ANALYSIS OF DISCRIMINATION IN RAIL WHEAT GATHERING RATES FROM NORTH DAKOTA, MINNESOTA, SOUTH DAKOTA, AND MONTANA

By

Ronald Q. Nichols and David C. Nelson

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BY

RONALD Q. NICHOLS
DAVID C. NELSON

Upper Great Plains Transportation Institute
North Dakota State University
P. O. Box 5074
Fargo, North Dakota 58105

in cooperation with

North Dakota State Wheat Commission
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HIGHLIGHTS

The specific objectives of this study were to test:

1. The differences between distant and near-to-market shippers in the ratio of railroad revenue to railroad out-of-pocket costs for shipments of wheat to the primary markets of Minneapolis-St. Paul and Duluth-Superior.

2. The differences between shippers located in the same area in the ratio of railroad revenue to railroad out-of-pocket costs for shipments of wheat to the primary markets.

3. The intensity of place discrimination over a period of time.

4. Relationship of trends in the railroads' market share of wheat shipments to the primary markets during 1968-69 and 1969-70 and ratios of railroad revenue to railroad out-of-pocket costs.

Results of the analysis of variance indicate there are highly significant differences between regional means and highly significant differences between row means of railroad revenue to railroad out-of-pocket costs at the 1 percent level of significance. In other words, place discrimination occurs and differences in railroad rates not in accord with differences in railroad costs do, in fact, exist.

Moving from east to west across northwestern Minnesota, North Dakota, northern South Dakota and northeastern Montana, the average ratio of railroad revenue to railroad out-of-pocket costs increases substantially with the exception of the extreme western sector of the study area which includes northwestern Montana east of the Rocky Mountains.

Regional means based on the analysis of variance indicated the average ratio of railroad revenue to railroad out-of-pocket costs during 1969-70 varied from 1.30 in western Minnesota to 2.08 in central Montana. With the exception of the extreme western region (northwestern Montana) place discrimination becomes more intensive as distance from the primary markets increases. Distant shippers are being discriminated against versus near-to-market shippers.

Moving from north to south across the study area the average ratio of railroad revenue to railroad out-of-pocket costs decreases substantially except in the case of moving from Row 2 to Row 3 where the ratio decreases by only 1 percent.

Row means based on the analysis of variance indicated the average ratio of railroad revenue to railroad out-of-pocket costs during 1969-70 varied from 1.62 in southwestern Minnesota and northern South Dakota (Row 4) to 1.84 in northwestern Minnesota, northern North Dakota and northern Montana (Row 1).

Moving from south to north across the study area the ratios of railroad revenue to railroad out-of-pocket costs increase; in other words, place discrimination becomes more intensive when moving from south to north across the study area. Northern shippers are being discriminated against versus southern shippers.

A substantial degree of place discrimination also exists within specific areas. The ratio of railroad revenue to railroad out-of-pocket costs in Area II (corresponding to North Dakota Crop Reporting District 3) varies 46 percent (1.88 minus 1.42) between individual shipping points.

As across-the-board railroad rate increases are applied to the existing rate structure, place discrimination is intensified. A comparison of 1968-69 and 1969-70 data reveals that those areas (central and western North Dakota and Montana) with high ratios of railroad revenue to railroad out-of-pocket costs prior to the rail rate increase (Exparte-262) experienced a greater percentage increase (5 or 6 percent) in these ratios than areas (eastern North Dakota and western Minnesota) with lower initial ratios of railroad revenue to railroad out-of-pocket costs. Areas in eastern North Dakota and western Minnesota experienced ratio increases of 3 or 4 percent.

The percentage of all wheat shipped by rail to the Minneapolis-St. Paul and Duluth-Superior markets, from shipping points included in the study area sample, decreased from 65 percent in 1968-69 to 59 percent in 1969-70. This indicates a substantial gain in the percentage of wheat transported by motor carrier and a serious loss in the percentage transported by the railroads.

ANALYSIS OF DISCRIMINATION IN RAIL WHEAT GATHERING RATES FROM NORTH DAKOTA, MINNESOTA, SOUTH DAKOTA AND MONTANA

Ronald Q. Nichols and David C. Nelson*

INTRODUCTION

Persistent complaints are heard of railroad rate discrimination.[1] Assertions are often made that rates for wheat transport are higher from Great Plains origins than from other production sources. Findings in research recently completed at the University of Nebraska indicate some credence to these assertions.[2] The ratios of railroad revenue to railroad out-of-pocket costs[3] for shipments of wheat from North Dakota

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*Nichols is a former research assistant and Nelson is Director, Upper Great Plains Transportation Institute, North Dakota State University, Fargo.

[1]Discrimination can be defined as unfair treatment among buyers by a particular seller. Economic price discrimination implies differences in prices not in accord with differences in costs for products and/or services rendered.

[2]Mariska, Brian L., Place Discrimination in Rail Shipments of Wheat From Great Plains Origins, Unpublished M.S. Thesis, Department of Agricultural Economics, University of Nebraska, Lincoln, May, 1970.

[3]The Interstate Commerce Commission defines out-of-pocket costs as 80 percent of freight operating expenses, rents and taxes (excluding federal income taxes) plus a return of 4 percent on 50 percent of the road property and 100 percent of the equipment used in freight service. Interstate Commerce Commission, Bureau of Accounts, Rail Carload Cost Scales by Territories for the Year 1968, Statement 1C1-68; Washington, D. C., Page 4, Sec. 2. Presumably out-of-pocket costs represent long-run incremental (marginal) costs of transporting most commodities under average conditions and appear to be the best available measure of long-run marginal costs of wheat shipments. Fully-distributed costs may also be calculated. Fully-distributed costs are defined by the Interstate Commerce Commission as out-of-pocket costs plus the remaining 20 percent of the freight operating expenses, rents and taxes, the passenger train and less-than-carload operating deficits and a return of 4 percent, after federal income taxes, on the remaining 50 percent of the property. Passenger-train deficits which should not be charged against wheat movements and less-than-carload shipments deficits which are not typical of wheat movements are the reasons for using out-of-pocket costs in this analysis. In addition, the revenue to out-of-pocket cost ratio provides good indications as to the degree of contribution to burden from wheat rates. The terms "out-of-pocket" and "fully-distributed" used hereinafter have been changed to "variable" and "fully allocated," respectively, by the Interstate Commerce Commission as shown in Finding No. 2, Docket No. 34013, Rules to Govern the Assembling and Presentation of Cost Evidence, 337 I.C.C. 298.

and Montana are higher than the ratios from any other state. This relative position of North Dakota and Montana in terms of the ranking of the ratios is a basis for concluding that these states are discriminated against in the shipping of wheat; that is, railroad rates on wheat are higher relative to the costs (of the railroads) of hauling it than from any other area.

Mariska's study also showed that the ratios of railroad revenue to railroad out-of-pocket costs were higher for those Nebraska shippers more distant from the primary markets (Omaha and Kansas City) than for those shippers located close to these markets. The fact that the ratio of railroad revenue to railroad out-of-pocket costs tends to increase (railroad rates increase faster than costs) as distance from the primary markets increases indicates that place discrimination[4] occurs. Those shippers located at places relatively greater distances from market are discriminated against versus shippers located at places closer to market.

Objectives

The general objective of this analysis is to determine that there is economic place discrimination against wheat shippers located in various sections of North Dakota, Montana, South Dakota and Minnesota.

The specific objectives are to test:

1. The differences between distant and near-to-market shippers in the ratio of railroad revenue to railroad out-of-pocket costs for shipments of wheat to the primary markets of Minneapolis-St. Paul and Duluth-Superior;[5]

2. The differences between shippers located in the same area in the ratio of railroad revenue to railroad out-of-pocket costs for shipments of wheat to the primary markets;

3. the intensity of place discrimination over a period of time; and

4. Relationship of trends in the railroad's market share of wheat shipments to the primary markets during 1968-69 and 1969-70, and ratios of railroad revenue to railroad out-of-pocket costs.

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[4]Place discrimination is simply price discrimination based on differences in location. Buyers are treated unfairly (prices are charged that are not in accord with differences in costs) due to their location.

[5]The railroad rates and railroad out-of-pocket costs (based on mileage) from most shipping points listed in this study are approximately the same to the primary markets (Minneapolis-St. Paul and Duluth-Superior) thus, only the ratio of railroad revenue to railroad out-of-pocket costs from each shipping point to Minneapolis-St. Paul was computed.

Procedure and Sources of Data

The period of study corresponds to the time periods August, 1968-July, 1969, and August, 1969-July, 1970. Data corresponding to the 1969-70 time period were used in all statistical analyses.[6] Data corresponding to the 1968-69 time period were used in comparing the railroad's market share coefficient of wheat shipments to primary markets for that period with the 1969-70 period and to demonstrate the effects of railroad rate increases over time.

North Dakota shipping points[7] used in this analysis are those sites selected for a separate study by personnel at the Traffic Division of the North Dakota Public Service Commission.[8] Sites selected were located on two railroad lines: (1) at terminal points, (2) on main lines, or (3) on branch lines. Selections were made that would result in a representative cross-section of shipping points in North Dakota.

Data pertaining to rail and motor carrier shipments of wheat from North Dakota elevators to Minneapolis-St. Paul and Duluth-Superior markets were obtained from files of the North Dakota Public Service Commission.

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[6]Cross-sectional data (aggregated by area) were required for all statistical analyses. Since South Dakota data were available for the 1969-70 time period only, data corresponding to this time period were utilized for the statistical analyses.

[7]Kloten, Niagara, Drayton, Walhalla, Hannah, Fairdale, Rock Lake, Devils Lake, West Fargo, Hunter, Hillsboro, Hatton, Gwinner, Havana, Marion, Ellendale, Wishek, Jud, Selz, Towner, Bottineau, Westhope, Courtenay, Jamestown, New Rockford, Carrington, Streeter, Dawson, Tuttle, Harvey, McClusky, Hazelton, Wilton, Hebron, Minot, Berthold, Parshall, Mohall, Stanley, Coteau, Tioga, Alamo, Williston, Ambrose, Grenora, Turtle Lake, Killdeer, Mott, Belfield, and Beach.

[8]Carroll, Gene J., I.C.C. Docket No. 35361, Public Service Commission, State of North Dakota, et al., Versus Burlington Northern, Incorporated, et al.; Exhibits (GJC-1, GJC-2, GJC-3, GJC-4, GJC-7, GJC-8, GJC-10), Tentative July 26, 1971.

The selection of shipping points in Montana,[9] northern South Dakota,[10] and western Minnesota[11] is based on mail surveys[12] of elevator operators in these areas. All shipping points where respondents supplied information on grain shipments to the Minneapolis-St. Paul and Duluth-Superior markets were included in this analysis.

Data pertaining to rail and motor carrier shipments of wheat to Minneapolis-St. Paul and Duluth-Superior markets from locations in Montana, South Dakota, and Minnesota were based on information provided by respondents (elevator operators) from these respective states.

Data were aggregated by area in each state (Figure 1). Areas in North Dakota correspond to the North Dakota Crop Reporting Districts (Figure 2). Extensions of North Dakota Crop Reporting District boundaries form the area boundaries for aggregating data in Montana, northern South Dakota and western Minnesota. East-west boundaries in Montana were established by drawing north-south lines through the cities of Wolf Point, Harlem, and Cut Bank (these cities were chosen because north-south lines through these locations represented natural gaps between groups of observations).

Data were further aggregated by region (Figure 3) and row (Figure 4). Region 1 includes Areas I, VIII, XIV, and XIX; Region 2--Areas II, IX, XV, and XX; Region 3--Areas III, X, XVI, and XXI; Region 4--Areas IV, XI, XVII, and XXII; Region 5--Areas V, XII, and XVIII; Region 6--Area VI; and Region 7--Areas VII and XIII. Row 1 includes Areas I, II, III, IV, V, VI, and VII; Row 2--Areas VIII, IX, X, XI, XII, and XIII; Row 3--Areas XIV, XV, XVI, XVII, and XVIII; Row 4--Areas XIX, XX, XXI, and XXII.

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[9]Glendive, Sidney, Circle, Poplar, Glasgow, Hinsdale, Wagner, Dodson, Havre, Ft. Benton, Inverness, Brady, and Conrad.

[10]Milbank, New Effington, Sisseton, Brookings, Bristol, Clark, Aberdeen, Westport, Huron, Mellette, Ferney, Redfield, McIntosh, and Lemmon.

[11]Crookston, Fisher, Eldred, Angus, East Grand Forks, Warren, Argyle, Stephen, Kennedy, Hallock, Northcote, Hawley, Glyndon, Nielsville, Climax, Brushvale, Kent, Dumont, and Wheaton.

[12]The Montana Survey was conducted by the Department of Agricultural Economics, Montana State University, Boseman; the South Dakota Survey by the Department of Agricultural Economics, South Dakota State University, Brookings, and the Minnesota Survey by the Upper Great Plains Transportation Institute, North Dakota State University, Fargo. South Dakota data were available for 1969-70 only.

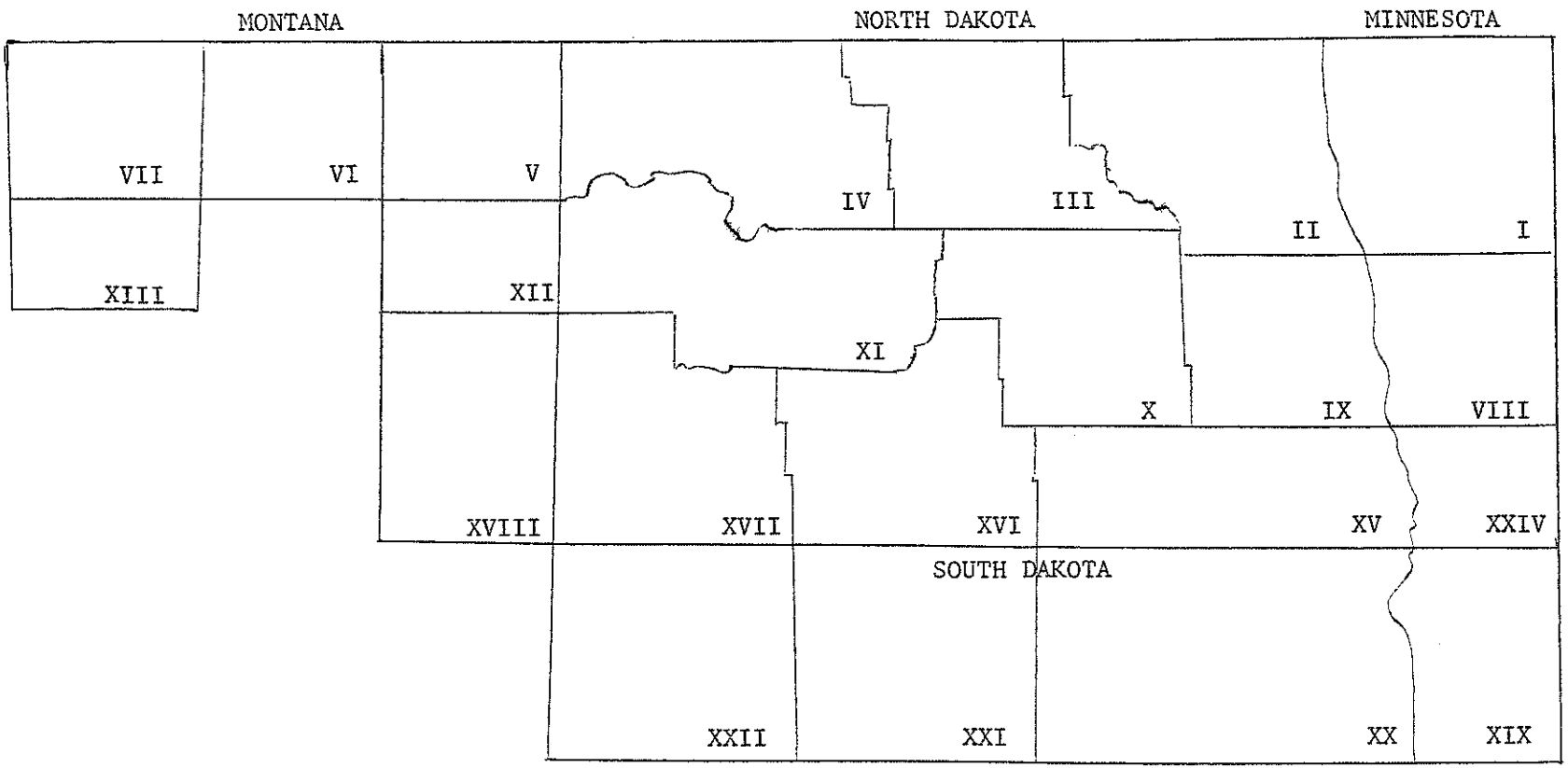

Figure 1. Areas in North Dakota, Northeast Montana, Northern South Dakota, and Northwest Minnesota as Used in This Study.

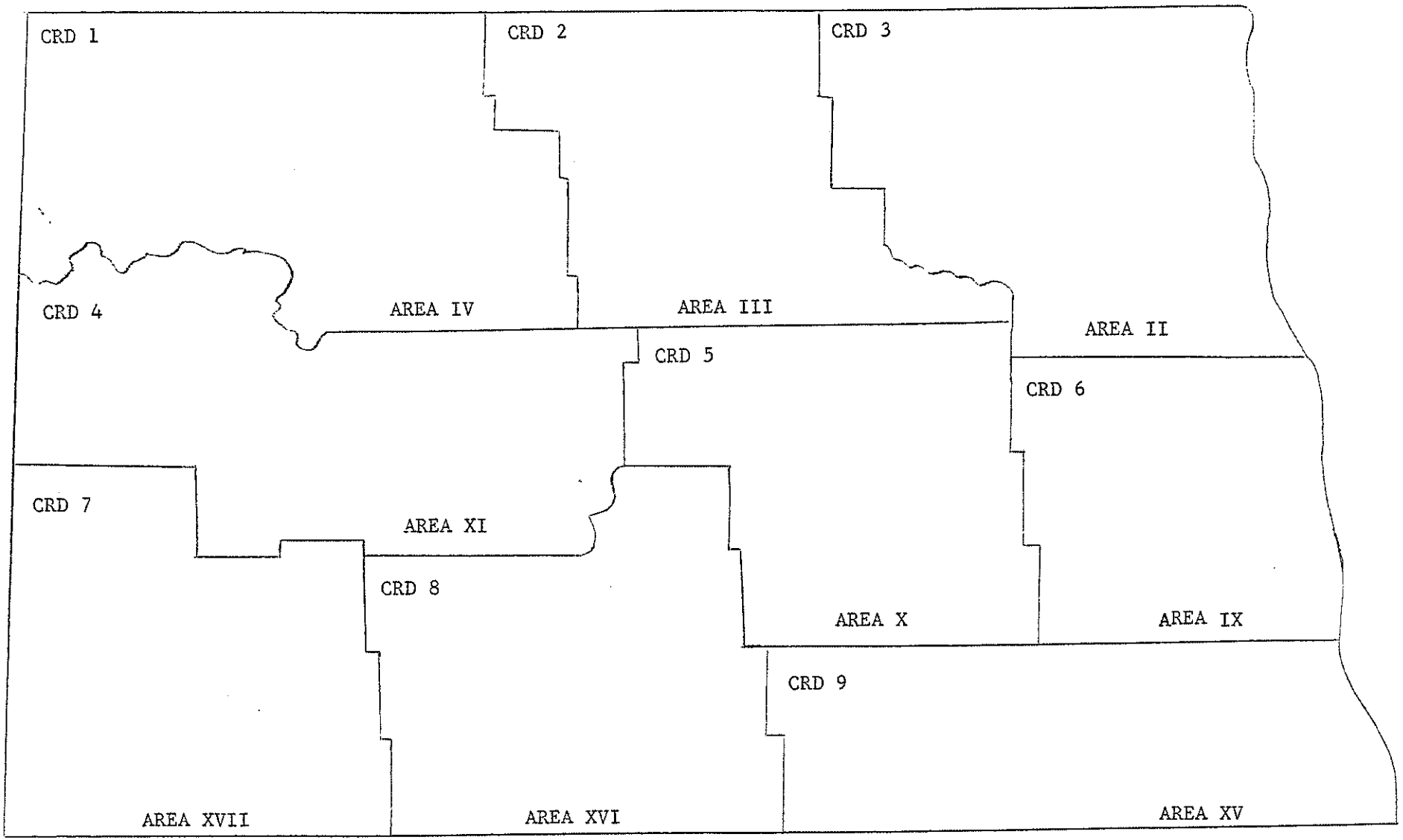

Figure 2. North Dakota Crop Reporting Districts and Corresponding Areas As Used in This Study

