AN ASSESSMENT OF THE IMPACT OF COMPETITION ON RAIL RATES FOR AGRICULTURAL SHIPMENTS-AN EMPIRICAL STUDY OF MINNESOTA RAIL RATES ON SOYBEAN, CORN AND WHEAT SHIPMENTS FY 2009

Minnesota is the 7th largest agricultural exporting state in the U.S., with total agricultural exports in 2008 of $5.46 billion. Soybeans, corn and wheat account for 72% of the total agricultural commodity exports. As agricultural exports grow, many shippers' and farmers' associations in Minnesota have expressed concerns about incrementally higher rail rates and relatively lower service levels because of lack of competition or tight capacity. They have regularly called for improvements in current rail freight transportation services. A 2008 survey of ethanol producers in Minnesota also found concerns about rail capacity, service quality and rates, and the impact of rail transportation on the sustainable development of the ethanol industry.

As a result of the concerns brought forth from various groups regarding railroad service and re-regulation, the Minnesota Department of Agriculture, with assistance from the Minnesota Department of Transportation, completed an analysis of rate competition among railroads and its impacts on rail rates in Minnesota for major agricultural shipments, namely soybean, corn and wheat, using the Surface Transportation Board Rail Waybill Sample. The analysis confirmed the speculation on the pricing strategy of railroads on corn, wheat and soybean shipments – that the less competition there is among railroads and between railroads and water transportation the higher the shipping rates that will be paid by corn, wheat, and soybean shippers. The analysis substantiated that the presence of additional rail competition and the availability of water transport nearby lowers corn and wheat rail rates. Additionally, the results showed that the effects of inter-railroad competition may vary with the extent of water competition.

FINAL REPORT

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An Assessment of the Impact of Competition on Rail Rates for Agricultural Shipments

An empirical study of Minnesota rail rates on soybean, corn and wheat shipments

MINNESOTA DEPARTMENT OF AGRICULTURE
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Minnesota Department of Agriculture, Agricultural Marketing Services Division
& Minnesota Department of Transportation, Office of Freight & Commercial Vehicle Operations

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For the
Minnesota Department of Agriculture, Agricultural Marketing Services Division
& Minnesota Department of Transportation, Office of Freight & Commercial Vehicle Operations

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Abstract

Minnesota is the 7th largest agricultural exporting state in the U.S. Its total agricultural exports in 2008 were $5.46 billion[1]. Soybeans, corn and wheat account for 72% of total agricultural commodity exports. As the agricultural exports grow, many shippers' and farmers' associations in Minnesota have expressed concerns about incrementally higher rail rates and relatively lower service levels because of lack of competition or tight capacity. They have regularly called for improvements in current rail freight transportation services[2]. A 2008 survey among ethanol producers in Minnesota also found concerns on rail capacity, service quality and rates and the impact of rail transportation on the sustainable development of the ethanol industry[3].

As a result of the concerns brought forth from various groups regarding railroad service and re-regulation, the Minnesota Department of Agriculture (MDA), with assistance from the Minnesota Department of Transportation (Mn/DOT), proposed to do an analysis of rate competition among railroads and its impacts on rail rates in Minnesota for major agricultural shipments, namely soybean, corn and wheat, using the Surface Transportation Board (STB) Rail Waybill Sample[4]. This analysis confirmed the speculation on the pricing strategy of railroads on corn, wheat and soybean shipments – that the less competition there is among railroads and between railroads and water transportation the higher the shipping rates that will be paid by corn, wheat, and soybean shippers. The analysis substantiated that the presence of additional rail competition and the availability of water transport nearby lowers corn and wheat rail rates. Additionally, the results showed that the effects of inter-railroad competition may vary with the extent of water competition.

[1] Source: www.ers.usda.gov

[2] Groups Weigh In on Proposed Freight Rail Reform, Minnesota Agri-Growth Council, Vol. 39, No 8, September 2008

[3] Assessing Feasibility of Intermodal Transport of Agricultural and Related Products on Short Line and Regional Railroads, Minnesota Department of Agriculture, 2008

[4] The Carload Waybill Sample: a sample of railroad waybills (in general, documents prepared from bills of lading that authorize railroads to move shipments and collect freight charges); the sample contains information on rail rates.

I. Introduction and Background

The U.S. transportation network plays an important role to maintain the strength and competitiveness of agriculture and rural communities. For the fiscal year 2009, U.S. agricultural exports are expected to reach $98 billion, and contribute $23 billion to the U.S. balance of trade[5]. For U.S. agriculture, rail service is a particularly important part of the logistics network, and plays a vital role in corn, wheat, and soybean transportation for domestic and export movements. In 2007, railroads originated approximately 35% of U.S. corn, wheat, and soybean shipments.

