can be assumed to be present.

WHY ELEVATORS REMAIN COMPETITIVE

It is apparent that a significant degree of concentration exists in the North Dakota country elevator industry. It has been increasing in the past and indications are that it will continue to increase in the future. Multi-car rates have provided the impetus, both directly and indirectly, for the development of subterminals. Almost by definition, these subterminals will provide the means for even more concentrated grain marketing in North Dakota. Traditional market structure theory suggests that this may lead to higher price-cost margins, slower growth, fewer innovations, and excess profits (Solmon). These conditions do not exist for most, if any, of North Dakota's elevators because of two factors: 1) many of North Dakota's elevators are cooperatives and 2) an individual elevator's market is contestable.

First, the traditional manifestations of monopoly power are not apparent because many elevators are cooperatives. One of the fundamental principles of cooperatives is that service is rendered to member-patrons at cost. If this is an elevator's policy, there are no profits whatsoever, much less the excess profits characteristic of a monopoly. In addition, cooperatives are quick to utilize new technology to reduce costs and maximize benefits to members. This further dismisses the possibility of monopoly, which assumes that technology is slowly adopted. Therefore, if cooperatives exist in a market, a monopoly cannot occur.

Second, the theory of contestable markets is applicable to the country elevator industry. An elevator's market is contestable inasmuch that another elevator need merely raise its price to expand its own trade area and decrease the trade areas of surrounding elevators. A diagram, Figure 9, will help explain.

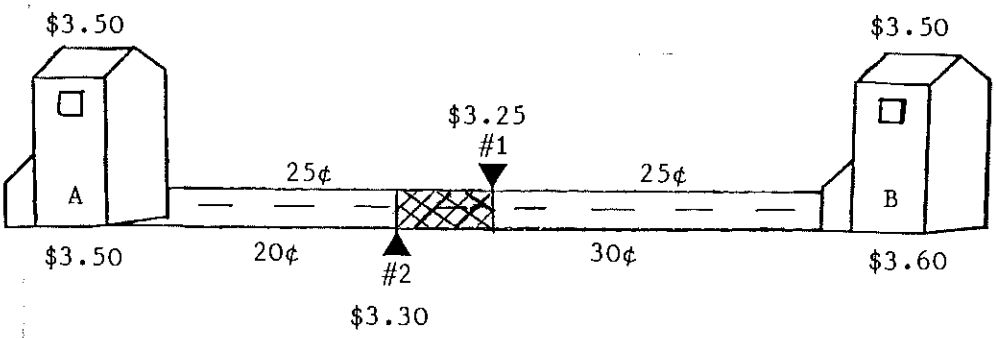


FIGURE 9. The Contestability of an Elevator's Market.

An elevator's trade area is defined by its price. Farmers will truck grain longer distances if the increased price exceeds their trucking expenses. For example, elevators A and B have a price of $3.50. Their trade areas are bounded by point #1 where net price to farmers is $3.25 ($3.50 minus $0.25 trucking expense to either elevator). If elevator B raised its price to $3.60 the new boundary would be point #2. Here the net price is $3.30, $3.50 minus $0.20 trucking expense to elevator A, and $3.60 minus $0.30 trucking expense to elevator B. The area between point #1 and point #2 is the market that has been contested. Therefore, if an elevator wishes to expand its market boundaries it need merely raise the price it pays for grain. No barriers to entry or special costs exist, and incumbents and newcomers face the same market demands - all characteristics of a contestable market.

Until the advent of multi-car rates there was little opportunity to take advantage of contestable markets. For an elevator to raise its

buying price it would have had to narrow its existing margin. But with the multi-car rate discount, it became feasible and profitable to increase the elevator's buying price and expand its trade area to fill the unit train.

The implication of the contestable market analysis is that no firm, or firms, will develop enough dominance to exert monopoly power over the market. If a firm develops margins higher than normal, another elevator can enter and capture that market. Cooperatives also play a role in monitoring the grain marketing system. With a contestable market and the threat of cooperative development, an increase in concentration should not have an adverse impact on the conduct and performance of the North Dakota grain marketing system.

SUMMARY AND CONCLUSIONS

A significant change in concentration has occurred in the North Dakota country elevator industry since the introduction of multi-car rates. It is evident that it has increased at an increasing rate since 1980 with the advent of multi-car rates and subterminal grain elevators. In the country elevator industry, however, increasing concentration is not an indication of monopoly power. Instead it appears that fewer elevators, each with more capacity and larger market shares, and the stability of the largest firms contribute to increased competitiveness in the grain handling system. The fact that most elevators are cooperatives and that elevator markets are contestable will prevent market dominance from occurring.

This change may mean greater efficiencies for the rail system as well. Hauls will be longer, more direct and in larger volumes. Railroads are also taking advantage of economies of size in handling multi-car shipments. Between increasing volume and decreasing costs, railroads should continue, even promote, multi-car shipments. Multi-car shipments offer efficiencies for

both the elevator and rail systems in the state. These shipments will likely grow to be the dominant method of moving grain in the future.

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