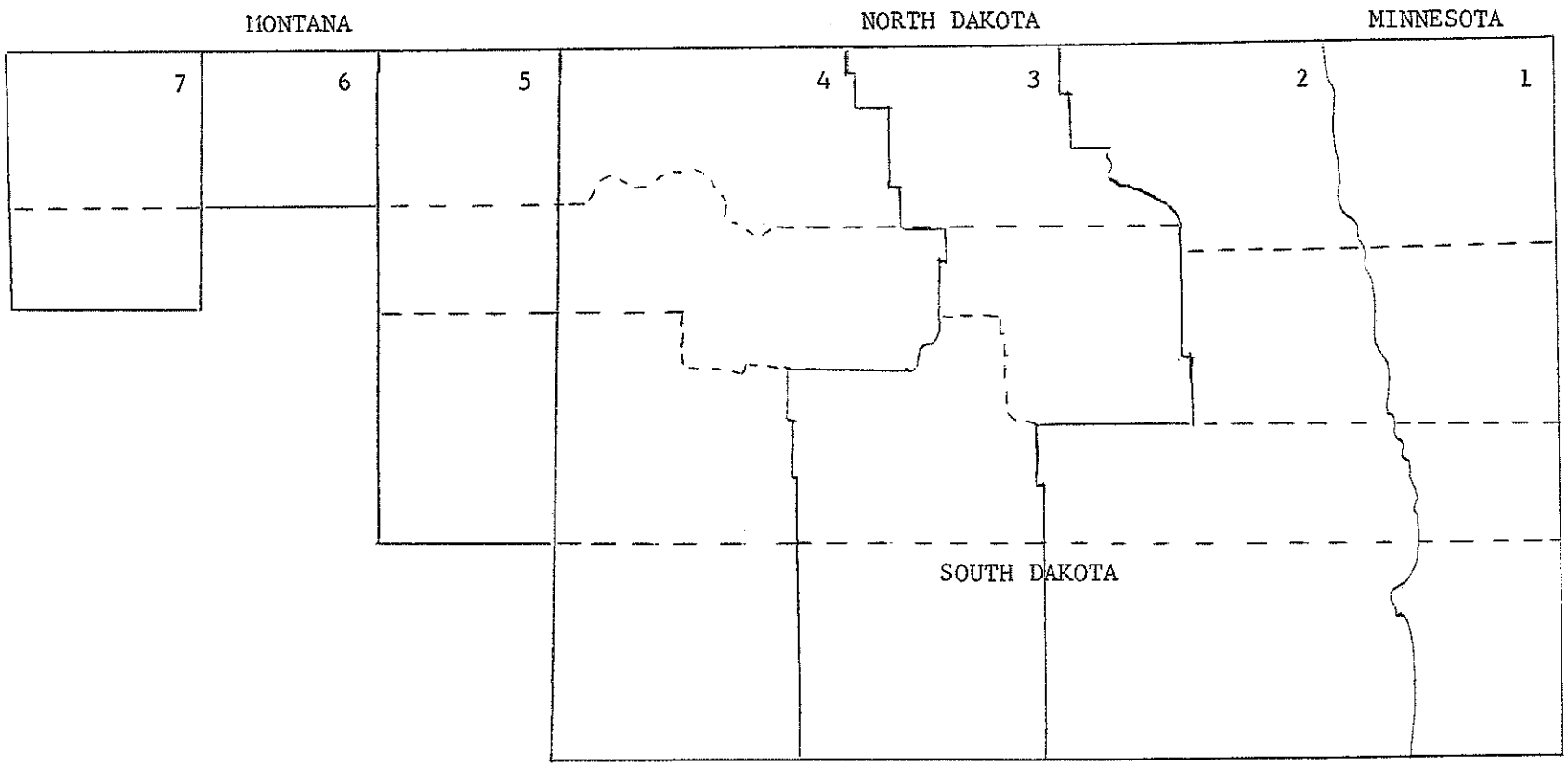

Figure 3. Regions as Used in This Study

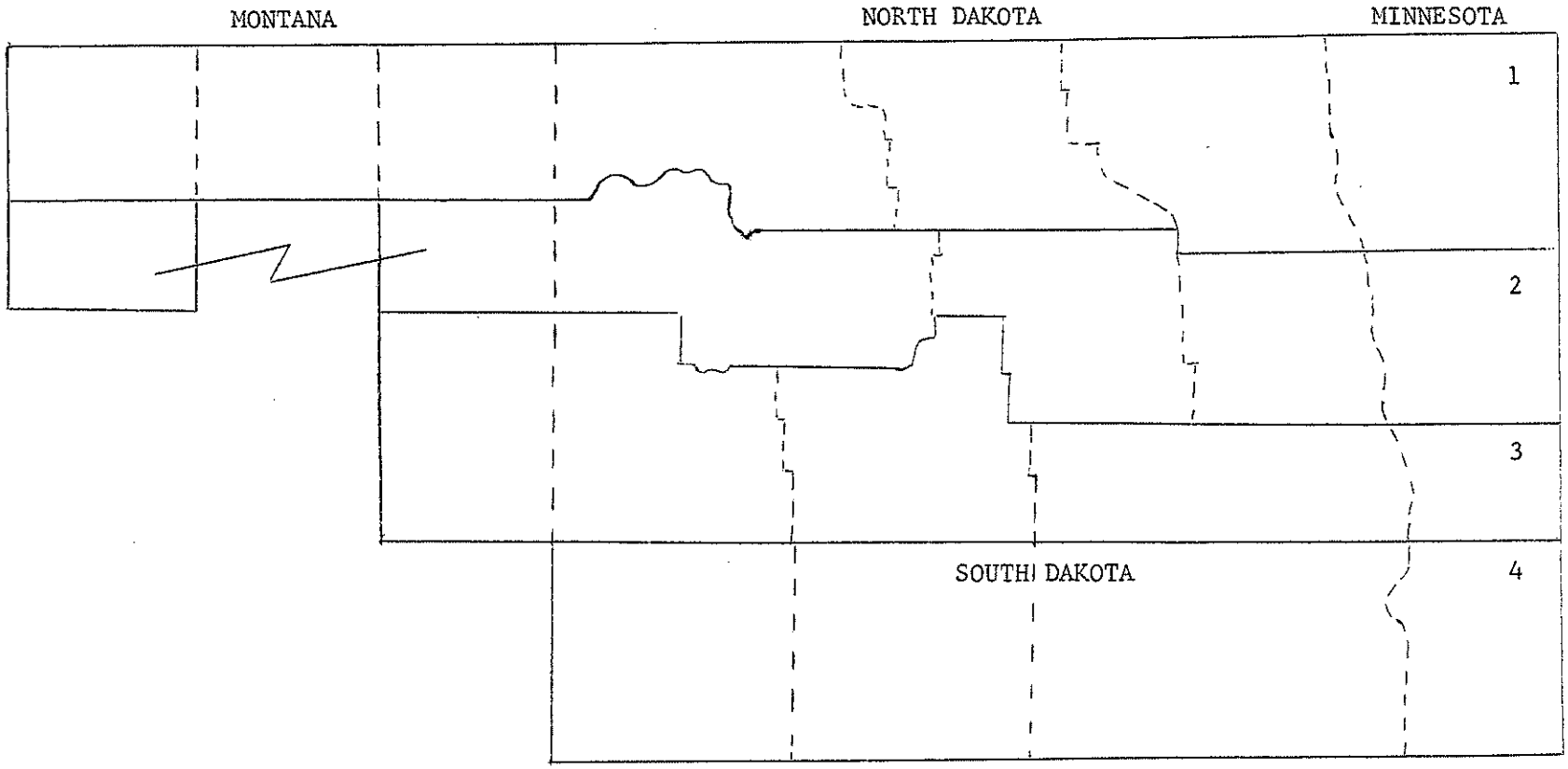

Figure 4. Rows as Used in This Study

Rail mileage from all shipping points to Minneapolis-St. Paul is based on official mileages as listed by the railroads.[13] total mileage from each shipping point to Minneapolis-St. Paul consists of way-train and through-train mileage.[14] The division between way-train and through-train mileage is based on terminal points[15] where trains are normally made up (trains are assembled for direct movement to Minneapolis-St. Paul and Duluth-Superior).

Rail rates from each shipping point to Minneapolis-St. Paul are those rates published in Grain Rate Book No. 8 and Grain Rate Book No. 7-A, Traffic Department, Minneapolis Grain Exchange.[16]

Equations used to calculate railroad out-of-pocket costs and adjustments to railroad out-of-pocket costs (due to inflation) for

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[13]Source: Distance Tariffs--Burlington Northern Railroad, Tariff No. 3, I.C.C. No. 3; Chicago, Milwaukee, St. Paul, and Pacific Railroad, Tariff No. 4000-G, I.C.C. No. B-7594; Chicago, Milwaukeee, St. Paul, and Pacific Railroad, Tariff No. 11850-B, I.C.C. No. B-5894; Chicago and and Northwestern Railroad, Tariff No. 14260-E, I.C.C. No. 11093; Soo Line Railroad, Tariff No. 250-H, I.C.C. No. 7571. The mileage from most shipping points listed in this study is approximately the same to the primary markets (Minneapolis-St. Paul and Duluth-Superior); thus, only the mileage from each shipping point to Minneapolis-St. Paul was computed.

[14]A 10 percent circuity factory is added to through-train mileage to compensate for possible "extra" mileage resulting from rail movement to Minneapolis-St. Paul by other than the most direct route.

[15]Terminal points used in this analysis include Missoula, Helena, Butte, Livingston, Laurel, Glendive, Dickinson, Mandan, Jamestown, Wahpeton, Dilworth, and Staples on the southern route of the Burlington Northern; White Fish, Shelby, Great Falls, Havre, Glasgow, Williston, Minot, Devils Lake, Grand Forks, Breckenridge, and Willmar on the northern route of the Burlington Northern; Montevideo, Aberdeen, and Mobridge on the Chicago, Milwaukee, St. Paul, and Pacific; Tracy, Huron, and Watertown on the Chicago and Northwestern; and Harvey, Enderlin, Hankinson, Thief River Falls, and Glenwood on the Soo Line Railroad.

[16]Rail rates for 1969-70 data were adjusted (increased) by 6 percent over rates published in the above rate books to include the rail freight rate increase, Exparte-262. Rail rates for those shipping points having both winter and summer rates were computed as an average of the two rates.

each shipping point were developed in a study conducted by personnel at the Traffic Division of the North Dakota Public Service Commission.[17]

Statistical techniques utilized in this study include analysis of variance and regression.

Analysis of Variance

The analysis of variance is the process of partitioning the sum of squares into components (Figure 5). One of the objectives of this process is to test the hypothesis that a number of population means are equal. Analysis of variance is used in this study to determine if

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[17] Carroll, Gene J., op. cit., GJC-1, pp. 14 and 65. Railroad out-of-pocket costs were computed as follows:

$C = d\ (a + bX + cY)$

where:

C = railroad out-of-pocket costs
a = 10.63237 = terminal costs plus loss and damage
b = .049806 = average way-train cost per mile
c = .029660 = average through-train cost per mile
d = 1.0221 = inflation factor
X = actual way-train miles
Y = through-train miles (includes 10 percent circuity)

Out-of-pocket costs for 1968-69 data were computed by use of the equation $C = a + bX + cY$. Out-of-pocket costs for 1969-70 data were computed by use of the equation $C = d\ (a + bX + cY)$. The inflation factor (d) was included for computation of 1969-70 data. The costs used here are Burlington Northern basis. Since the physical operation of moving grain out of North Dakota should be very much the same for all railroads, the Burlington Northern based cost formula was applied to all shipping points in the study sample (it was determined that Soo Line total costs are slightly lower than Burlington Northern total costs (a = 0.46, b = .9524, c = .0329); see Carroll, Gene J., op. cit., GJC-1, p. 10).

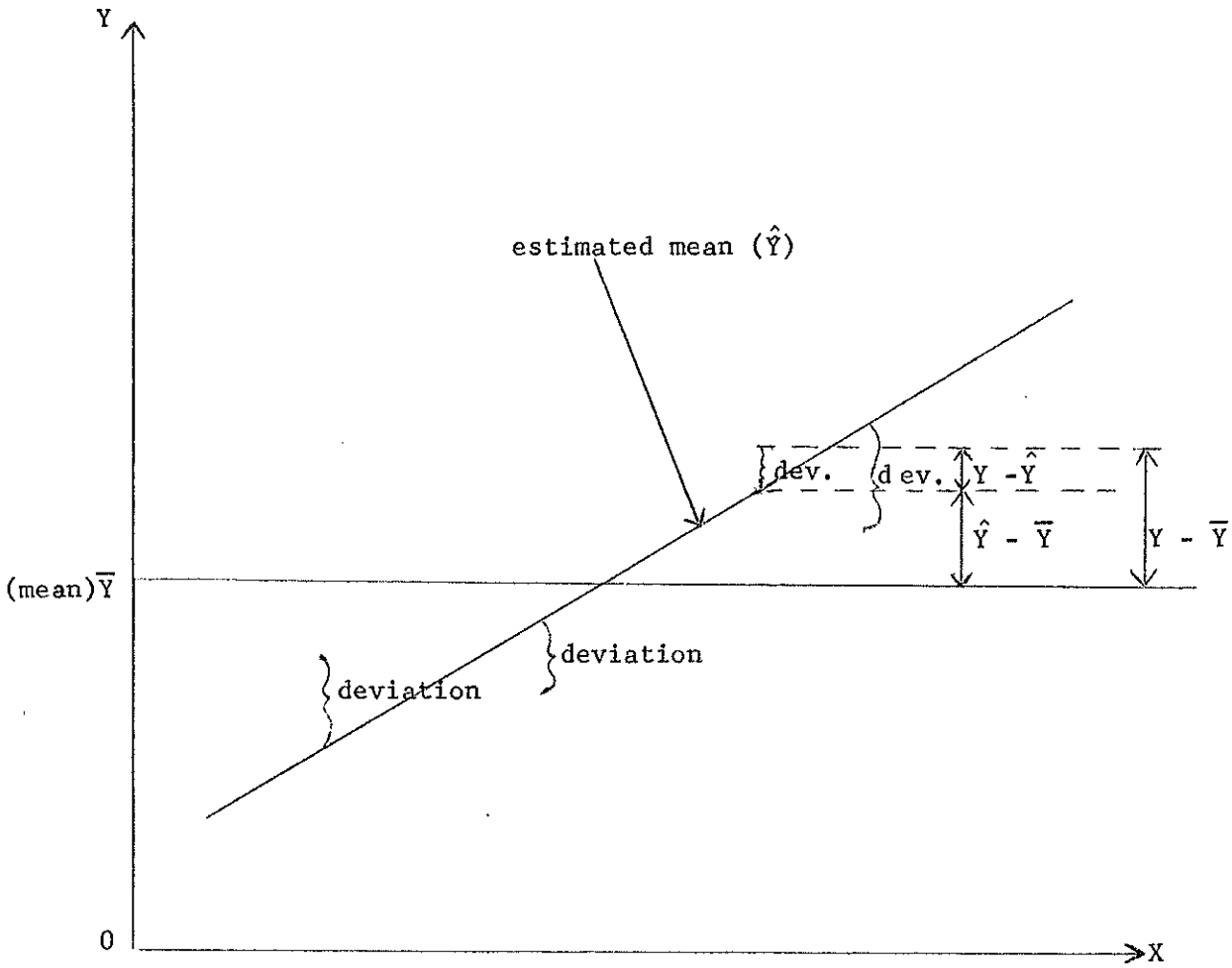

Figure 5. Partitioning of the Sum of Squares into Components. The sum of squares is the summation of the squared deviations of two or more observations from the mean of these observations. The line of regression is that line which best fits the given observations (the least amount of total deviation is realized). Total sum of squares (SS) equals regression sum of squares plus residual sum of squares or:

$$\Sigma(Y - \overline{Y})^2 = (\hat{Y} - \overline{Y})^2 + (Y - \hat{Y})^2.$$

significant[18] differences in the ratio of railroad revenue to railroad out-of-pocket costs exist between various shipping points in the study area. If significant differences are evident, place discrimination does occur (there are differences in railroad rates not in accord with differences in costs for shipping wheat to the primary markets).

Ratios of railroad revenue to railroad out-of-pocket costs were computed for each shipping point in the sample. The means of these ratios were computed to each area, region, and row. Analysis of variance was used to determine if significant differences do exist.

If there is little or no variation between the ratio means from one area to another; the variation of the ratio means within an area, the variation of the ratio means between regions and the variation of the ratio means between rows will be similar when adjusted for

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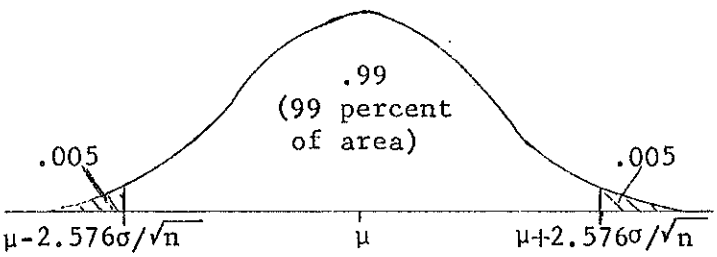
[18]The word significance has a technical meaning in statistics. In general, it is used in connection with the rejection of an hypothesis. The possible values of a sample mean which cause rejection of the hypothesis make up the rejection region or critical region. The chance of finding a single sample which has the sample mean in this critical region if the hypothesis is true is called the level of significance (usually denoted by Greek letter α). In this example the critical region is the shaded area. The level of significance is 1 percent (.005 + .005 = .01). The population is assumed to be a normal population with mean equal to μ and variance equal to σ. If the sample mean were to fall inside the critical region the hypothesis would be rejected (the chance of finding a single sample which has a mean that falls inside the critical region if the hypothesis is true is 1 percent). A convention frequently followed is to state the result significant if the hypothesis is rejected with α - .05 and highly significant if it is rejected with α = .01 (1 percent).



In this study it is assumed that the means are equal (an hypothesis is made that the ratios of railroad revenue to railroad out-of-pocket costs are the same throughout the study area). If the computed sample mean falls within the nonshaded area (outside the critical region), the hypothesis is accepted. If the computed sample mean falls inside the critical region, the hypothesis is rejected and it is concluded the means (of the ratios of railroad revenue to railroad out-of-pocket costs) are not equal. The conclusion would be highly significant; only 1 percent of all sample means would result in a wrong conclusion.

degrees of freedom.[19] An analysis of variance will result in the conclusion that there are no differences in ratio means throughout the study area and that place discrimination does not occur.

If, in the opposite case, there are significant differences between ratio means in the study area, the variation between area ratio means, the variation of the ratio means between regions and the variation of the ratio means between rows will be different when adjusted for degrees of freedom. An analysis of variance will result in the conclusion that there are significant differences in the ratio means and that place discrimination does occur.

Regression Analysis

Regression deals with the relation between two or more variables. A regression problem considers the frequency distribution of one variable when another is held fixed at each of several levels.