While shipping agricultural products cost-effectively is increasingly important, studies find that, after the enactment of The Staggers Rail Act of 1980, the rationalization of the rail system has lessened competition between railroads in many areas. In balance, deregulation also allowed the implementation of new services with higher efficiency and lower rates such as 'shuttle trains'. Regardless of these changes, some shippers have felt that less competition has resulted in higher rail transportation costs for some agricultural shippers, especially for "captive shippers", served by only one carrier and geographically isolated from other outlets. A Congressional study by the GAO released October 2006[6], stated that

> "the railroad industry is increasingly healthy and rates generally down since enactment of the Staggers Rail Act, but concerns about competition and captivity remain."

It pointed out there was a

> "reasonable possibility that shippers in selected markets may be paying excessive rates related to a lack of competition in these markets."

Along with the GAO report, USDA reports further confirmed that the existence of such potential abuse may adversely affect rates for corn, wheat, and soybean shipments originating in certain geographic areas that lack sufficient competition. A 2008 USDA study on the corn, wheat, and soybean and soybean exports to Mexico shows that competition from barges affects rail rates. Agricultural shippers paid higher rail transportation rates the further they were from an inland waterway[7]. A 2007 national study on the rail rates of export corn, wheat, and soybean shipments reveals that for corn, the difference in pricing from one railroad (monopoly) to two railroads with equal market shares (duopoly) causes rates to decline by 16.6 percent at 20 miles from water, 6.7

[5] February 21, 2008, USDA ERS/FAS Outlook for U.S. Agricultural Trade

[6] "Freight Railroads: Industry Health Has Improved, but Concerns about Competition and Capacity Should Be Addressed." GAO-07-94. United States General Accountability Office, Washington, D.C., October 6th, 2006

[7] Salin, Delmy. April 2008. "U.S. Corn, Wheat, and Soybean Exports to Mexico—a Modal Share Transportation Analysis", USDA Agricultural Marketing Service, Transportation Services Division.

percent at 100 miles from water, and 2.1 percent at 200 miles from water[8] (referred as 2007 USDA study hereafter). Increased competition is also found to lower rail rates for domestic shipments, but to a lesser degree.

The GAO report also recommended that the Surface Transportation Board (STB), which has regulatory authority to resolve railroad rate and service disputes, analyze the state of competition in the railroad industry. The response was an independent report[9] commissioned by the Surface Transportation Board (STB) which investigated the competition in the U.S. freight railroad industry and stated that (referred to as 2008 STB study hereafter):

> "the recent increase in revenue per ton-mile appears to be largely the result of increases in variable, fixed, and marginal costs—related to increases in the railroad industry's input prices and diminishing productivity growth—and not due to the increased exercise of market power. While recognizing that differential pricing and the exercise of local market power is necessary to achieve financial viability, **in both our qualitative and quantitative research, we did find concerns about shipper captivity and railroad performance**."

For future research directions, the STB-commissioned report said:

> "Another area that would benefit from a more disaggregate analysis is railroad capacity, particularly given our conclusion that capacity 'tightness' issues have most likely been due to localized congestion and constraints, and not because of a system-wide lack of capacity. Also, more disaggregated RPM-type[10] data on railroad performance would be helpful to better investigate capacity issues as well as service quality concerns."

Minnesota is the 7th largest agricultural exporting state in the U.S. Its total agricultural exports in 2008 were $5.46 billion[11]. Soybeans, corn and wheat in particular account for 72% of total agricultural commodity exports. As the agricultural exports grow, many shippers' and farmers' associations in Minnesota have expressed concerns about incrementally higher rail rates and relatively lower service levels because of lack of competition or tight capacity. They have regularly called for improvements in current rail freight transportation services. The 2008 survey study among ethanol producers in Minnesota also showed similar concerns about rail transportation impacting the sustainable development of the ethanol industry[12].

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[8] Harbor, Anetra. 2007. "Competition in the U.S. Railroad Industry: Implications for Corn, Soybean, and Wheat Shipments." Presented at Transportation Research Forum, Fort Worth, Texas, March 16-19,2008.
[9] A Study of Competition in the U.S. Freight railroad Industry and Analysis of Proposals that Might Enhance Competition, Christensen Associates, Inc. November 2008
[10] Railroad Performance Measures
[11] Source: www.ers.usda.gov
[12] Assessing Feasibility of Intermodal Transport of Agricultural and Related Products on Short Line and Regional Railroads, Minnesota Department of Agriculture, 2008

Mn/DOT Freight Planning and Development, in the course of conducting localized regional freight studies, has heard similar concerns from certain rail shippers. They noted that trucking costs discourage shippers more than 75 miles away from an inland port from economically using barges. The same transportation costs deter shippers from traveling more than 50-75 miles to any alternative rail terminal. Thus, it could be suggested that inland or isolated corn, wheat, and soybean elevators served by a single railroad may be more susceptible to "captive shipper" conditions that could affect rail service and rates.

Therefore, MDA, partnering with Mn/DOT, proposed:

- To do a rigorous analysis of rate competition among railroads and the impact of rate competition among railroads on rail rates in Minnesota for major agricultural shipments, namely soybean, corn and wheat, using STB Rail Waybill Sample
- For the purpose of determining if a lack of competition among railroads and between railroads and water transportation is resulting in railroads charging corn, wheat, and soybean shippers excessive shipping rates in locations with low levels of competition.