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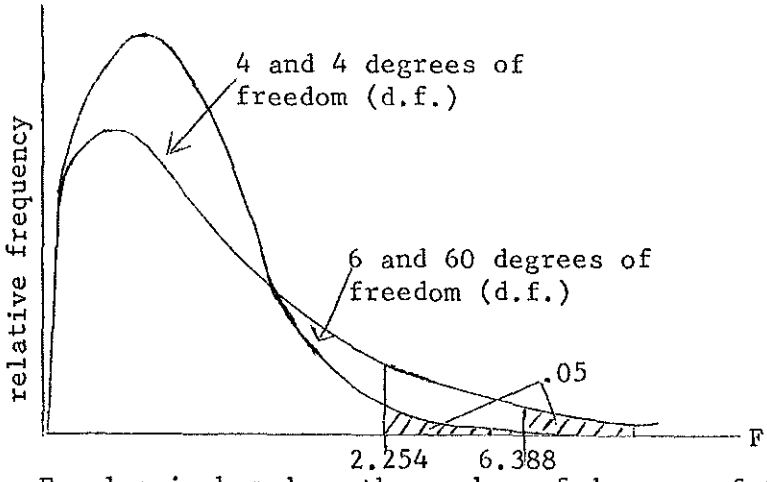
[19] The statistic F given by the formula

$$F = \frac{s_1^2}{s_2^2}$$

has a sampling distribution called the F distribution. There are two sample variances involved (s_1^2 and s_2^2) and two sets of degrees of freedom, $N_1 - 1$ in the numerator and $N_2 - 1$ in the denominator where N equals the number of observations in each sample. Each pair of degrees of freedom determines an F distribution, and to indicate which is intended, we shall write F ($N_1 - 1$, $N_2 - 1$), where the first number in parentheses is the number of degrees of freedom in the numerator and the second is the number of degrees of freedom in the denominator. In this example the F-curve with 6 and 60 degrees of freedom and the F-curve with 4 and 4 degrees of freedom are used to demonstrate the differences in two such F distributions. The value of F (2.254) which is the .05 level of significance for F (6 and 60 d.f.) is less than the value of F (6.388) for the .05 level of significance for F (4 and 4 d.f.). Selection of the correct F value is based on the number of degrees of freedom ($N_i - 1$) in the numerator and denominator of the F statistic.



Regression is used in this analysis to determine the relation between the dependent variable[20] (the ratio of railroad revenue to railroad out-of-pocket costs) and the independent variable[21] (distance from shipping point to primary market). The dependent variable is regressed on the independent variable.

A regression equation (estimating equation) is computed, which demonstrates the relationship between a dependent and one or more independent variables. An example of the regression equation is:

$$X_1 = a + bX_2$$

where X_1 is the dependent variable, X_2 is the independent variable, a is the X_1 intercept ($X_1 = a$ when $X_2 = 0$) and b is the slope of the line of regression.

Two coefficients, the correlation coefficient and the coefficient of determination, are also computed.

The correlation coefficient (r) describes the linear relationship between two variables. The correlation coefficient indicates the degree of spread (scatter) of the observations about the line of regression. In a perfectly linear relationship all points (plotted observations) fall on the line of regression and $r = \pm 1$.

The coefficient of determination (r^2) is defined as the amount of variation in the dependent variable explained by the independent variable.

Regression analysis was also used in this study to determine the relation between the ratio of the ratio of railroad revenue to railroad out-of-pocket costs to the railroad's market share coefficient (of wheat shipments to the primary markets) and distance from shipping point to the primary markets.

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[20]The values of the dependent variable are estimated, by the use of an estimating equation, from the values of one or more independent variables.

[21]The independent variable is used, by the use of an estimating equation, to estimate the values of the dependent variable.

DIFFERENCES BETWEEN DISTANT AND NEAR-TO-MARKET SHIPPERS IN THE RATIO OF RAILROAD REVENUE TO RAILROAD OUT-OF-POCKET COSTS FOR SHIPMENTS OF WHEAT TO PRIMARY MARKETS

Ratios of railroad revenue to railroad out-of-pocket costs were computed for each shipping point in the study area.[22] In the absence of place discrimination all ratios should be equal. The degree of variation in ratio values is a measure of the degree of discrimination; the higher the ratio of railroad revenue to railroad out-of-pocket costs, the greater the discrimination against the shipping point in question.

Analysis of variance was the statistical technique used to test for significant differences in the ratios of railroad revenue to railroad out-of-pocket costs between wheat shippers in the study area.

Results of the analysis of variance indicate there are highly significant differences between regional means (of railroad revenue to railroad out-of-pocket costs) and highly significant differences between row means (of railroad revenue to railroad out-of-pocket costs) at the 1 percent level of significance.[23] In other words, place discrimination occurs and differences in railroad rates not in accord with differences in railroad costs do, in fact, exist.

Moving from east to west across northwestern Minnesota, North Dakota, northern South Dakota and northeastern Montana, the average ratio of railroad revenue to railroad out-of-pocket costs increases substantially with the exception of the extreme western sector of the study area which includes northwestern Montana east of the Rocky Mountains (Figure 6). In this area the ratio of railroad revenue to railroad out-of-pocket costs is substantially less in central Montana and also less than in eastern Montana.

Regional means based on the analysis of variance (Part 1, Appendix A) indicated the average ratio of railroad revenue to railroad out-of-pocket costs were: (1) western Minnesota = 1.30, (2) eastern North Dakota (including northeastern South Dakota) = 1.50, (3) central North Dakota (including north central South Dakota) = 1.22, (4) western North Dakota (including northwestern South Dakota) = 1.81, (5) eastern Montana = 1.97, (6) central Montana = 2.08, and (7) western Montana (east of the Rocky Mountains) = 1.88.

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[22] See Appendix Table 2.

[23] See calculations in Part 1, Appendix A and footnote 18, p. 12.

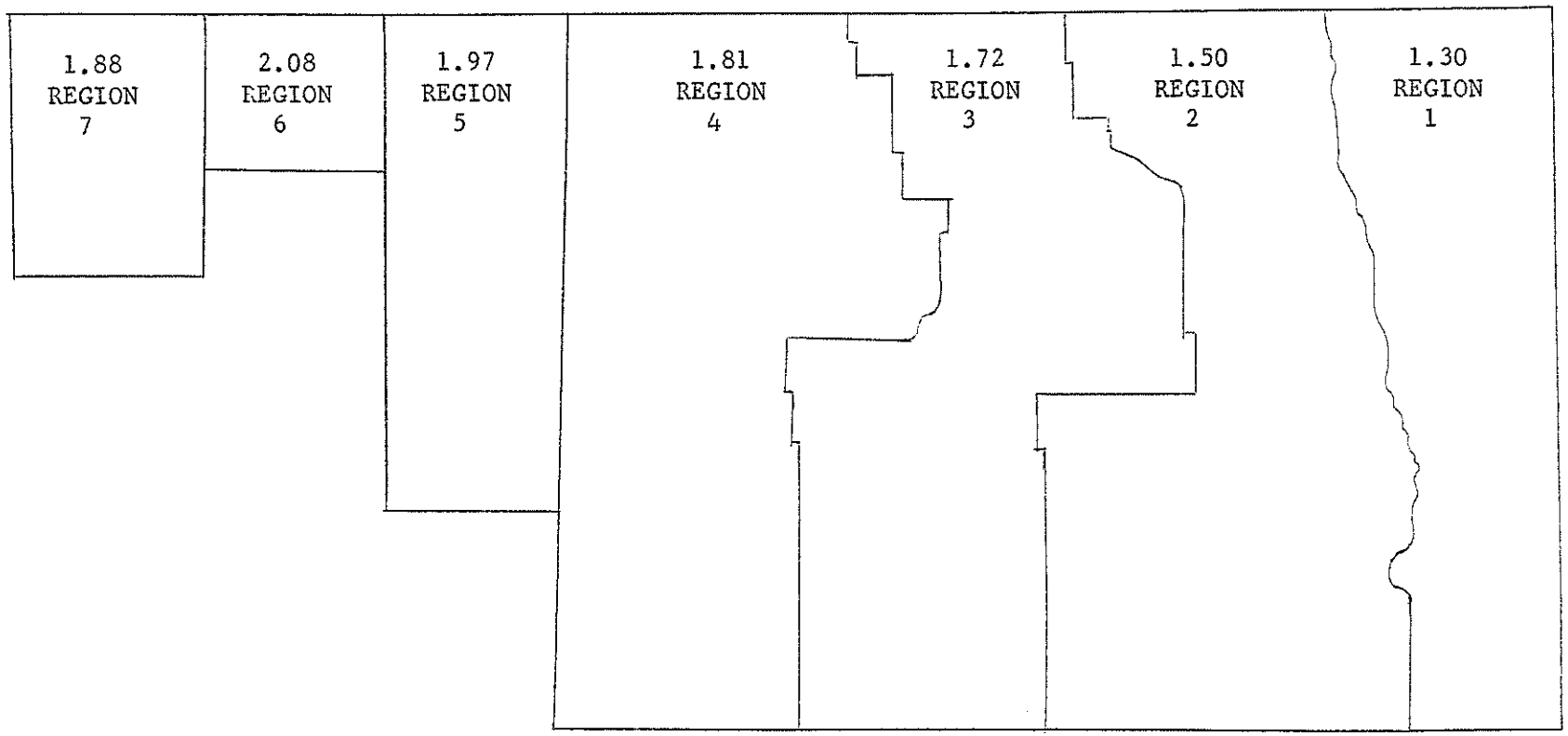

Figure 6. Average Ratio of Railroad Revenue to Railroad Out-Of-Pocket Costs By Region, 1969-70

Two types of place discrimination are evident in this analysis. Moving from east to west across Regions 1-6, the ratio of railroad revenue to railroad out-of-pocket costs increases; in other words, place discrimination becomes more intensive as distance from the primary markets (Minneapolis-St. Paul and Duluth-Superior) increases. Distant shippers are being discriminated against versus near-to-market shippers.

The second type of place discrimination becomes evident moving from Region 6 to Region 7 (the ratio of railroad revenue to railroad out-of-pocket costs decreases from 2.08 in Region 6 to 1.88 in Region 7). The ratio of railroad revenue to railroad out-of-pocket costs is less in Region 7 than in Regions 5 and 6 (costs are increasing faster than rates, with distance, moving from Region 6 to Region 7). In other words, shippers in Regions 5 and 6 are being discriminated against versus shippers in Region 7 (in this case, near-to-market shippers are being discriminated against versus distant shippers).

Several factors may be relevant in the railroad's ability to practice place discrimination against distant shippers (from the primary market) of wheat in the study area.

The most important factor may be a lack of intermodal competition. As the length of haul increases, motor carrier costs become more prohibitive and competition with the railroad for wheat transport decreases. As competition decreases, the railroad is able to charge rates based on factors other than cost-of-service. Consequently, ratios of railroad revenue to railroad out-of-pocket costs increase as distance from primary markets becomes greater and place discrimination results.

It is possible that the decrease in the ratio of railroad revenue to railroad out-of-pocket costs in Region 7 after steadily increasing in Regions 1-6 is an attempt on the part of the railroads to capture some of the traffic (wheat shipments) being lost to motor carriers hauling to the west coast from Region 7.

Moving from north to south across the study area, the average ratio of railroad revenue to railroad out-of-pocket costs decreases substantially except in the case of moving from Row 2 to Row 3, where the ratio decreases by only 1 percent (Figure 7).

Row means based on the analysis of variance (Part 1, Appendix A) indicated the average ratio of railroad revenue to railroad out-of-pocket costs were: Row 1 (northwestern Minnesota, northern North Dakota and northern Montana) = 1.84, Row 2 (western Minnesota (Area 8), central North Dakota and central Montana) = 1.78, Row 3 (western Minnesota (Area 12), southern North Dakota and southwestern Montana) = 1.77, and Row 4 (southwestern Minnesota and northern South Dakota) = 1.62.

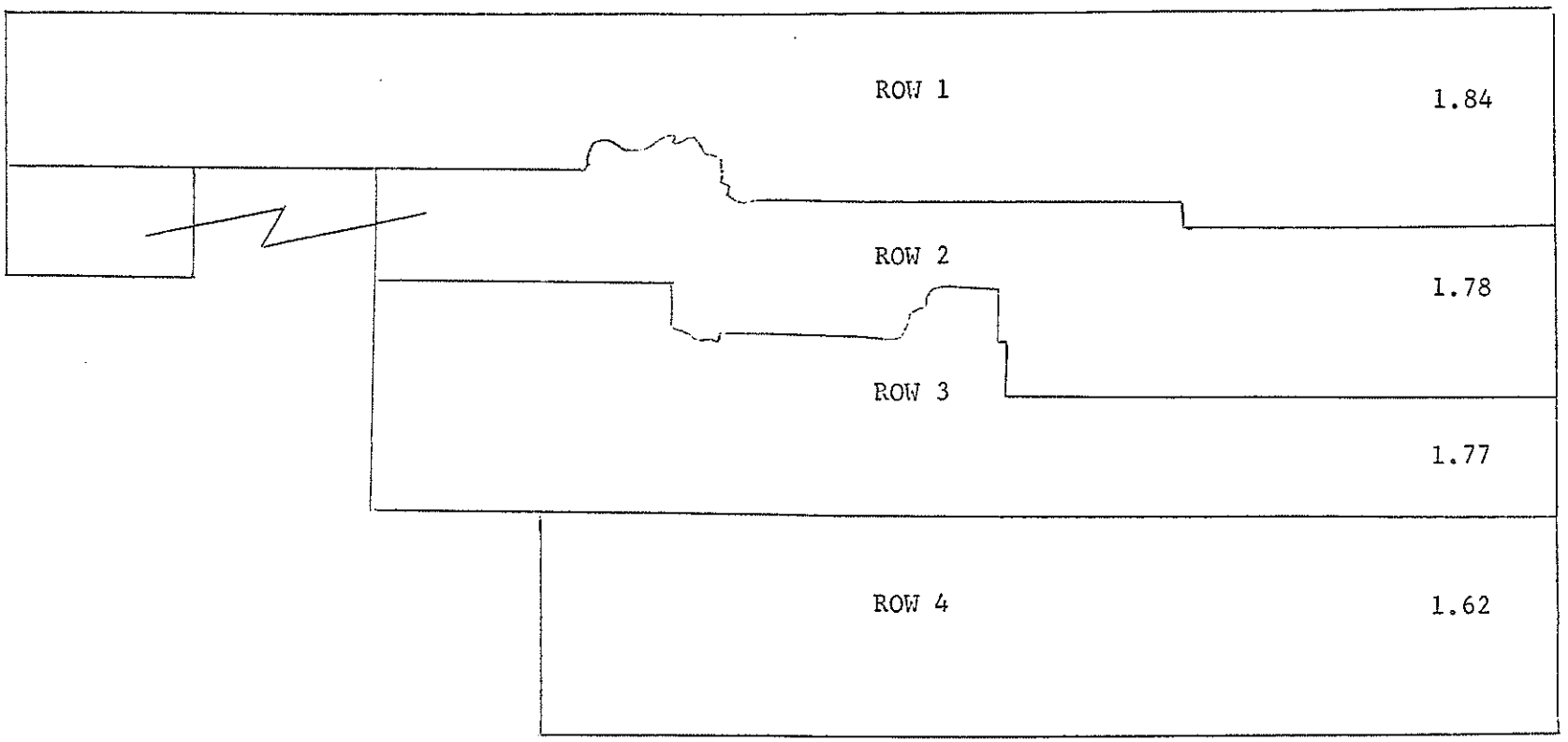

Figure 7. Average Ratio of Railroad Revenue to Railroad Out-Of-Pocket Costs by Row, 1969-70

Place discrimination is evident in this analysis. Moving from South to north across Rows 4 through 1 the ratios of railroad revenue to railroad out-of-pocket costs increase; in other words, place discrimination becomes more intensive moving from south to north across the study area. Northern shippers are being discriminated against versus southern shippers.

The increase in the ratio of railroad revenue to railroad out-of-pocket costs is very substantial from Row 4 (1.62) to Row 3 (1.77). The increase from Row 3 to Row 2 is only 1 percent (1.77 to 1.78), but the increase from Row 2 to Row 1 is again quite substantial (1.78 to 1.84).

Several factors may be relevant to the existence of place discrimination where wheat shippers located in northern sectors of the study area are discriminated against versus wheat shippers located in the southern sectors of the study area.

One important factor may be a reluctance on the part of railroads serving certain areas to lower rates or to hold the line on rate increases.

The fact that ratios of railroad revenue to railroad out-of-pocket costs are higher in certain sectors indicates some rates are based on factors other than cost-of-service.

A second factor might be the absence of a good four-lane motor carrier route through the area included in Row 1 and therefore a curtailment of motor carrier competition enabling the railroads to charge higher rates for wheat transport based on factors other than cost-of-service.

The fact that a good four-lane motor carrier route (Interstate Highway 94) passes through parts of Rows 2 and 3 and is capable of providing service to most shipping points in these rows enhances motor carrier competition in these areas. This may be a factor in the closeness of the average ratios of railroad revenue to railroad out-of-pocket costs between Rows 2 and 3.

The substantial decrease in the ratio of railroad revenue to railroad out-of-pocket costs moving from Row 3 (southern North Dakota and west central Minnesota) to Row 4 (northern South Dakota and southwestern Minnesota) may be due to several factors. One important factor may be increased competition from motor carriers in this area. Also, railroads serving shipping points in these areas may have been more cognizant in holding rates in line and basing rates more on cost-of-service and less on other factors.

Regression analysis was utilized in this study to determine if a relationship exists between the independent variable (distance to the

Minneapolis-St. Paul market from the respective shipping points) and the value of the corresponding dependent variable (the ratio of railroad revenue to railroad out-of-pocket costs for these shipping points).

Two regression equations were computed. A linear regression analysis[24] was conducted which demonstrates the relationship between distance to primary market and the ratio of railroad revenue to railroad out-of-pocket costs for those shipping points located in North Dakota and (west central and northwestern) Minnesota. A curvilinear regression analysis[25] was conducted which demonstrates the relationship between distance to primary market and the ratio of railroad revenue to railroad out-of-pocket costs for all shipping points listed in this study.

Results of the linear regression analysis indicate there is a definite relationship between distance of shipping point from primary market and the ratio of railroad revenue to railroad out-of-pocket costs. The greater the distance from primary market to shipping point, the higher the ratio of railroad revenue to railroad out-of-pocket costs. In other words, those shippers located a greater distance from, the primary markets (Minneapolis-St. Paul and Duluth-Superior) are discriminated against versus shippers located a short distance from the primary markets.

The regression equation derived from the linear regression analysis is (Figure 8):

$$X_1 = .99 + .00152\ X_2 \quad [26]$$
$$(.000142)$$

where X_1 is the dependent variable (ratio of railroad revenue to railroad out-of-pocket costs), X_2 is the independent variable (distance of shipping point from Minneapolis-St. Paul), .99 is the computed alpha coefficient (The X_1 intercept)[27] and .00152 is the computed beta coefficient (the slope of the line of regression). The correlation

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[24] See calculations in Part II, Appendix A.

[25] See calculations in Part III, Appendix A.

[26] See calculations in Part II, Appendix A.

[27] The X_1 intercept is the value of X_1 when $X_2 = 0$. In the above equation when $X_2 = 0$, $X_1 = .99$.

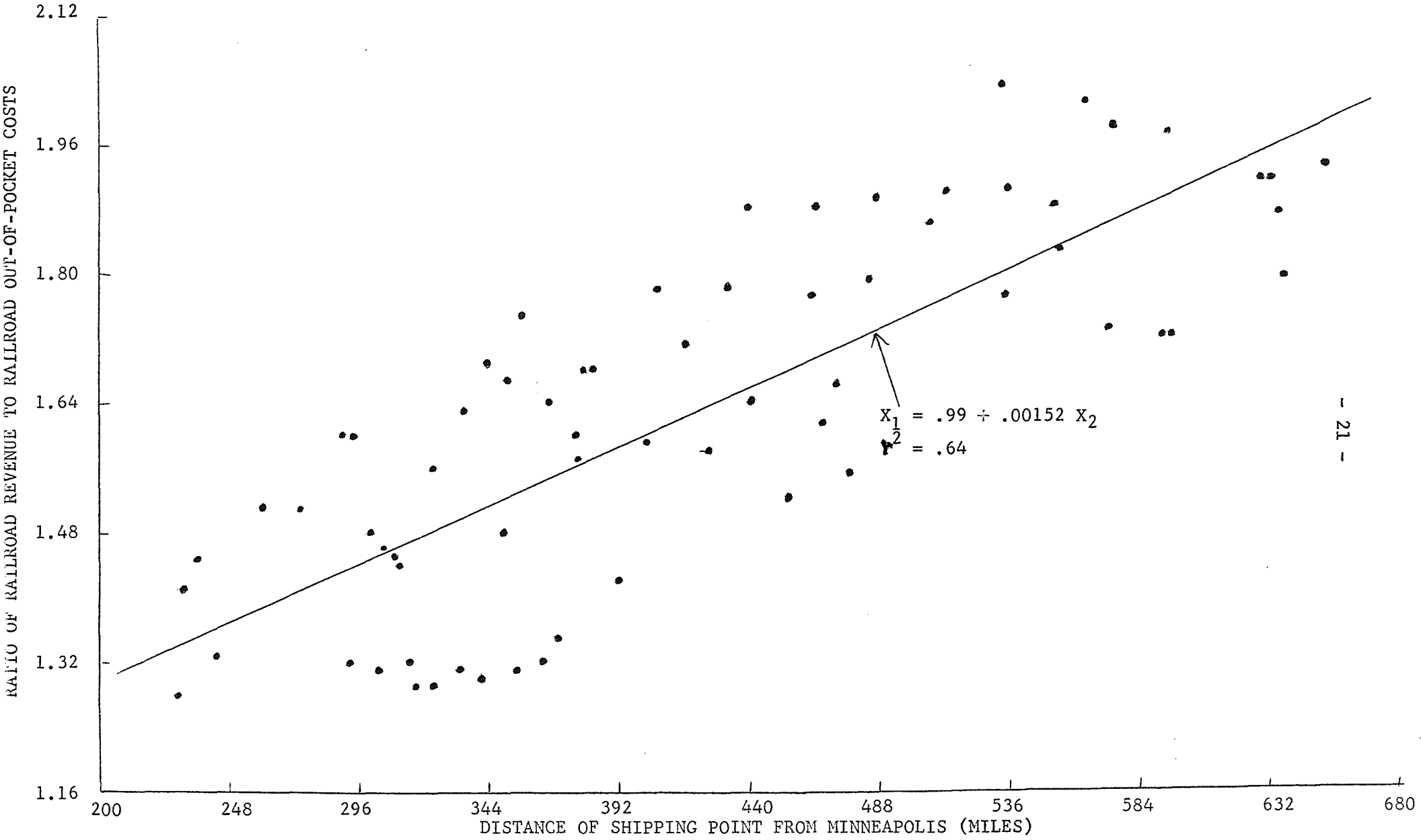

Figure 8. Relationship Between the Ratio of Railroad Revenue to Railroad Out-of-Pocket Costs and Distance of Shipping Point From Primary Market For Shipping Points in North Dakota and Western Minnesota, 1969-70

coefficient[28] is .80 and the coefficient of determination[29] is .64.

In the above equation the positive beta coefficient indicates the line of regression is upsloping to the right.[30] As distance of shipping points from the primary market increases, the ratio of railroad revenues to railroad out-of-pocket costs also increases. (Railroad rates increase at a faster rate than railroad out-of-pocket costs. Changes in railroad rates are not in accord with changes in costs and place discrimination results.)

Results of the curvilinear regression analysis indicate there is a definite relationship between distance from primary market and the ratio of railroad revenue to railroad out-of-pocket costs. The greater the distance from primary market to shipping point, the higher the ratio of railroad revenue to railroad out-of-pocket costs, (with the exception of the extreme western region of the study area (northwestern Montana) where the regression curve is downward sloping after increasing (with distance) throughout the rest of the study area. Those shippers located a greater distance from Minneapolis-St. Paul are discriminated against versus shippers located a short distance from Minneapolis-St. Paul. (The exception, again, is western Montana where the ratio of railroad revenue to railroad out-of-pocket costs is less than in central and eastern Montana. In this case, near-to-market shippers are discriminated against versus shippers located more distant from Minneapolis-St. Paul.)

The regression equation derived from the curvilinear regression analysis is (Figure 9):

$$X_1 = .54606 \underset{(.00021)^2}{+ .0035\ X_2} \underset{(.00000016)}{- .000002\ X_2^2} \quad [31]$$

where X_1 is the dependent variable (ratio of railroad revenue to railroad out-of-pocket costs), X_2 is the independent variable (distance of shipping point from Minneapolis-St. Paul), X_2^2 is the independent variable squared, .54606 is the computed alpha coefficient (the X_1 intercept)

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[28] The correlation coefficient (r) describes the linear relationship between two variables. The correlation coefficient indicates the degree of spread (scatter) of the observations about the line of regression. In a perfectly linear relationship all points (plotted observations) fall on the line of regression and $r = \pm 1$.

[29] The coefficient of determination (r^2) is defined as the amount of variation in the dependent variable explained by the independent variable. In the above equation 64 percent of the variation in the ratio of railroad revenue to railroad out-of-pocket costs is explained by distance of the shipping point from the primary market (Minneapolis-St. Paul).

[30] See Figure 7. In the absence of place discrimination the line of regression would be horizontal (the ratio of railroad revenue to railroad out-of-pocket costs would be the same regardless of the distance of shipping point from primary market).

[31] See calculations in Part III, Appendix A.

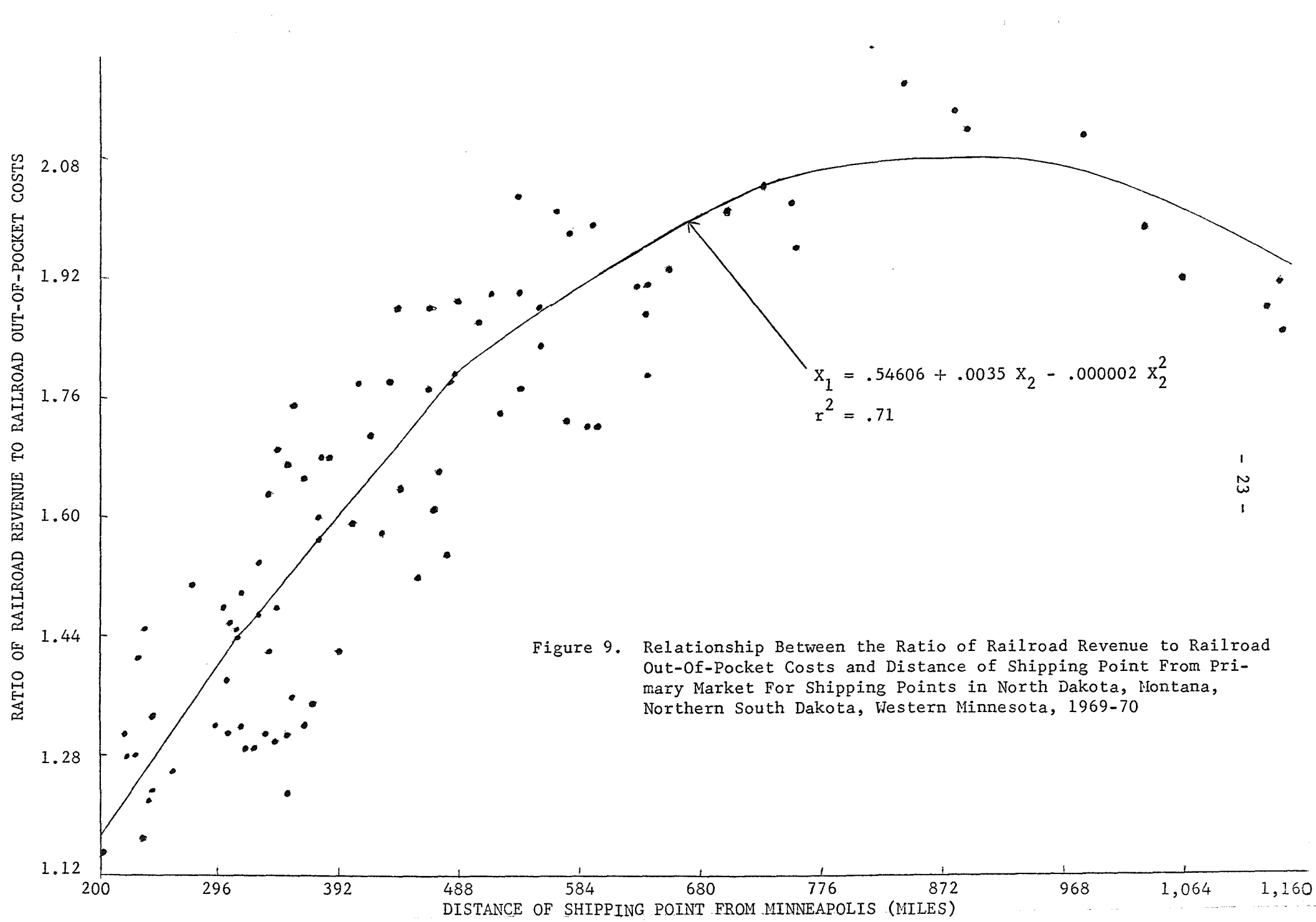

Figure 9. Relationship Between the Ratio of Railroad Revenue to Railroad Out-Of-Pocket Costs and Distance of Shipping Point From Primary Market For Shipping Points in North Dakota, Montana, Northern South Dakota, Western Minnesota, 1969-70

and .0035 and -.000002 are the computed beta coefficients (these coefficients determine the slope of the regression curve at any particular value of X_2). The correlation coefficient (r) is .84 and the coefficient of determination (r^2) is .71.

The above polynomial equation describes a regression curve which is upsloping to the right up to some point where the effects of the negative coefficient on the independent variable squared (X_2^2) will cause the regression curve to reach a maximum and then slope downward to the right. The downward sloping portion of this regression curve is equivalent to Region 7 where the ratio of railroad revenue to railroad out-of-pocket costs decreases (after increasing throughout Regions 1-6).

DIFFERENCES BETWEEN SHIPPERS LOCATED IN THE SAME AREA IN THE RATIO OF RAILROAD REVENUE TO RAILROAD OUT-OF-POCKET COSTS FOR SHIPMENTS OF WHEAT TO PRIMARY MARKETS

In the absence of place discrimination, all ratios of railroad revenue to railroad out-of-pocket costs should be equal. The degree of variation in ratio values is a measure of the degree of discrimination; the higher the ratio of railroad revenue to railroad out-of-pocket costs, the greater the discrimination against the shipping point in question.

It has been demonstrated that there are highly significant differences in the average ratio of railroad revenue to railroad out-of-pocket costs between regions and also between rows in the study area.

There are also very substantial differences in the ratio of railroad revenue to railroad out-of-pocket costs between shippers located in the same area or approximately the same distance from the primary markets (Figure 10).

A substantial degree of place discrimination exists within specific areas. The ratio of railroad revenue to railroad out-of-pocket costs in Area II varies 46 percent (1.88 minus 1.42) between individual shipping points. Area X includes ratios that vary nearly 30 percent, while Areas III, IV, VIII, and XV include ratios of railroad revenue to railroad out-of-pocket costs that vary about 20 percent. Thus, a substantial degree of place discrimination exists within particular areas.

Also, those areas (III and IV) in north central and northwestern North Dakota have a much higher average ratio of railroad revenue to railroad out-of-pocket costs than those areas (X and XI) immediately to the south. Although the distance to primary markets from Areas III and X is approximately the same, the average ratio of railroad revenue to railroad out-of-pocket costs is 11 percent higher (1.84 minus 1.73) in Area III than in Area X. The same is true of Areas IV and XI. The average ratio of railroad revenue to railroad out-of-pocket costs is 17 percent higher (1.93 minus 1.76) in Area IV than in Area XI.

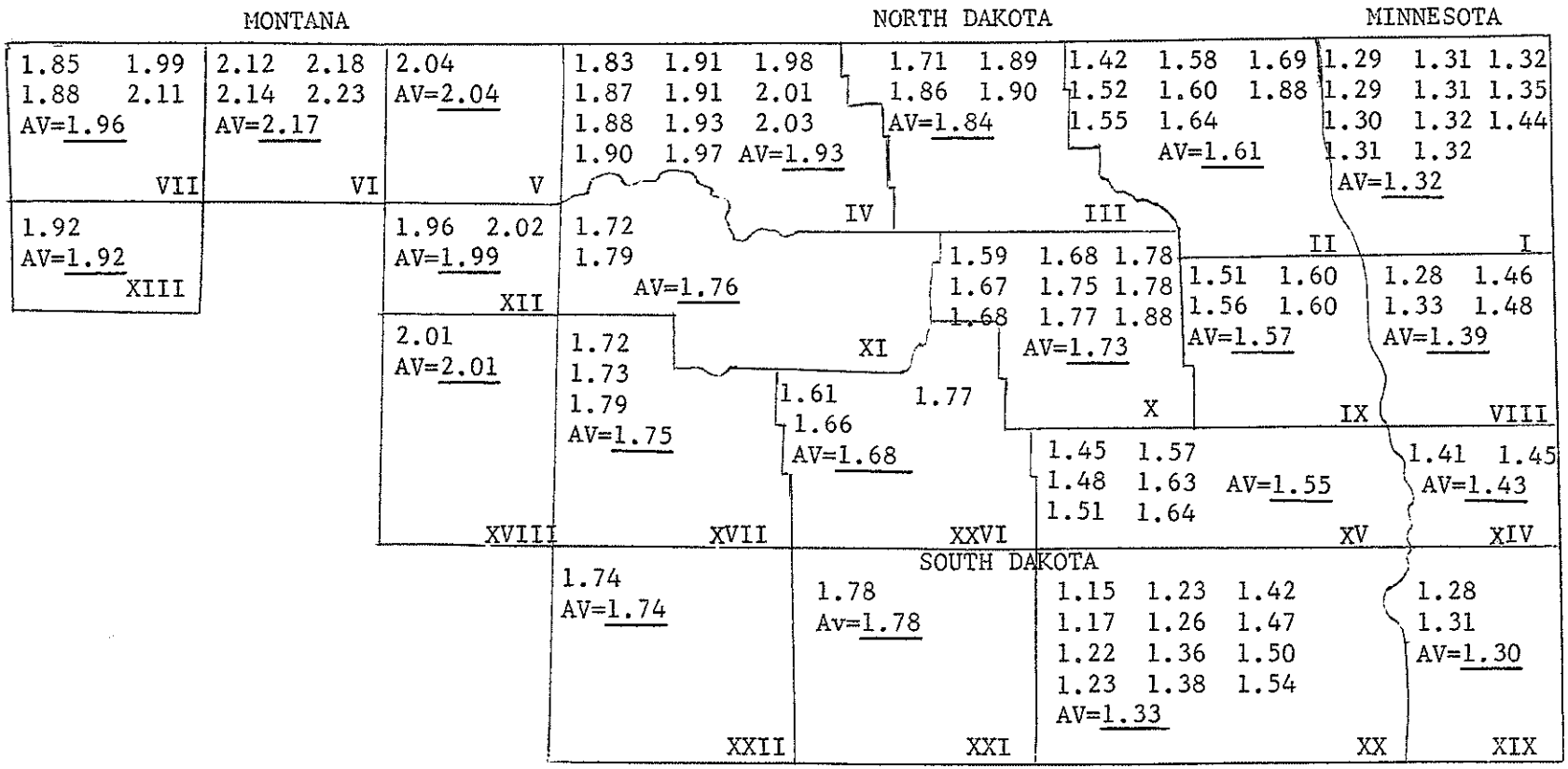

Figure 10. Ratios of Railroad Revenue to Railroad Out-Of-Pocket Costs For Individual Shipping Points By Area In North Dakota, Montana, Northern South Dakota, and Western Minnesota, 1969-70
Note: Average Ratios for Each Area Are Also Listed (Underscored).

Based on earlier findings of highly significant differences between Regional means of railroad revenue to railroad out-of-pocket costs and also between Row means of railroad revenue to railroad out-of-pocket costs, it can also be assumed that significant differences exist between ratios of railroad revenue to railroad out-of-pocket costs for shipping points within several of the Areas.

A comparison of the variation of the ratios of railroad revenue to railroad out-of-pocket costs for those shipping points within Area II to the ratio mean of this area (1.61) reveals the fact that one ratio is 27 percent (1.88 minus 1.61) greater than the area ratio mean, whereas one ratio is 19 percent (1.61 minus 1.42) less than the area ratio mean. These differences between ratios of railroad revenue to railroad out-of-pocket costs within Areas must surely be significant when the greatest variation between Row ratio means and the average ratio of railroad revenue to railroad out-of-pocket costs for all shipping points is 13 percent (1.75 minus 1.62). Other areas (such as III, IV, VIII, X, and XV) include ratios of railroad revenue to railroad out-of-pocket costs that vary substantially. Based on earlier findings, these differences may be considered significant.

One important reason for the existence of place discrimination within a particular area may be an absence of cost considerations when rail rates are established and adjusted. Other factors may be a lack of intermodal competition, poor highway systems, and a reluctance on the part of railroads to lower rates in certain areas.

THE INTENSITY OF PLACE DISCRIMINATION OVER A PERIOD OF TIME

As rail rate increases are applied to the existing rate structure, place discrimination is intensified (Figures 11 and 12). An across-the board increase in railroad rates intensifies existing place discrimination. A comparison of 1968-69 and 1969-70 data reveals that the ratio of railroad revenue to railroad out-of-pocket costs increased 5 or 6 percent in central and western North Dakota and Montana, whereas the ratio of railroad revenue to railroad out-of-pocket costs increased only 3 or 4 percent in western Minnesota and eastern North Dakota[32] (except Area XV which increased by 5 percent). Those areas (central and western North Dakota and Montana) with high ratios of railroad revenue to railroad out-of-pocket costs prior to the rail rate increase

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[32]Rail rates for 1969-70 are higher than rates for 1968-69 due to railroad freight rate increase ExParte-262 (a 6 percent increase). Railroad out-of-pocket costs for 1969-70 are higher than railroad out-of-pocket costs for 1968-69 by an amount equal to the inflation factor (minus 1.0) times those costs computed for 1968-69 (see Footnote 17, page 10).

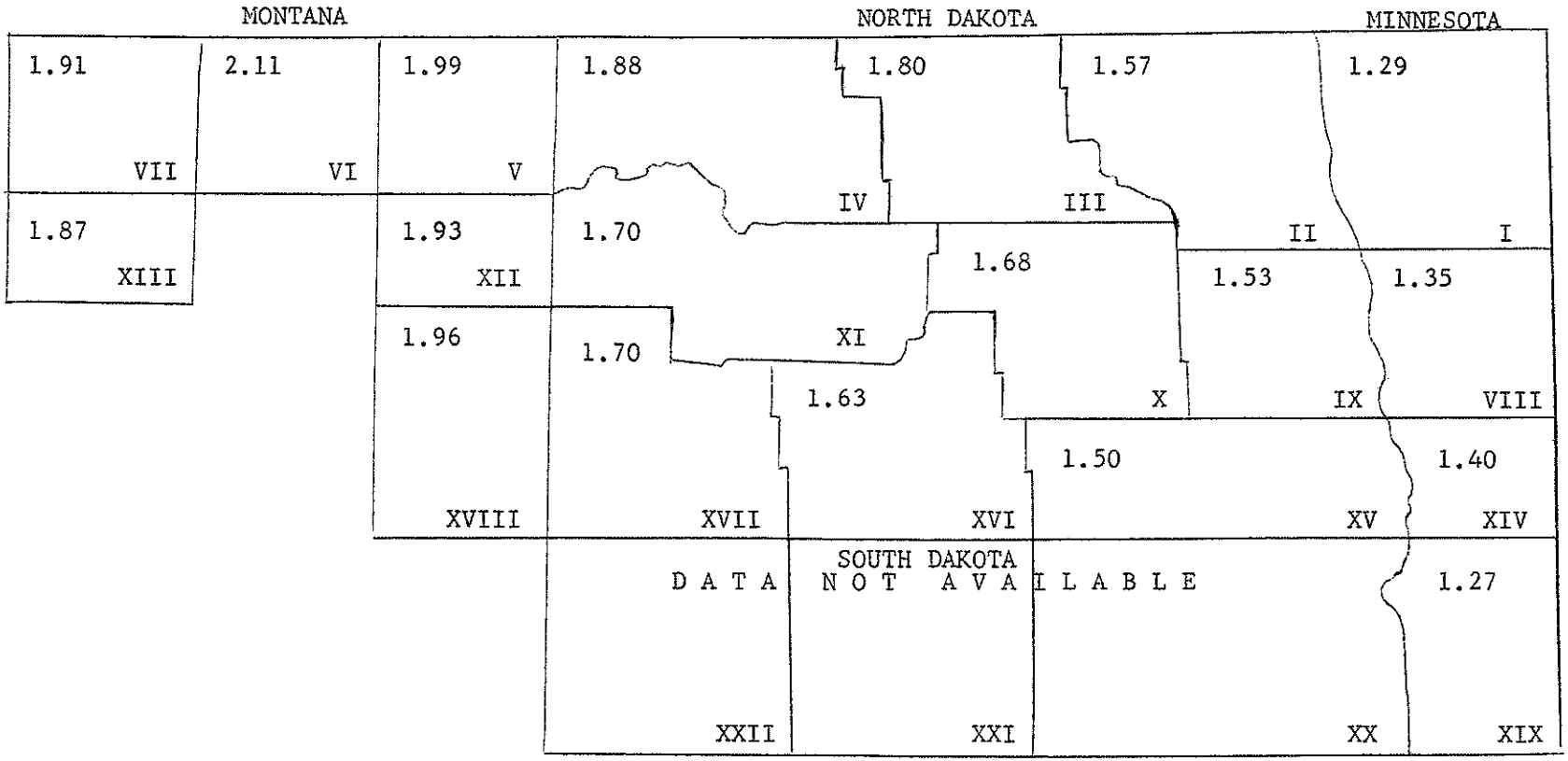

Figure 11. Average Ratio of Railroad Revenue to Railroad Out-Of-Pocket Costs By Area in North Dakota, Montana, and Western Minnesota, 1968-69

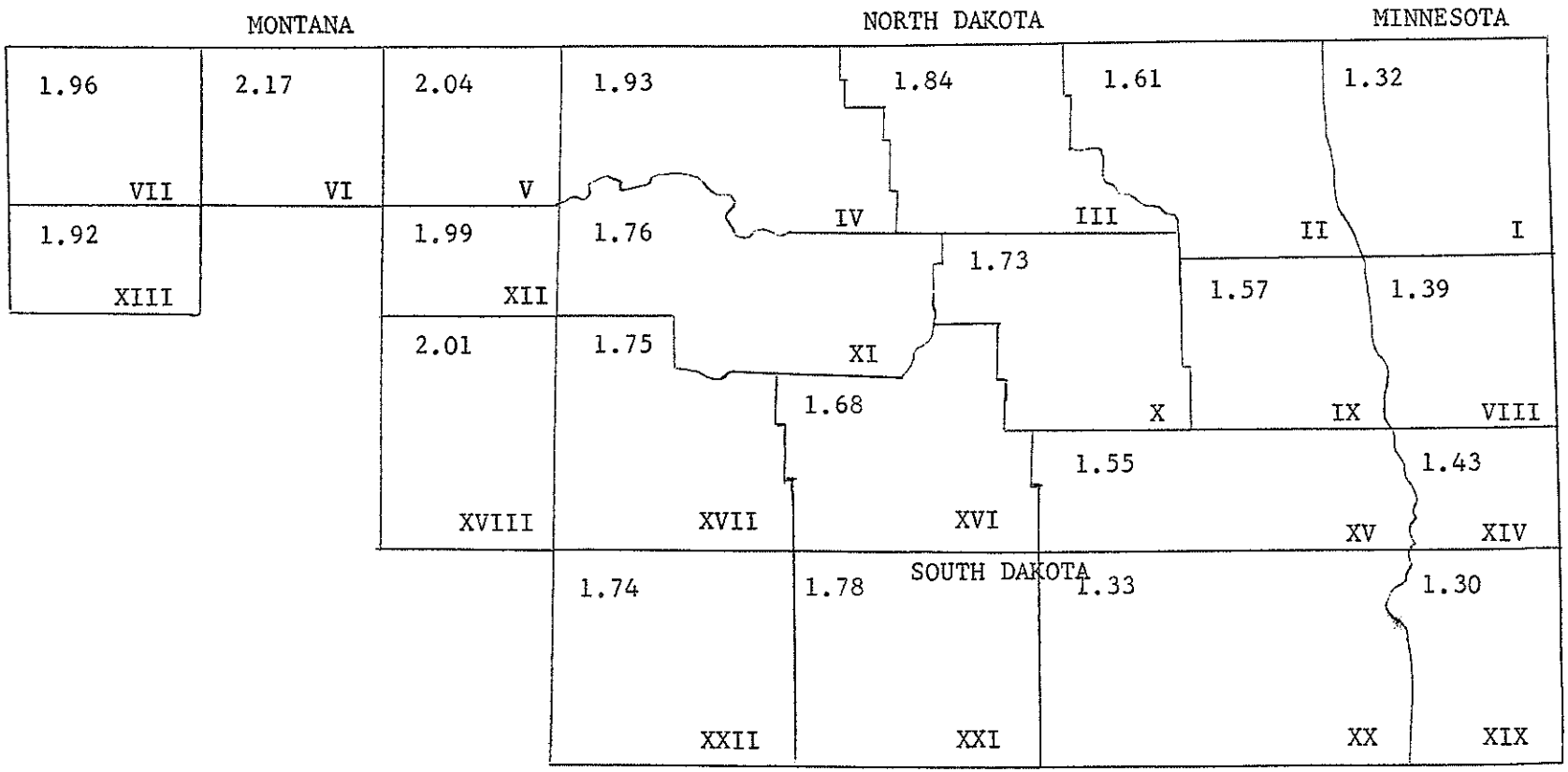

Figure 12. Average Ratio of Railroad Revenue to Railroad Out-Of-Pocket Costs By Area in North Dakota, Montana, Northern South Dakota, and Western Minnesota, 1969-70

experienced a greater percentage increase in these ratios than areas (eastern North Dakota and western Minnesota) with lower initial ratios of railroad revenue to railroad out-of-pocket costs. Thus, place discrimination intensifies over time as rail rate increases are applied to the existing rate structure.

TRENDS IN THE RAILROAD'S MARKET SHARE OF WHEAT SHIPMENTS TO THE PRIMARY MARKETS DURING 1968-69 AND 1969-70

The percentage of all wheat shipped by rail to the Minneapolis-St. Paul and Duluth-Superior markets decreased from 65 percent (Figure 13) in 1968-69 to 59 percent (Figure 14) in 1969-70.[33] This indicates a substantial gain in the percentage of wheat transported by motor carrier and a serious loss in the percentage transported by the railroads.

Regression analysis was utilized in this study to determine if a relationship exists between the percentage of wheat shipped by rail and distance of the shipping point from the primary market.

Ratios of the ratio of railroad revenue to railroad out-of-pocket costs to the railroad's market share coefficient were computed.[34] (R_{ro}/m.s. coefficient)

Results of the linear regression analysis indicate there is a definite relationship between R_{ro}/m.s. coefficient and distance from shipping point to primary market. The regression equation derived from the linear regression analysis is (Figure 15):

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[33] These data represent only those shipping points included in the study area sample. Population figures (percentages) may vary, but the trend would be the same.

[34] See Appendix Table 2 and Figure 15. All six ratio values over 7.50 were omitted from the regression analysis as these values were atypical (substantially different from the normal distribution of values).

Omitted values included shipping points located in Regions 1 and 2 only. These shipping points (Fisher and Northcote, Minnesota; Rock Lake, Hunter, and Hillsboro, North Dakota; and Westport, South Dakota) were similar, in that the railroad's market share coefficient of wheat shipments to the primary markets was very small (.09 to .18). In other words, only 9 to 18 percent of all wheat shipped from these locations to the primary markets was transported by rail.

Results of a linear regression analysis including these six atypical values indicate there is no relationship between R_{ro} to m.s. coefficient and distance from shipping point to primary market (Part V, Appendix A). Since these six values were atypical and seemed not to be among the normal distribution of values (See Figure 15), they were omitted from the regression analysis.

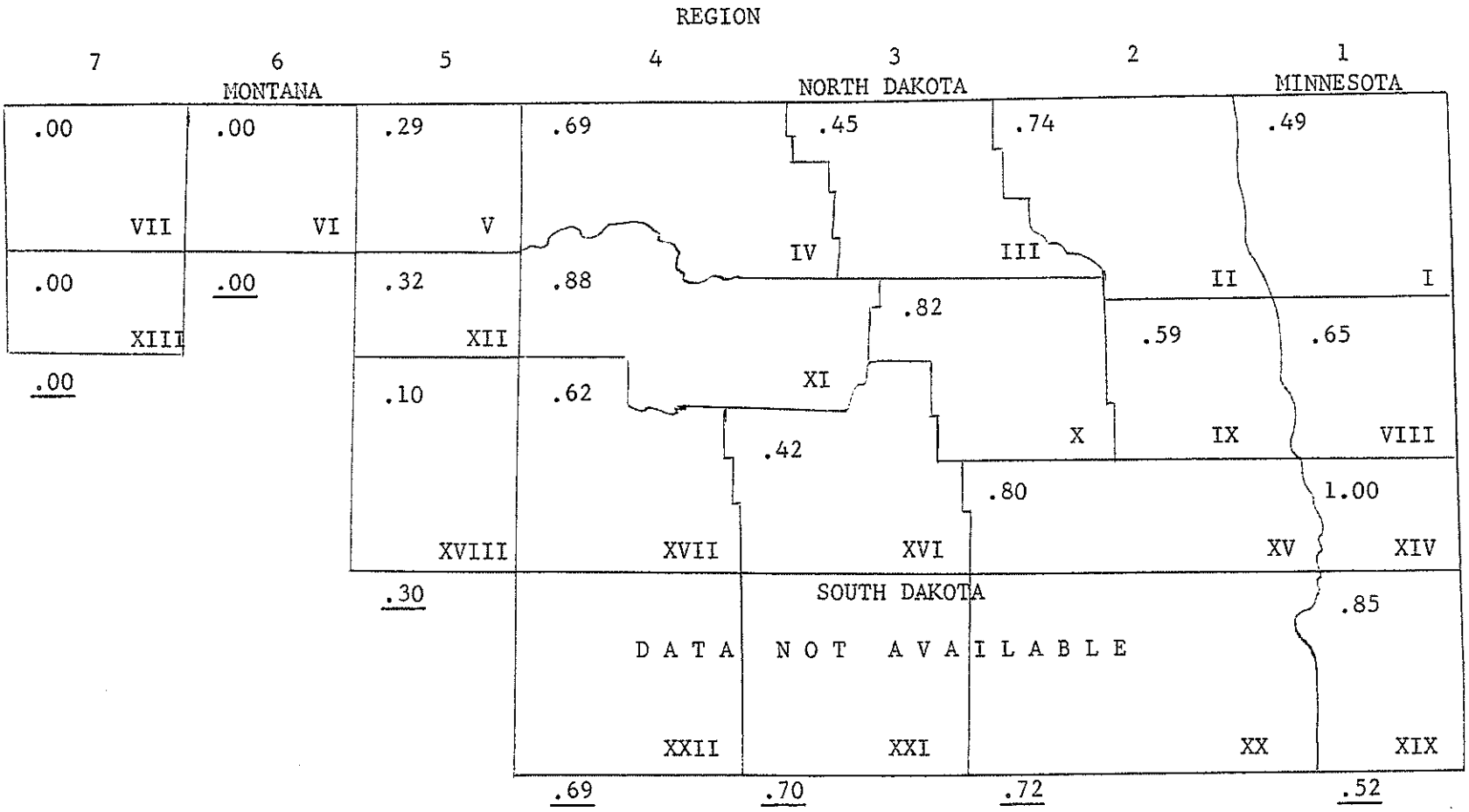

Figure 13. Railroad's Market Share Coefficient of Wheat Shipments to Primary Markets (Minneapolis-St. Paul and Duluth-Superior) By Area, 1968-69 Source: Appendix Table 1.
Note: Regional Coefficients Are Underscored. Wheat Shipments to Primary Markets Totaled 38,529,033 Bushels. Rail Shipments Totaled 25,149,320 Bushels, or 65 Percent of Total Shipments.

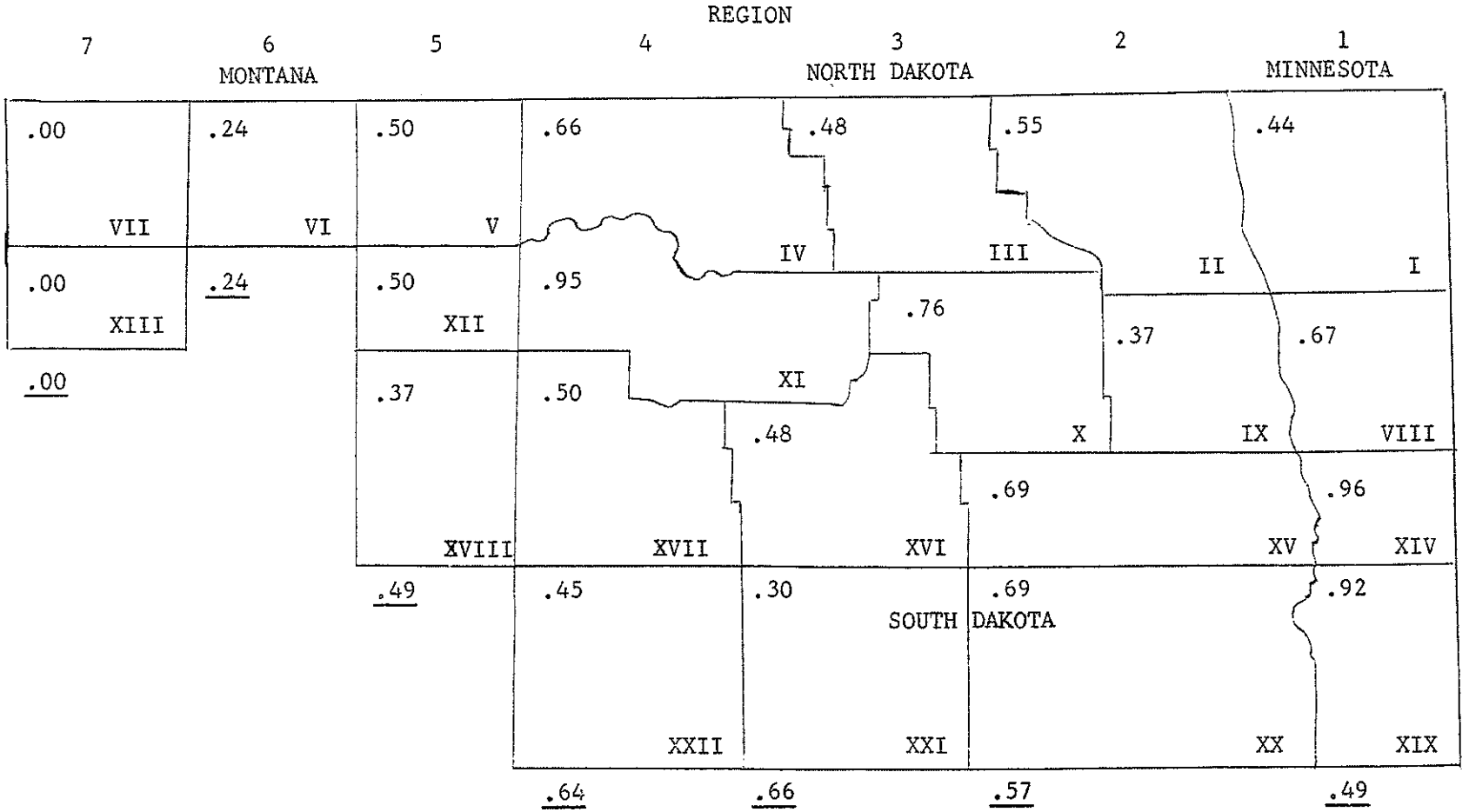

Figure 14. Railroad's Market Share Coefficient of Wheat Shipments to Primary Markets (Minneapolis-St. Paul and Duluth-Superior) By Area, 1969-70 Source: Appendix Table 2. Note: Regional Coefficients Are Underscored. Wheat Shipments to Primary Markets Totaled 42,303,800 Bushels. Rail Shipments Totaled 25,123,330 Bushels, or 59 Percent of Total Shipments.

$$X_1 = .96 + \underset{(.00084)}{.00436}\ X_2 \quad [35]$$

where X_1 is the dependent variable (ratio of the ratio of railroad revenue to railroad out-of-pocket costs to the railroad's market share coefficient), X_2 is the independent variable (distance of shipping point from Minneapolis-St. Paul), .96 is the computed alpha coefficient (the X_1 intercept) and .00436 is the computed beta coefficient (the slope of the line of regression). The correlation coefficient is .50 and the coefficient of determination is .25.

In the above equation the positive beta coefficient indicates the line of regression is upsloping to the right. As distance of the shipping point from the primary market increases, the ratio of the ratio of railroad revenue to railroad out-of-pocket costs to the railroad's market share coefficient also increases (the R_{ro} is increasing faster than the railroad's m.s. coefficient). This may suggest that the railroad is losing a portion of the wheat traffic due to much higher ratios of railroad revenue to railroad out-of-pocket costs as distance from shipping point to primary market increases. If the demand for rail transportation of wheat is elastic[36] as was indicated by the Berger-Nelson study,[37] an increase in rail rates will result in a decrease in total revenue received by the railroads (Figure 16).

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[35] See calculations in Part IV, Appendix A.

[36] The elasticity of demand may be defined as

$$\varepsilon d = \frac{\%\ \Delta Q}{\%\ \Delta P}$$

where $\%\ \Delta Q$ is the percentage change in quantity and $\%\ \Delta P$ is the percentage change in price. Demand is said to be elastic (> 1) when a small decrease in price results in a large increase in quantity demanded and vice-versa.

[37] Berger, Donald W. and David C. Nelson, An Analysis of the Elasticity of Demand for Rail Transportation of Hard Red Spring Wheat, Agricultural Economics Report No. 73, Department of Agricultural Economics, North Dakota State University, Fargo, September, 1970.

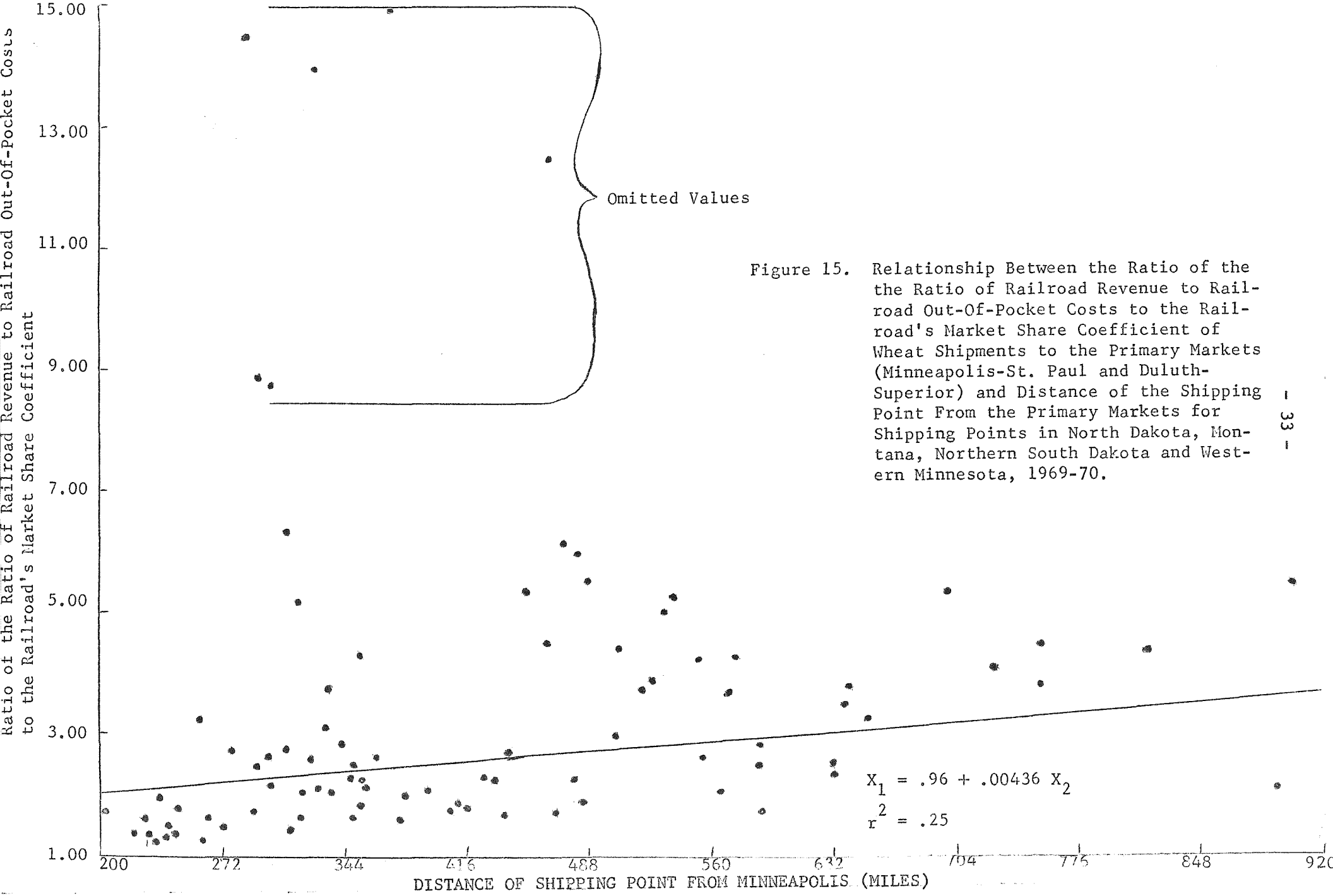

Figure 15. Relationship Between the Ratio of the the Ratio of Railroad Revenue to Railroad Out-Of-Pocket Costs to the Railroad's Market Share Coefficient of Wheat Shipments to the Primary Markets (Minneapolis-St. Paul and Duluth-Superior) and Distance of the Shipping Point From the Primary Markets for Shipping Points in North Dakota, Montana, Northern South Dakota and Western Minnesota, 1969-70.

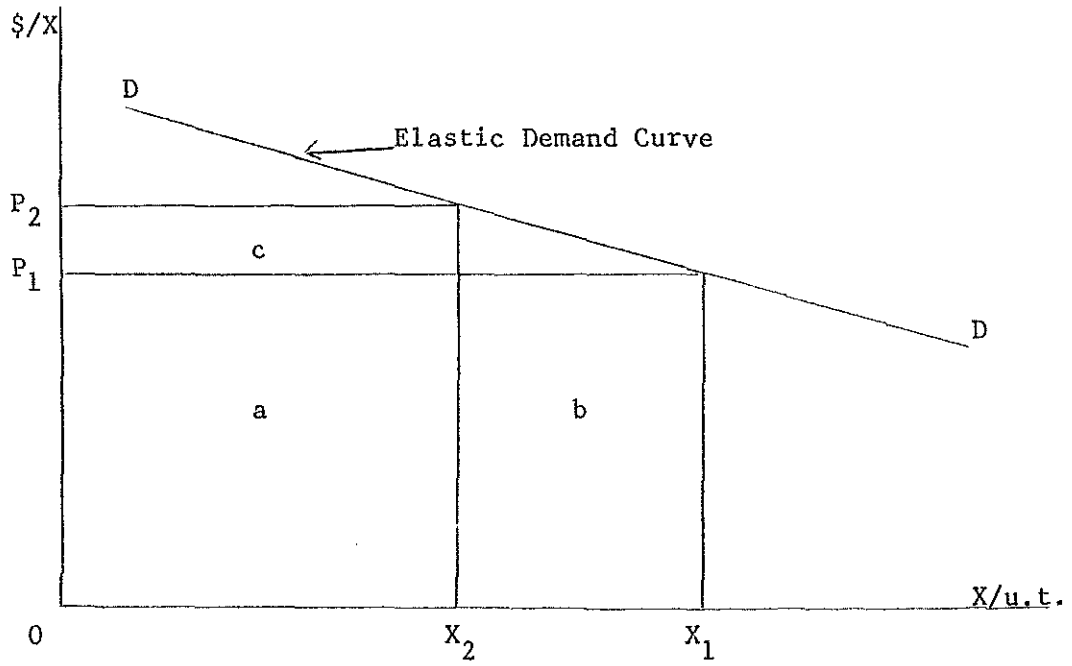

Figure 16. Elastic Demand For Rail Transportation of Wheat To Primary Markets. $/X is the Price of Transportation (Rail Rates) X/u.t. is the Quantity of Wheat Transported by Rail. Total Revenue (TR) Equals P_i0 Times X_j0. Assume P_1 (Rail Rate) Is In Effect. TR = P_10 Times $0X_1$ Which Equals Area a + b. Assume A Rail Rate Increase From P_1 to P_2. Quantity Transported Decreases to X2 and TR = P_20 Times 0_{X2} Which Is Area a + c. Since Area c is Less Than Area b, Total Revenue (TR) Has Decreased (By An Amount Equal to b-c) With the Increase in Rail Rates on Wheat (P_1 to P_2).

APPENDIX A

I

An analysis of variance was used to determine if significant differences exist in the ratio of railroad revenue to railroad out-of-pocket costs between various shipping points in the study area.

The Least-Squares Analysis of Data, with unequal Subclass Numbers (ARS 20-8, July, 1960, Agricultural Research Service, United States Department of Agriculture) was utilized (on an IBM 360-Model 50 computer) in computing data for this analysis.

Results of the analysis of variance:

The ratios of railroad revenue to railroad out-of-pocket costs were computed and aggregated by area. Regional ratio means and row ratio means were computed and the analysis of variance was conducted to determine if significant differences between regional means of the ratio of railroad revenue to railroad out of pocket costs and significant differences in the row means of railroad revenue to railroad out-of-pocket costs did, in fact, exist.

An hypothesis was made that there were no differences in ratio means. The 1 percent level of significance was chosen ($\alpha = .01$).

The results of the analysis of variance:

Identification	Standard Error Constant	Means
Entire Study Area	0.1555	1.7517
Treatments (Regions)		
Region 1	0.2434	1.3023
Region 2	0.1897	1.5016
Region 3	0.2576	1.7191
Region 4	0.2605	1.8121
Region 5	0.5083	1.9666
Region 6	0.5292	2.0837
Region 7	0.4680	1.8767
Replicates (Rows)		
Row 1	0.1727	1.8355
Row 2	0.2434	1.7830
Row 3	0.2861	1.7688
Row 4	0.3099	1.6195

Analysis of variance:

Source	Degrees of Freedom	Sum of Squares	Mean Square	Computed F
Mean	1	126.8570	126.8570	--
Treatment (Regions)	6	4.557808	.7596348	76.37
Replicate (Rows)	3	.4301182	.1433728	14.41
Error	86	.8553698	.0099462	--

Treatments or regions:

$$\frac{\text{Treatment mean square}}{\text{Error mean square}} = \frac{.7596348}{.0099462} = 76.37$$

$F_{.01} = 3.04$ (6 and 80 d.f.) 76.37 is greater than 3.04:

Therefore, we reject the hypothesis that Treatment (Regional) means are equal and conclude that there are significant differences in Regional means, since $\alpha = .01$ the conclusion is said to be highly significant.

Replicates or Rows:

$$\frac{\text{Replicate mean square}}{\text{Error mean square}} = \frac{.1433728}{.0099462} = 14.41$$

$F_{.01} = 4.04$ (3 and 80 d.f.) 14.41 is greater than 4.04:

Therefore, we reject the hypothesis that Replicate (Row) means are equal and conclude that there are significant differences in Regional means. Since $\alpha = .01$, the conclusion is said to be highly significant.

II

A linear Regression Analysis of the relationship between distance to primary market and the ratio of railroad revenue to railroad out-of-pocket costs for those shipping points located in North Dakota; and west-central and northwestern Minnesota (Areas I, II, III, IV, VIII, IX, X, XI, XIV, XV, XVI, and XVII).

X_1	X_2	X_1	X_2	X_1	X_2
1.32	292.2	1.88	464.8	1.88	440.3
1.31	303.0	1.55	477.3	1.77	462.6
1.44	311.0	1.51	259.8	1.61	466.7
1.32	314.2	1.60	288.6	1.66	472.3
1.29	316.6	1.60	293.6	1.77	534.5
1.29	322.7	1.56	322.6	1.90	512.7
1.31	332.5	1.51	274.0	2.03	534.1
1.30	341.0	1.45	309.2	1.88	553.3
1.31	354.3	1.63	334.9	1.83	554.7
1.32	363.6	1.48	349.4	2.01	565.4
1.35	369.2	1.64	365.7	1.98	575.0
1.28	228.8	1.57	376.5	1.97	592.6
1.33	243.4	1.71	416.7	1.91	631.3
1.48	299.5	1.89	487.4	1.91	631.8
1.46	305.1	1.86	506.6	1.87	636.0
1.41	230.5	1.90	535.7	1.93	653.5
1.45	235.5	1.67	351.0	1.79	484.2
1.69	343.4	1.75	355.8	1.72	596.1
1.60	376.4	1.68	379.3	1.73	573.3
1.42	391.9	1.68	382.3	1.72	594.3
1.58	424.6	1.59	401.8	1.79	638.3
1.64	440.9	1.78	406.0		
1.52	453.9	1.78	432.0		

Source: Appendix Table 2. X_1 is the dependent variable (ratio of railroad revenue/railroad out-of-pocket costs) and X_2 is the independent variable (distance of shipping point from Minneapolis-St. Paul).

Terms:

X_1	X_2
$\Sigma X_1 = 109.35$	$\Sigma X_2 = 28,068.2$
$\bar{X}_1 = 1.63$	$\bar{X}_2 = 419.9$
$\Sigma X_1^2 = 181.56$	$\Sigma X_2^2 = 12,673,806.5$
$\Sigma X_1 X_2 = 47,151.1$	
$\Sigma X_1^2 = 3.32$	$\Sigma X_2^2 = 916,037.5$
$\Sigma X_1 X_2 = 1,399.9$	
$s_1 = .2226$	$s_2 = 116.93$
$r_{12} = .80$	

Calculations:

The sum of the squares of the deviations of X_1 values from their mean:

$$\Sigma X_1^2 = \Sigma X_1^2 - \bar{X}_1 \Sigma X_1$$

$$= 181.56 - 1.63\ (109.35)$$

$$= 181.56 - 178.24$$

$$\Sigma X_1^2 = 3.32$$

The sum of the squares of the deviations of X_2 values from their mean:

$$\Sigma X_2^2 = \Sigma X_2^2 - \bar{X}_2 \Sigma X_2$$

$$= 12,673,806.5 - 418.9\ (28,068.2)$$

$$= 12,673,806.5 - 11,757,769.0$$

$$\Sigma X_2^2 = 916,037.5$$

The sum of the products of the deviations of the X_1 values and the X_2 values from their respective means:

$$\Sigma X_1 X_2 = \Sigma X_1 X_2 - \bar{X}_1 \Sigma X_2$$

$$= 47,151.1 - 1.63\ (28,068.2)$$

$$= 47,151.1 - 45,751.2$$

$$\Sigma X_1 X_2 = 1,399.9$$

The standard deviation of X_1:

$$s_1 = \sqrt{\Sigma X_1^2/N} = \sqrt{3.32/67} = \sqrt{.04955}$$

$$s_1 = .2226$$

The standard deviation of X_2:

$$s_2 = \sqrt{\Sigma X_2^2/N} = \sqrt{916,037.5/67} = \sqrt{13,672.2}$$

$$s_2 = 116.93$$

The correlation between X_1 and X_2:

$$r_{12} = \frac{\Sigma X_1 X_2}{N s_1 s_2} = \frac{1,399.9}{67(.2226)(116.93)}$$

$$r_{12} = \frac{1,399.9}{1,742.3} = .803$$

$$r_{12} = .80 \qquad r_{12}^2 = .64$$

The beta coefficient:

$$b = r_{12} \frac{s_1}{s_2} = .80 \left(\frac{.2226}{116.93}\right)$$

$$= .80 \ (0.00190)$$

$$b = 0.00152$$

The alpha coefficient:

$$a = \overline{X}_1 - b \overline{X}_2 = 1.63 - .00152 \ (418.9)$$

$$= 1.63 - .63673 = 1.63 - .64$$

$$a = 0.99$$

The regression equation is:

$$X_1 = 0.99 + 0.00152 \ X_2$$

The standard error of beta:

$$s_b^2 = \frac{s_1^2 \ (1 - r_{12}^2)}{(N-2) \ s_2^2} = \frac{.04955 \ (1 - .64)}{65 \ (13,672.2)}$$

$$s_b^2 = \frac{.04955 \ (.36)}{888,693} = \frac{.01784}{888,693}$$

$$s_b^2 = .000000020074$$

$$s_b = \sqrt{s_b^2} = \sqrt{.000000020074}$$

$$s_b = .000142 \text{ (the standard error of beta)}$$

$$\frac{b}{s_b} = \frac{.00152}{.000142} = 10.70 \text{ (beta divided by the standard error of beta)}$$

$$\frac{b}{s_b} = 10.70$$

There are 67 observations, n - 2 = 67 - 2 or 65 degrees of freedom (d.f.). $t_{99} = 2.39$ with 60 degrees of freedom; therefore, beta is significant at the 1 percent level (10.70 > 2.39).

III

A curvilinear Regression Analysis of the relationship between distance to primary market and the ratio of railroad revenue/railroad out-of-pocket costs for all shipping points listed in the study area (North Dakota, Montana, northern South Dakota, and western Minnesota).

Minreg, a correlation and multiple linear regression program developed at the University of Minnesota, was utilized (on an IBM 360-Model 50 computer) in computing data for this analysis.

Results of the curvilinear Regression Analysis:

Data--The ratio of railroad revenue to railroad out-of-pocket costs was plotted against distance from shipping point to Minneapolis-St. Paul for all sample points. Each point in Montana (Regions 5, 6, and 7) was included three times as the number of observations in these regions was only about one-third to one-fourth the number of observations in Regions 1 to 4. (In other words, data from Montana shipping points were weighted by three times the number of actual observations listed in the study sample.)

The Regression Equation derived from the curvilinear regression analysis was:

$$X_1 = .54606 + .0035\ X_2 - .000002\ X_2^2$$
$$\qquad\quad (.05934)\ (.00021)\quad (.00000016)$$

where X_1 is the dependent variable (ratio of railroad revenue to railroad out-of-pocket costs); X_2 is the independent variable (distance of shipping point from Minneapolis-St. Paul); X_2^2 is the independent variable squared; .54606 is the computed alpha value (X_1 intercept); and .0035 and .000002 are computed beta coefficients (these coefficients determine the slope of the regression curve at any particular point). Those values in parentheses are the standard error of the intercept (.05934) and the standard error of the regression coefficients (.00021 and .00000016). The correlation coefficient (r) is .8379 and the coefficient of determination (r^2) is .7021.

IV

A linear Regression Analysis of the relationship between distance to primary market and the ratio of the ratio of railroad revenue to railroad out-of-pocket costs to the railroad's market share coefficient for all shipping points listed in the study sample (except those points (6) where the ratio value was greater than 7.50).

X_1	X_2	X_1	X_2	X_1	X_2
2.54	292.2	3.79	334.9	1.69	466.7
2.77	311.0	1.66	349.4	6.15	472.3
2.59	314.2	2.16	365.7	5.21	534.5
1.55	316.6	1.62	376.5	5.93	480.8
2.63	322.7	1.77	202.9	2.97	512.7
3.12	332.5	1.23	235.4	3.33	534.1
2.89	341.0	1.30	240.0	4.27	553.3
4.37	354.3	1.84	242.0	2.61	554.7
2.64	363.6	1.26	260.3	2.03	565.4
1.36	228.8	2.60	300.5	4.30	575.0
1.37	243.4	1.67	314.2	2.49	592.6
2.18	299.5	2.10	327.6	2.39	631.3
6.35	305.1	2.03	335.8	2.42	631.8
1.99	230.5	2.56	350.0	3.53	636.0
1.45	235.5	2.23	355.1	3.22	653.5
1.36	221.2	1.80	416.7	1.90	484.2
1.39	228.3	5.56	487.4	1.76	596.1
2.17	343.4	4.43	506.6	3.68	573.3
2.76	376.4	5.00	535.7	2.77	594.3
1.75	391.9	2.29	351.0	3.81	638.3
2.29	424.6	1.84	355.8	3.87	521.0
1.66	440.9	2.13	379.3	5.43	699.8
5.43	453.9	2.00	382.3	4.56	754.8
2.28	477.3	1.69	401.8	3.88	751.8
1.66	259.8	1.78	406.0	4.08	729.4
5.20	322.6	2.25	432.0	2.14	891.0
1.51	274.0	2.61	440.3	6.06	898.8
1.45	309.2	4.78	462.6		

Source: Appendix Table 2. X_1 is the dependent variable (ratio of ratio of railroad revenue to railroad out-of-pocket costs to railroad's market share coefficient for wheat shipments to primary markets) and X_2 is the independent variable (distance of shipping point from Minneapolis-St. Paul).

Terms:

X_1	X_2
$\Sigma X_1 = 235.17$	$\Sigma X_2 = 35,689.7$
$\bar{X}_1 = 2.83$	$\bar{X}_2 = 430.0$
$\Sigma X_1^2 = 819.07$	$\Sigma X_2^2 = 17,360,414.9$
$\Sigma X_1 X_2 = 109,718.8$	
$\Sigma X_1^2 = 153.54$	$\Sigma X_2^2 = 2,013,843.9$

$\Sigma X_1X_2 = 8,717$

$s_1 = 1.3601$ $\qquad$ $s_2 = 155.77$

$r_{12} = .50$

Calculations:

The sum of the squares of the deviations of X_1 values from their mean:

$$\Sigma x_1^2 = \Sigma X_1^2 - \overline{X}_1 \Sigma X_1$$

$$= 819.07 - (2.83)\ (235.17)$$

$$= 819.07 - 665.53$$

$$\Sigma x_1^2 = 153.54$$

The sum of the squares of the deviations of X_2 values from their mean:

$$\Sigma x_2^2 = \Sigma X_2^2 - \overline{X}_2\ \Sigma X_2$$

$$= 17,360,414.9 - 430\ (35,689.7)$$

$$= 17,360,414.9 - 15,346,571.0$$

$$\Sigma x_2^2 = 2,013,843.9$$

The sum of the products of the deviations of the X_1 values and the X_2 values from their respective means:

$$\Sigma x_1x_2 = \Sigma X_1X_2 - \overline{X}_1\ \Sigma X_2$$

$$= 109,718.8 - 2.83\ (35,689.7)$$

$$= 109,718.8 - 101,001.8$$

$$\Sigma x_1x_2 = 8,717$$

The standard deviation of X_1:

$$s_1 = \sqrt{\Sigma x_1^2/N} = \sqrt{153.54/83} = \sqrt{1.84987}$$

$$s_1 = 1.3601$$

The standard deviation of X_2:

$$s_2 = \sqrt{\Sigma X_2^2/N} = \sqrt{2,013,843.9/83} = \sqrt{24,263.2}$$

$$s_2 = 155.77$$

The correlation between X_1 and X_2:

$$r_{12} = \frac{\Sigma X_1 X_2}{N s_1 s_2} = \frac{8,717.0}{83(1.3601)(155.77)} = \frac{8,717.0}{17,586.4}$$

$$r_{12} = .50 \qquad r_{12}^2 = .25$$

The beta coefficient:

$$b = r_{12} \frac{s_1}{s_2} = .50 \left(\frac{1.3601}{155.77}\right)$$

$$= .50 \ (.00873)$$

$$b = .00436$$

The alpha coefficient:

$$a = \overline{X}_1 - b \overline{X}_2 = 2.83 - .00436 \ (430.0)$$

$$= 2.83 - 1.87480 = 2.83 - 1.87$$

$$a = 0.96$$

The regression equation is:

$$X_1 = 0.96 + 0.00436 X_2$$

The standard error of beta:

$$s_b^2 = \frac{s_1^2 (1-r_{12}^2)}{(N-2) s_2^2} = \frac{1.84987 \ (.75)}{81 \ (24,263.2)}$$

$$s_b^2 = \frac{1.38740}{1,965,319.2} = .0000007059$$

$$s_b^2 = .0000007059$$

$$s_b = \sqrt{s_b^2} = \sqrt{.0000007059}$$

$s_b = .00084$ (the standard error of beta)

$$\frac{b}{s_b} = \frac{.00436}{.00084} = 5.19 \text{ (beta divided by the standard error of beta)}$$

$$\frac{b}{s_b} = 5.19$$

There are 83 observations, n - 2 = 83 - 2 or 81 degrees of freedom (d.f.). $t_{.99} = 2.39$ with 60 degrees of freedom; therefore, beta is significant at the 1 percent level (5.19 > 2.39).

V

A linear Regression Analysis of the relationship between distance to primary market and the ratio of the ratio of railroad revenue to railroad out-of-pocket costs to the railroad's market share coefficient for all shipping points listed in the study sample.

X_1	X_2	X_1	X_2	X_1	X_2
2.54	292.2	14.55	288.6	2.00	382.3
8.73	303.0	8.89	293.6	1.69	401.8
2.77	311.0	5.20	322.6	1.78	406.0
2.59	314.2	1.51	274.0	2.25	432.0
1.55	316.6	1.45	309.2	2.61	440.3
2.63	322.7	3.79	334.9	4.78	462.6
3.12	332.5	1.66	349.4	1.69	466.7
2.89	341.0	2.16	365.7	6.15	472.3
4.37	354.3	1.62	376.5	5.21	534.5
2.64	363.6	1.77	202.9	5.93	480.8
15.00	369.2	1.23	235.4	2.97	512.7
1.36	228.8	1.30	240.0	3.33	534.1
1.37	243.4	1.84	242.0	4.27	553.3
2.18	299.5	1.26	260.3	2.61	554.7
6.35	305.1	2.60	300.5	2.03	565.4
1.99	230.5	1.67	314.2	4.30	575.0
1.45	235.5	14.00	327.0	2.49	592.6
1.36	221.2	2.10	327.6	2.39	631.3
1.39	228.3	2.03	335.8	2.42	631.8
2.17	343.4	2.56	350.0	3.53	636.0
2.76	376.4	2.23	355.1	3.22	653.5
1.75	391.9	1.80	416.7	1.90	484.2
2.29	424.6	5.56	487.4	1.76	596.1
1.66	440.9	4.43	506.6	3.68	573.3
5.43	453.9	5.00	535.7	2.77	594.3
12.53	464.8	2.29	351.0	3.81	638.3
2.28	477.3	1.84	355.8	3.87	521.0
1.66	259.8	2.13	379.3	5.43	699.8
4.56	754.8				
3.88	751.8				
4.08	729.4				
2.14	891.0				
6.06	898.8				

Source: Appendix Table 2. X_1 is the dependent variable (ratio of ratio of railroad revenue to railroad out-of-pocket costs to the railroad's market share coefficient for wheat shipments to primary markets) and X_2 is the independent variable (distance of shipping point from Minneapolis-St. Paul).

Terms:

X_1	X_2
$\Sigma X_1 = 308.87$	$\Sigma X_2 = 37,735.9$
$\overline{X}_1 = 3.47$	$\overline{X}_2 = 424.0$
$\Sigma X_1^2 = 1,764.01$	$\Sigma X_2^2 = 18,080,991.5$

$\Sigma X_1 X_2 = 135,113.10$

$\Sigma X_1^2 = 692.23$ $\Sigma X_2^2 = 2,080,969.9$

$\Sigma X_1 X_2 = 4,169.5$

$s_1 = 2.7889$ $s_2 = 152.91$

$r_{12} = .11$

Calculations:

The sum of the squares of the deviations of the X_1 values from their mean:

$$\Sigma X_1^2 = \Sigma X_1^2 - \overline{X}_1 \Sigma X_1$$

$$= 1,764.01 - (3.47)(308.87)$$

$$= 1,764.01 - 1,071.78$$

$$\Sigma X_1^2 = 692.23$$

The sum of the squares of the deviations of the X_2 values from their mean:

$$\Sigma X_2^2 = \Sigma X_2^2 - \overline{X}_2 \Sigma X_2$$

$$= 18,080,991.5 - (424.0)(37,735.9)$$

$$= 18,080,991.5 - 16,000,021.6$$

$$\Sigma X_2^2 = 2,080,969.9$$

The sum of the products of the deviations of the X_1 values and the X_2 values from their respective means:

$$\Sigma X_1 X_2 = \Sigma X_1 X_2 - \overline{X}_1 \Sigma X_2$$

$$= 135,113.10 - 3.47 (37,735.9)$$

$$= 135,113.10 - 130,943.57$$

$$\Sigma X_1 X_2 = 4,169.5$$

The standard deviation of X_1:

$$s_1 = \sqrt{\Sigma X_1^2/N} = \sqrt{692.23/89} = \sqrt{7.77786}$$

$$s_1 = 2.7889$$

The standard deviation of X_2:

$$s_2 = \sqrt{\Sigma X_2^2/N} = \sqrt{2,080,969.9/89} = \sqrt{23,381.7}$$

$$s_2 = 152.91$$

The correlation between X_1 and X_2:

$$r_{12} = \frac{\Sigma X_1 X_2}{N s_1 s_2} = \frac{4,169.5}{89(2.7889(152.91)} = \frac{4,169.5}{37,953.8}$$

$$r_{12} = .11 \qquad r_{12}^2 = .01$$

The beta coefficient:

$$b = r_{12} \frac{s_1}{s_2} = .11 \frac{(2.7889)}{152.91} = .11\ (.01824)$$

$$b = .00201$$

The alpha coefficient:

$$a = \overline{X}_1 - b\,\overline{X}_2 = 3.47 - .00201\ (424.0)$$

$$= 3.47 - .85224 = 3.47 - .85$$

$$a = 2.62$$

The regression equation is:

$$X_1 = 2.62 + 0.00201\ X_2$$

The standard error of beta:

$$s_b^2 = \frac{s_1^2(1-r_{12}^2)}{(N-2)\ s_2^2} = \frac{7.77786(.99)}{(87)(23,381.7)}$$

$$s_b^2 = \frac{7.70}{2,034,207.9}$$

$$s_b^2 = .00000378$$

$$s_b = \sqrt{s_b^2} = \sqrt{.00000378}$$

$$s_b = .00194 \text{ (the standard error of beta)}$$

$$\frac{b}{s_b} = \frac{.00201}{.00194} = 1.036 = 1.04$$

There are 89 observations, n - 2 = 89 - 2 or 87 degrees of freedom (d.f.). $t_{.99} = 2.39$ with 60 degrees of freedom; therefore, beta is not significant at the 1 percent level (1.04 < 2.39).

APPENDIX B

APPENDIX TABLE 1. DATA PERTAINING TO SHIPPING POINTS IN NORTH DAKOTA, MONTANA, NORTHERN SOUTH DAKOTA AND WESTERN MINNESOTA BY AREA DURING THE PERIOD AUGUST, 1968, THROUGH JULY, 1969

Shipping Point	Terminal	Way Mileage	Through Mileage	Total Mileage	Railroad Revenue	Railroad Out-Of-Pocket Costs	Shipping Point R_{ro}	Area R_{ro}	Region R_{ro}	Total Wheat Shipments	Rail Wheat Shipments	Shipping Point-Market Share Coefficient[a]	Area-Market Share Coefficient[a]	Region-Market Share Coefficient[a]
REGION 1 - 1968-69														
Row 1 (Area I)														
Crookston	Staples	149.5	142.7	292.2	28.5	22.31	1.28			267,932	219,932	.82		
Fisher	Staples	160.3	142.7	303.0	29.0	22.85	1.27			379,504	102,947	.27		
Eldred	Dilworth	61.4	249.6	311.0	29.5	21.09	1.40			386,675	190,000	.49		
Angus	Staples	171.5	142.7	314.2	30.0	23.41	1.28			310,000	200,000	.65		
East Grand Forks	Staples	173.9	142.7	316.6	29.5	23.53	1.25	1.29		300,000	250,000	.83	.49	
Warren	Staples	180.0	142.7	322.7	30.0	23.83	1.26			1,020,000	620,000	.61		
Argyle	Staples	189.8	142.7	332.5	31.0	24.32	1.27			373,600	236,000	.63		
Stephen	Staples	198.3	142.7	341.0	31.5	24.74	1.27			1,363,492	401,276	.29		
Kennedy	Staples	211.6	142.7	351.3	32.5	25.40	1.28			626,213	340,613	.54		
Hallock	Staples	220.9	142.7	363.0	335.	25.87	1.29		1.31	400,000	200,000	.50		.50
Northcote	Staples	226.5	142.7	369.2	34.5	26.15	1.32			300,371	19,367	.06		
Row 2 (Area VIII)														
Hawley	Staples	86.1	142.7	228.8	24.0	19.15	1.25			79,777	69,999	.88		
Glyndon	Staples	100.7	142.7	243.4	25.5	19.88	1.28	1.35		95,000	90,000	.95	.65	
Nielsville	Dilworth	49.9	249.6	299.5	29.5	20.52	1.44			94,700	84,200	.89		
Climax	Dilworth	55.5	249.6	305.1	29.5	20.80	1.42			166,380	40,595	.24		
Row 3 (Area XIV)														
Brushvale	Breckenridge	9.1	221.4	230.5	24.5	17.65	1.39	1.40		22,000	22,000	1.00	1.00	
Kent	Breckenridge	14.1	221.4	235.5	25.0	17.90	1.40			139,241	139,241	1.00		
Row 4 (Area XIX)														
Dumont	Montevideo	74.9	146.3	221.2	24.0	18.70	1.28	1.27		51,225	51,225	1.00	.85	
Wheaton	Montevideo	82.0	146.3	228.3	24.0	19.06	1.26			187,166	152,431	.81		

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APPENDIX TABLE 1. DATA PERTAINING TO SHIPPING POINTS IN NORTH DAKOTA, MONTANA, NORTHERN SOUTH DAKOTA, AND WESTERN MINNESOTA BY AREA DURING THE PERIOD AUGUST, 1968, THROUGH JULY, 1969 - continued

Shipping Point	Terminal	Way Mileage	Through Mileage	Total Mileage	Railroad Revenue	Railroad Out-Of-Pocket Costs	Shipping Point R_{ro}	Area R_{ro}	Region R_{ro}	Total Wheat Shipments	Rail Wheat Shipments	Shipping Point-Market Share Coefficient	Area-Market Share Coefficient	Region-Market Share Coefficient
REGION 2 - 1968-69														
Row 1 (Area II)														
Kloten	Fargo	88.4	254.6	343.4	37.0	22.61	1.64			383,257	245,046	.64		
Niagara	Grand Forks	41.6	334.8	376.4	35.0	22.63	1.55			374,806	261,743	.70		
Drayton	Grand Forks	57.1	334.8	391.9	32.5	23.41	1.39			480,416	397,669	.83		
Walhalla	Grand Forks	89.8	334.8	424.6	38.5	25.04	1.54	1.57		866,375	690,617	.80	.74	
Hannah	Fargo	186.3	254.6	440.9	44.0	27.46	1.60			196,803	195,229	.99		
Fairdale	Thief River Falls	111.6	342.3	453.9	39.0	26.34	1.48			687,016	510,816	.74		
Rock Lake	Devils Lake	53.5	411.3	464.8	46.5	25.50	1.82			1,031,143	724,931	.70		
Devils Lake	Thief River Falls	135.0	342.3	477.3	41.5	27.51	1.51			841,647	567,026	.67		
Row 2 (Area IX)														
West Fargo	Fargo	5.2	254.6	259.8	27.0	18.44	1.46			862,638	835,538	.97		
Hunter	Fargo	34.0	254.6	288.6	31.0	19.88	1.56	1.53		381,793	84,094	.22	.59	
Hillsboro	Fargo	39.0	254.6	293.6	31.5	20.13	1.56		1.54	306,593	27,532	.09		.72
Hatton	Fargo	68.0	254.6	322.6	33.0	21.57	1.53			490,458	263,939	.54		
Row 3 (Area XV)														
Gwinner	Wahpeton	51.6	222.4	274.0	29.0	19.80	1.46			238,579	238,579	1.00		
Havana	Wahpeton	86.8	222.4	309.2	30.5	21.55	1.42			190,093	189,364	1.00		
Marion	Fargo	80.3	254.6	334.9	35.0	22.18	1.58	1.50		857,427	463,356	.54	.80	
Ellendale	Wahpeton	127.0	222.4	349.4	34.0	23.55	1.44			212,264	186,798	.88		
Wishek	Hankinson	135.4	230.3	365.4	38.5	24.21	1.59			456,781	404,495	.89		
Jud	Fargo	121.9	254.6	376.5	37.0	24.26	1.53			457,774	452,972	.99		

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APPENDIX TABLE 1. DATA PERTAINING TO SHIPPING POINTS IN NORTH DAKOTA, MONTANA, NORTHERN SOUTH DAKOTA, AND WESTERN MINNESOTA BY AREA DURING THE PERIOD AUGUST, 1968, THROUGH JULY, 1969 - continued

Shipping Point	Terminal	Way Mileage	Through Mileage	Total Mileage	Railroad Revenue	Railroad Out-Of-Pocket Costs	Shipping Point R_{ro}	Area R_{ro}	Region R_{ro}	Total Wheat Shipments	Rail Wheat Shipments	Shipping Point-Market Share Coefficient	Area-Market Share Coefficient	Region-Market Share Coefficient
Row 4 (Area XX)														
Milbank	Montevideo	56.6	146.3	202.9										
New Effington	Glenwood	98.0	137.4	235.4										
Sisseton	Montevideo	93.7	146.3	240.0										
Brookings	Tracy	64.3	177.7	242.0										
Bristol	Montevideo	114.0	146.3	260.3										
Clark	Watertown	31.1	269.4	300.5										
Aberdeen	Aberdeen	--	314.2	314.2										
Westport	Aberdeen	12.8	314.2	327.0										
Huron	Huron	--	327.6	327.6										
Mellette	Aberdeen	21.6	314.2	335.8										
Ferney	Watertown	80.6	269.4	350.0										
Redfield	Aberdeen	40.9	314.2	355.1										
REGION 3 - 1968-69														
Row 1 (Area III)														
Selz	Fargo	162.1	254.6	416.7	44.0	26.26	1.68			107,069	105,422	.98		
Towner	Devils Lake	76.1	411.3	487.4	49.0	26.62	1.84	1.80		102,838	12,056	..12	.45	
Bottineau	Devils Lake	95.3	411.3	506.6	50.0	27.58	1.81			494,706	266,024	.54		
Westhope	Devils Lake	124.4	411.3	535.7	54.0	29.03	1.86			289,855	61,408	.21		

DATA NOT AVAILABLE

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APPENDIX TABLE 1. DATA PERTAINING TO SHIPPING POINTS IN NORTH DAKOTA, MONTANA, NORTHERN SOUTH DAKOTA, AND WESTERN MINNESOTA BY AREA DURING THE PERIOD AUGUST, 1968, THROUGH JULY, 1969 - continued

Shipping Point	Terminal	Way Mileage	Through Mileage	Total Mileage	Railroad Revenue	Railroad Out-Of-Pocket Costs	Shipping Point R_{ro}	Area R_{ro}	Region R_{ro}	Total Wheat Shipments	Rail Wheat Shipments	Shipping Point-Market Share Coefficient	Area-Market Share Coefficient	Region-Market Share Coefficient
Row 2 (Area X)														
Courtenay	Enderlin	63.9	287.1	351.0	36.0	22.33	1.61			708,300	685,532	.97		
Jamestown	Jamestown	--	355.8	355.8	36.0	21.19	1.70			993,664	896,058	.90		
New Rockford	Fargo	124.7	254.6	379.3	40.0	24.39	1.64			275,139	251,192	.91		
Carrington	Enderlin	95.2	287.1	382.3	39.0	23.89	1.63	1.68		906,318	779,598	.86	.82	
Streeter	Fargo	147.2	254.6	401.8	39.5	25.52	1.55		1.70	354.342	300,978	.85		.70
Dawson	Jamestown	50.2	355.8	406.0	41.0	23.69	1.73			52,569	52,569	1.00		
Tuttle	Jamestown	76.2	355.8	432.0	43.5	24.98	1.74			397,065	362,665	.91		
Harvey	Harvey	--	440.3	440.3	43.5	23.69	1.84			440,782	359,695	.82		
McClusky	Jamestown	106.8	355.8	462.6	45.5	26.50	1.72			613,671	206,667	.34		
Row 3 (Area XVI)														
Hazelton	Jamestown	110.9	355.8	466.7	42.0	26.71	1.57			341,275	318,297	.93		
Wilton	Hankinson	242.0	230.3	472.3	47.5	29.52	1.61	1.63		219,372	23,277	.11	.42	
Hebron	Mandan	60.6	473.9	534.5	47.5	27.71	1.71			582,387	140,739	.24		
Row 4 (Area XXI)														
McIntosh	Mobridge	58.6	422.2	480.8			DATA NOT AVAILABLE							
REGION 4 - 1968-69														
Row 1 (Area IV)														
Minot	Harvey	72.4	440.3	512.7	50.5	27.30	1.85			2,858,731	1,989,486	.70		
Berthold	Minot	22.4	511.7	534.1	53.5	26.93	1.99			1,088,505	589,249	.54		
Parshall	Harvey	115.0	440.3	553.3	54.0	29.42	1.84			1,009,481	651,421	.65		
Mohall	Devils Lake	143.4	411.3	554.7	53.5	29.97	1.79			453,925	325,956	.72		

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APPENDIX TABLE 1. DATA PERTAINING TO SHIPPING POINTS IN NORTH DAKOTA, MONTANA, NORTHERN SOUTH DAKOTA, AND WESTERN MINNESOTA BY AREA DURING THE PERIOD AUGUST, 1968, THROUGH JULY, 1969 - continued

Shipping Point	Terminal	Way Mileage	Through Mileage	Total Mileage	Railroad Revenue	Railroad Out-Of-Pocket Costs	Shipping Point R_{ro}	Area R_{ro}	Region R_{ro}	Total Wheat Shipments	Rail Wheat Shipments	Shipping Point-Market Share Coefficient	Area-Market Share Coefficient	Region-Market Share Coefficient
Stanley	Minot	53.7	511.7	565.4	55.5	28.48	1.95	1.88		364,352	328,455	.90	.69	
Coteau	Minot	63.3	511.7	575.0	55.5	28.96	1.92			340,830	116,200	.34		
Tioga	Minot	80.9	511.7	592.6	57.0	29.84	1.91			423,001	244,426	.58		
Alamo	Minot	119.6	511.7	631.3	59.0	31.77	1.86		1.82	561,885	558,856	.99		.69
Williston	Minot	120.1	511.7	631.8	59.0	31.79	1.86			1,565,214	1,206,442	.77		
Ambrose	Harvey	195.7	440.3	636.0	61.0	33.44	1.82			414,892	266,290	.64		
Grenora	Minot	141.8	511.7	653.5	62.0	32.87	1.89			1,169,186	833,831	.71		
Row 2 (Area XI)														
Turtle Lake	Jamestown	128.4	355.8	484.2	48.0	27.58	1.74	1.70		387,758	367,287	.95	.88	
Killdeer	Mandan	122.2	473.9	596.1	51.5	30.77	1.67			678,201	575,517	.85		
Row 3 (Area XVII)														
Mott	Mandan	99.4	473.9	573.3	50.0	29.64	1.69			977,100	644,910	.66		
Belfield	Mandan	120.4	473.9	594.3	51.5	30.68	1.68	1.70		506,711	273,952	.54	.62	
Beach	Mandan	164.4	473.9	638.3	57.0	32.88	1.73			1,019,921	623,912	.61		
Row 4 (Area XXII)														
Lemmon	Mobridge	98.8	422.2	521.0			DATA NOT AVAILABLE							
REGION 5 - 1968-69														
Row 1 (Area V)														
Poplar	Williston	85.6	643.8	729.4	67.5	33.99	1.99	1.99		350,000	100,000	.29	.29	

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APPENDIX TABLE 1. DATA PERTAINING TO SHIPPING POINTS IN NORTH DAKOTA, MONTANA, NORTHERN SOUTH DAKOTA, AND WESTERN MINNESOTA BY AREA DURING THE PERIOD AUGUST, 1968, THROUGH JULY, 1969 - continued

Shipping Point	Terminal	Way Mileage	Through Mileage	Total Mileage	Railroad Revenue	Railroad Out-Of-Pocket Costs	Shipping Point R_{ro}	Area R_{ro}	Region R_{ro}	Total Wheat Shipments	Rail Wheat Shipments	Shipping Point-Market Share Coefficient	Area-Market Share Coefficient	Region-Market Share Coefficient
Row 2 (Area XII)														
Sidney	Glendive	55.0	699.8	754.8	65.0	34.13	1.90	1.93	1.95	468,000	161,000	.34		
Circle	Glendive	52.0	699.8	751.8	66.5	33.98	1.96			932,497	291,033	.31	.32	.30
Row 3 (Area XVIII)														
Glendive	Glendive	--	699.8	699.8	61.5	31.39	1.96	1.96		96,510	9,350	..10	.10	
REGION 6 - 1968-69														
Row 1 (Area VI)														
Glasgow	Glasgow	--	815.8	815.8	75.5	34.83	2.17			100,000	--	0.00		
Hinsdale	Glasgow	25.9	815.8	841.7	76.5	36.12	2.12	2.11	2.11	--	--	--	0.00	
Wagner	Glasgow	75.2	815.8	891.0	80.5	38.57	2.09			--	--	--		0.00
Dodson	Glasgow	83.0	815.8	898.8	80.5	38.96	2.07			3,042		0.00		
REGION 7 - 1968-69														
Row 1 (Area VII)														
Havre	Havre	--	984.1	984.1	82.0	39.82	2.06			--	--	--		
Inverness	Havre	47.5	984.1	1,031.6	82.0	42.19	1.94	1.91		800	--	0.00	0.00	
Brady	Shelby	44.8	1,099.0	1,143.8	82.0	45.46	1.80		1.90	--	--	--		
Conrad	Shelby	31.4	1,099.0	1,130.4	82.0	44.79	1.83			--	--	--		
Row 2 (Area XIII)														
Ft. Benton	Havre	78.7	984.1	1,062.8	82.0	43.74	1.87	1.87		--	--	--		

[a] Dashes (--) denote no wheat shipments. Zeroes (0.00) denote the incidence of wheat shipment, but entirely by another mode (truck).

APPENDIX TABLE 2. DATA PERTAINING TO SHIPPING POINTS IN NORTH DAKOTA, MONTANA, NORTHERN SOUTH DAKOTA, AND WESTERN MINNESOTA BY AREA DURING THE PERIOD AUGUST, 1969, THROUGH JULY, 1970

Shipping Point	Terminal	Way Mileage	Through Mileage	Total Mileage	Railroad Revenue	Railroad Out-Of-Pocket Costs	Shipping Point R_{ro}	Area R_{ro}	Region R_{ro}	Total Wheat Shipments	Rail Wheat Shipments	Shipping Point-Market Share Coefficient[a]	Area-Market Share Coefficient[a]	Region-Market Share Coefficient[a]	Shipping Point R_{ro} Market Share Coefficient
REGION 1 - 1969-70															
Row 1 (Area I)															
Crookston	Staples	149.5	142.7	292.2	30.0	22.80	1.32			263,267	136,867	.52			2.54
Fisher	Staples	160.3	142.7	303.0	30.5	23.35	1.31			394,682	60,402	.15			8.73
Eldred	Dilworth	61.4	249.6	311.0	31.0	21.56	1.44			369,055	190,864	.52			2.77
Angus	Staples	171.5	142.7	314.2	31.5	23.93	1.32			395,000	200,000	.51			2.59
East Grand Forks	Staples	173.9	142.7	316.6	31.0	24.05	1.29			300,000	2 250,000	.83			1.55
Warren	Staples	180.0	142.7	322.7	31.5	24.36	1.29	1.32		1,100,200	540,000	.49	.44		2.63
Argyle	Staples	189.8	142.7	332.5	32.5	24.86	1.31			353,600	148,000	.42			3.12
Stephen	Staples	198.3	142.7	341.0	33.0	25.29	1.30			1,417,269	634,866	.45			2.89
Kennedy	Staples	211.6	142.7	351.3	34.0	25.96	1.31			635,793	189,793	.30			4.37
Hallock	Staples	220.9	142.7	363.6	35.0	26.44	1.32			400,000	200,000	.50			2.64
Northcote	Staples	226.5	142.7	369.2	36.0	26.73	1.35			175,627	15,631	.09			15.00
Row 2 (Area VIII)															
Hawley	Staples	86.1	142.7	228.8	25.0	19.57	1.28			70,268	65,733	.94			1.36
Glyndon	Staples	100.7	142.7	243.4	27.0	20.32	1.33	1.39	1.35	210,000	203,000	.97	.67	.49	1.37
Nielsville	Dilworth	49.9	249.6	299.5	31.0	20.97	1.48			90,300	61,400	.68			2.18
Climax	Dilworth	55.5	249.6	305.1	31.0	21.26	1.46			182,980	41,800	.23			6.35
Row 3 (Area XIV)															
Brushvale	Breckenridge	9.1	221.4	230.5	25.5	18.04	1.41	1.43		28,000	20,000	.71	.96		1.99
Kent	Breckenridge	14.1	221.4	235.5	26.5	18.30	1.45			152,151	152,151	1.00			1.45

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APPENDIX TABLE 2. DATA PERTAINING TO SHIPPING POINTS IN NORTH DAKOTA, MONTANA, NORTHERN SOUTH DAKOTA, AND WESTERN MINNESOTA BY AREA DURING THE PERIOD AUGUST, 1969, THROUGH JULY, 1970 - continued

Shipping Point	Terminal	Way Mileage	Through Mileage	Total Mileage	Railroad Revenue	Railroad Out-Of-Pocket Costs	Shipping Point R_{ro}	Area R_{ro}	Region R_{ro}	Total Wheat Shipments	Rail Wheat Shipments	Shipping Point-Market Share Coefficient	Area-Market Share Coefficient	Region-Market Share Coefficient	Shipping Point R_{ro} Market Share Coefficient
Row 4 (Area XIX)															
Dumont	Montevideo	74.9	146.3	221.2	25.0	19.11	1.31	1.30		21,155	20,355	.96	.92		1.36
Wheaton	Montevideo	82.0	146.3	228.3	25.0	19.48	1.28			178,973	163,911	.92			1.39
REGION 2 - 1969-70															
Row 1 (Area II)															
Kloten	Fargo	88.4	254.6	343.4	39.0	23.11	1.69			372,897	291,330	.78			2.17
Niagara	Grand Forks	41.6	334.8	376.4	37.0	23.13	1.60			283,869	165,590	.58			2.76
Drayton	Grand Forks	57.1	334.8	391.9	34.0	23.93	1.42			331,291	268,041	.81			1.75
Walhalla	Grand Forks	89.8	334.8	424.6	40.5	25.59	1.58	1.61		1,147,220	788,555	.69	.55		2.29
Hannah	Fargo	186.3	254.6	440.9	46.0	28.07	1.64			218,360	215,847	.99			1.66
Fairdale	Thief River Falls	111.6	342.3	453.9	41.0	26.92	1.52			810,676	229,443	.28			5.43
Rock Lake	Devils Lake	53.5	411.3	464.8	49.0	26.06	1.88			804,470	120,145	.15			12.53
Devils Lake	Thief River Falls	135.0	342.3	477.3	43.5	28.12	1.55			798,071	546,296	.68			2.28
Row 2 (Area IX)															
West Fargo	Fargo	5.2	254.6	259.8	28.5	18.85	1.51			346,737	315,920	.91			1.66
Hunter	Fargo	34.0	254.6	288.6	32.5	20.32	1.60	1.57		433,333	45,798	.11	.37		14.55
Hillsboro	Fargo	39.0	254.6	293.6	33.0	20.57	1.60		1.58	216,310	38,100	.18		.55	8.89
Hatton	Fargo	68.0	254.6	322.6	34.5	22.05	1.56			511,211	153,709	.30			5.20

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APPENDIX TABLE 2. DATA PERTAINING TO SHIPPING POINTS IN NORTH DAKOTA, MONTANA, NORTHERN SOUTH DAKOTA, AND WESTERN MINNESOTA BY AREA DURING THE PERIOD AUGUST, 1969, THROUGH JULY, 1970 - continued

Shipping Point	Terminal	Way Mileage	Through Mileage	Total Mileage	Railroad Revenue	Railroad Out-Of-Pocket Costs	Shipping Point R_{ro}	Area R_{ro}	Region R_{ro}	Total Wheat Shipments	Rail Wheat Shipments	Shipping Point-Market Share Coefficient	Area-Market Share Coefficient	Region-Market Share Coefficient	Shipping Point R_{ro} Market Share Coefficient
Row 3 (Area XV)															
Gwinner	Wahpeton	51.6	222.4	274.0	30.5	20.24	1.51			142,005	142,005	1.00			1.51
Havana	Wahpeton	86.8	222.4	309.2	32.0	22.03	1.45			135,879	135,879	1.00			1.45
Marion	Fargo	80.3	254.6	334.9	37.0	22.67	1.63	1.55		904,507	389,605	.43	.69		3.79
Ellendale	Wahpeton	127.0	222.4	349.4	35.5	24.07	1.48			270,755	241,836	.89			1.66
Wishek	Hankinson	135.4	230.3	365.4	40.5	24.74	1.64			442,095	334,596	.76			2.16
Jud	Fargo	121.9	254.6	376.5	39.0	24.88	1.57			221,059	214,880	.97			1.62
Row 4 (Area XX)															
Milbank	Montevideo	56.6	146.3	202.9	21.0	18.18	1.15			46,250	30,000	.65			1.77
New Effington	Glenwood	98.0	137.4	235.4	23.5	20.02	1.17			49,400	47,000	.95			1.23
Sisseton	Montevideo	93.7	146.3	240.0	24.5	20.07	1.22			85,000	80,000	.94			1.30
Brookings	Tracy	64.3	177.7	242.0	24.0	19.53	1.23			12,000	8,000	.67			1.84
Bristol	Montevideo	114.0	146.3	260.3	26.5	21.11	1.26			31,226	31,226	1.00			1.26
Clark	Watertown	31.1	269.4	300.5	28.5	20.62	1.38	1.33		188,325	100,000	.53	.69		2.60
Aberdeen	Aberdeen	--	314.2	314.2	30.5	20.39	1.50			247,400	222,400	.90			1.67
Westport	Aberdeen	12.8	314.2	327.0	32.5	21.04	1.54		1.39	76,329	8,068	.11		.59	14.00
Huron	Huron	--	327.6	327.6	30.5	20.80	1.47			265,599	186,424	.70			2.10
Mellette	Aberdeen	21.6	314.2	335.8	30.5	21.49	1.42			142,667	99,220	.70			2.03
Ferney	Watertown	80.6	269.4	350.0	28.5	23.14	1.23			98,647	47,459	.48			2.56
Redfield	Aberdeen	40.9	314.2	355.1	30.5	22.48	1.36			31,000	19,000	.61			2.23

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APPENDIX TABLE 2. DATA PERTAINING TO SHIPPING POINTS IN NORTH DAKOTA, MONTANA, NORTHERN SOUTH DAKOTA, AND WESTERN MINNESOTA BY AREA DURING THE PERIOD AUGUST, 1969, THROUGH JULY, 1970 - continued

Shipping Point	Terminal	Way Mileage	Through Mileage	Total Mileage	Railroad Revenue	Railroad Out-Of-Pocket Costs	Shipping Point R_{ro}	Area R_{ro}	Region R_{ro}	Total Wheat Shipments	Rail Wheat Shipments	Shipping Point-Market Share Coefficient	Area-Market Share Coefficient	Region-Market Share Coefficient	Shipping Point R_{ro} Market Share Coefficient
REGION 3 - 1969-70															
Row 1 (Area III)															
Selz	Fargo	162.1	254.6	416.7	46.0	26.84	1.71			154,310	146,343	.95			1.80
Towner	Devils Lake	76.1	411.3	487.4	51.5	27.21	1.89	1.84		132,851	45,662	.34	.48		5.56
Bottineau	Devils Lake	95.3	411.3	506.6	52.5	28.19	1.86			677,872	285,763	.42			4.43
Westhope	Devils Lake	124.4	411.3	535.7	56.5	29.67	1.90			189,285	72,319	.38			5.00
Row 2 (Area X)															
Courtenay	Enderlin	63.9	287.1	351.0	38.0	22.82	1.67			576,610	422,552	.73			2.29
Jamestown	Jamestown	--	355.8	355.8	38.0	21.66	1.75			585,259	558,115	.95			1.84
New Rockford	Fargo	124.7	254.6	379.3	42.0	24.93	1.68			207,778	242,634	.79			2.13
Carrington	Enderlin	95.2	287.1	382.3	41.0	24.42	1.68		1.75	855,230	718,846	.84		.66	2.00
Streeter	Fargo	147.2	254.6	401.8	41.5	26.08	1.59	1.73		537,431	505,267	.94	.76		1.69
Dawson	Jamestown	50.2	355.8	406.0	43.0	24.21	1.78			66,549	66,549	1.00			1.78
Tuttle	Jamestown	76.2	355.8	432.0	45.5	25.53	1.78			481,157	380,897	.79			2.25
Harvey	Harvey	--	440.3	440.3	45.5	24.21	1.88			505,953	364,889	.72			2.61
McClusky	Jamestown	106.8	355.8	462.6	48.0	27.09	1.77			666,363	245,329	.37			4.78
Row 3 (Area XVI)															
Hazelton	Jamestown	110.9	355.8	466.7	44.0	27.30	1.61			373,666	355,515	.95			1.69
Wilton	Hankinson	242.0	230.3	472.3	50.0	30.17	1.66	1.68		402,233	107,782	.27	.48		6.15
Hebron	Mandan	60.6	473.9	534.5	50.0	28.32	1.77			682,488	233,636	.34			5.21
Row 4 (Area XXI)															
McIntosh	Mobridge	58.6	422.2	480.8	47.5	26.65	1.78	1.78		100,000	30,000	.30	.30		5.93

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APPENDIX TABLE 2. DATA PERTAINING TO SHIPPING POINTS IN NORTH DAKOTA, MONTANA, NORTHERN SOUTH DAKOTA, AND WESTERN MINNESOTA BY AREA DURING THE PERIOD AUGUST, 1969, THROUGH JULY, 1970 - continued

Shipping Point	Terminal	Way Mileage	Through Mileage	Total Mileage	Railroad Revenue	Railroad Out-Of-Pocket Costs	Shipping Point R_{ro}	Area R_{ro}	Region R_{ro}	Total Wheat Shipments	Rail Wheat Shipments	Shipping Point-Market Share Coefficient	Area-Market Share Coefficient	Region-Market Share Coefficient	Shipping Point R_{ro} Market Share Coefficient
REGION 4 - 1969-70															
Row 1 (Area IV)															
Minot	Harvey	72.4	440.3	512.7	53.0	27.90	1.90			3,622,075	2,322,545	.64			2.97
Berthold	Minot	22.4	511.7	534.1	56.0	27.53	2.03			1,279,214	781,830	.61			3.33
Parshall	Harvey	115.0	440.3	553.3	56.5	30.07	1.88			1,048,914	460,834	.44			4.27
Mohall	Devils Lake	143.4	411.3	554.7	56.0	30.63	1.83			550,862	386,987	.70			2.61
Stanley	Minot	53.7	511.7	565.1	58.5	29.11	2.01			511,373	505,050	.99			2.03
Coteau	Minot	63.3	511.7	575.0	58.5	29.60	1.98	1.93		516,142	238,030	.46	.66		4.30
Tioga	Minot	80.9	511.7	592.6	60.0	30.50	1.97			483,399	384,764	.79			2.49
Alamo	Minot	119.6	511.7	631.3	62.0	32.47	1.91		1.87	440,868	354,502	.80		.65	2.39
Williston	Minot	120.1	511.7	631.8	62.0	32.49	1.91			1,756,765	1,390,781	.79			2.42
Ambrose	Harvey	195.7	440.3	636.0	64.0	34.18	1.87			574,590	305,580	.53			3.53
Grenora	Minot	141.8	511.7	653.5	65.0	33.60	1.93			918,382	548,325	.60			3.22
Row 2 (Area XI)															
Turtle Lake	Jamestown	128.4	355.8	484.2	50.5	28.19	1.79	1.76		720,585	677,852	.94	.95		1.90
Killdeer	Mandan	122.2	473.9	596.1	54.0	31.45	1.72			399,011	390,602	.98			1.76
Row 3 (Area XVII)															
Mott	Mandan	99.4	473.9	573.3	52.5	30.30	1.73			1,164,273	550,014	.47			3.68
Belfield	Mandan	120.4	473.9	594.3	54.0	31.36	1.72	1.75		501,233	313,510	.62	.50		2.77
Beach	Mandan	164.4	473.9	638.3	60.0	33.61	1.79			759,132	354,389	.47			3.81
Row 4 (Area XXII)															
Lemmon	Mobridge	98.8	422.2	521.0	50.0	28.70	1.74	1.74		690,000	310,000	.45	.45		3.87

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APPENDIX TABLE 2. DATA PERTAINING TO SHIPPING POINTS IN NORTH DAKOTA, MONTANA, NORTHERN SOUTH DAKOTA, AND WESTERN MINNESOTA BY AREA DURING THE PERIOD AUGUST, 1969, THROUGH JULY, 1970 - continued

Shipping Point	Terminal	Way Mileage	Through Mileage	Total Mileage	Railroad Revenue	Railroad Out-Of-Pocket Costs	Shipping Point R_{ro}	Area R_{ro}	Region R_{ro}	Total Wheat Shipments	Rail Wheat Shipments	Shipping Point-Market Share Coefficient	Area-Market Share Coefficient	Region-Market Share Coefficient	Shipping Point R_{ro} Market Share Coefficient
REGION 5 - 1969-70															
Row 1 (Area V)															
Poplar	Williston	85.6	643.8	729.4	71.0	34.74	2.04	2.04		680,870	342,860	.50	.50		4.08
Row 2 (Area XII)															
Sidney	Glendive	55.0	699.8	754.8	68.5	34.88	1.96	1.99		486,000	211,000	.43	.50	.49	4.56
Circle	Glendive	52.0	699.8	751.8	70.0	34.73	2.02		2.01	1,148,332	601,162	.52			3.88
Row 3 (Area XVIII)															
Glendive	Glendive	--	699.8	699.8	64.5	32.08	2.01	2.01		103,555	38,155	.37	.37		5.43
REGION 6 - 1969-70															
Row 1 (Area VI)															
Glasgow	Glasgow	--	815.8	815.8	79.5	35.60	2.23			150,000	--	0.00			--
Hinsdale	Glasgow	25.9	815.8	841.7	80.5	36.92	2.18	2.17	2.17	--	--	--	.24	.24	--
Wagner	Glasgow	75.2	815.8	891.0	84.5	39.42	2.14			40,000	40,000	1.00			2.14
Dodson	Glasgow	83.0	815.8	898.8	84.5	39.82	2.12			60,435	21,315	.35			6.06

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APPENDIX TABLE 2. DATA PERTAINING TO SHIPPING POINTS IN NORTH DAKOTA, MONTANA, NORTHERN SOUTH DAKOTA, AND WESTERN MINNESOTA BY AREA DURING THE PERIOD AUGUST, 1969, THROUGH JULY, 1970 - continued

Shipping Point	Terminal	Way Mileage	Through Mileage	Total Mileage	Railroad Revenue	Railroad Out-Of-Pocket Costs	Shipping Point R_{ro}	Area R_{ro}	Region R_{ro}	Total Wheat Shipments	Rail Wheat Shipments	Shipping Point-Market Share Coefficient	Area-Market Share Coefficient	Region-Market Share Coefficient	Shipping Point R_{ro} Market Share Coefficient
REGION 7 - 1969-70															
Row 1 (Area VII)															
Havre	Havre	--	984.1	984.1	86.0	40.70	2.11			--	--	--			--
Inverness	Havre	47.5	984.1	1,031.6	86.0	43.12	1.99	1.96		--	--	--	0.00		--
Brady	Shelby	44.8	1,099.0	1,143.8	86.0	46.46	1.85		1.95	--	--	--		0.00	--
Conrad	Shelby	31.4	1,099.0	1,130.4	86.0	45.78	1.88			--	--	--			--
Row 2 (Area XIII)															
Ft. Benton	Havre	78.7	984.1	1,062.8	86.0	44.71	1.92	1.92		--	--	--	0.00		--

[a/] Dashes (--) denote no wheat shipments. Zeroes (0.00) denote the incidence of wheat shipment, but entirely by another mode (truck).