The study is a disaggregate analysis based on STB Annual Rail Waybill Sample and other current available freight transportation data of this region, and is a localized independent empirical study for policy makers and state freight planners to potentially develop solutions and policies concerning those issues.

II. Data and Methodology

The primary data source for the analysis is the 2007 STB Annual Confidential Rail Waybill Sample[13] of Minnesota. In this report, a subset of the Waybill Sample is used. This subset includes 648 corn shipments, 215 soybean shipments, and 212 wheat shipments that originated from Minnesota. The method used in this study follows that introduced by MacDonald (1987)[14], and is similar to that employed in the 2007 USDA study[15]. Regression techniques are used to estimate the impact of competition and other variables on rates charged for agricultural products originated from Minnesota, mainly soybeans, corn, and wheat. The outline of the regression model and variables follows.

Regression Model

The regression model used in this study, specified in logarithmic form, is expressed as:

$$\ln(\text{RTM}) = \beta_0 + \beta_1 \ln(\text{MILES}) + \beta_2 \ln(\text{TONS}) + \beta_3 \ln(\text{VOLUME}) + \beta_4 (\ln(\text{VOLUME}))^2 + \beta_5 \ln(\text{MIBARGE}) + \beta_6 \ln(\text{RRCOMP}) + \beta_7 \ln(\text{MIBARGE})\ln(\text{RRCOMP}) + \beta_8 Q_2 + \beta_9 Q_3 + \beta_{10} Q_4 + \mu . \text{ (Equation 1)}$$

Variables

Where revenue per ton-mile in cents (RTM) is the variable of interest it is dependent upon the following variables:

1) MILES, the shipment distance from origin to destination,
2) TONS, the number of tons in the shipment,
3) VOLUME, the sum of all grain tonnage shipped between specific origin and destination points (a squared term is also estimated to capture possible diminishing returns). In this study, the specific origin of one shipment is defined by "Origin FIPS Code" which is the Federal Information Processing Standard code for the county in which the reported waybill movement originated. The destination is defined by "Termination State" where the reported waybill movement terminated.

[13] The Carload Waybill Sample: a sample of railroad waybills (in general, documents prepared from bills of lading that authorize railroads to move shipments and collect freight charges); the sample contains information on rail rates.
[14] MacDonald, James M. 1987. "Competition and Rail Rates for the Shipment of Corn, Soybeans, and Wheat." Rand Journal of Economics: Vol. 18, No.1, Spring 1987, pp.151-163
[15] Anetra L. Harbor, 2008. "An Assessment of the Impact of Competition on Rail Rates for Export Corn, Soybean, and Wheat Shipments", Research report presented at the 2008 Transportation Research Forum, TX

5) MIBARGE, the distance to the nearest barge loading location. This variable is estimated by calculating the distance between the origin freight station rating zip code and the nearest grain barge loading location using GIS software[16].
6) RRCOMP, an index measuring competition among railroads. An interaction term (MIBARGE*RRCOMP) is also included to determine if the effect of RRCOMP on rail rates varies with distance to water competition.
7) Q2, Q3, Q4 are quarterly "dummy" variables, used to control for seasonal grain transportation demand.

Besides those independent variables, RTM is also determined by other unobserved factors, which are contained in error term μ.

To measure the competition of rail service for each freight origin in Minnesota, the report used two variables to measure: one is MIBARGE, the other one is RRCOMP. MIBARGE is used to estimate the impact of water transport on RTM for a specific origin. RRCOMP is used to estimate the competition between railroads for a specific origin. It is calculated using the reciprocal of a Herfindahl index measuring the concentration of grain shipments originating in a particular crop-reporting district (in this study, it is divided by county). RRCOMP is calculated as:

$$\text{RRCOMP}=\left[\sum_{j=1}^{n} S_{ij}^{2}\right]^{-1}$$

where S_{ij} is the share of grain shipments of railroad j in district i (county i) and is calculated from total grain tonnages from the Waybill Sample data. The use of the reciprocal of the Herfindahl index leads to a straightforward interpretation of the variable. The presence of one railroad (monopoly) in an area results in an RRCOMP of 1. Two railroads with equal market shares (duopoly) results in an RRCOMP of 2. The variable increases as the number of railroads rise and as market shares become more evenly distributed.

To estimate the impact on RTM because of seasonal variation in rail demand by grain shippers, the study used Q2, Q3, Q4 as quarterly dummy variables to capture the difference on rail rates because of seasonal variation.

The elasticity of rail rates with respect to distance from a barge location is estimated as follows:

$$\ln(\text{RTM}) = \beta_0 + \beta_1 \ln(\text{MILES}) + \beta_2 \ln(\text{TONS}) + \beta_3 \ln(\text{VOLUME}) + \beta_4 (\ln(\text{VOLUME}))^2 + \beta_5 \ln(\text{MIBARGE}) + \beta_6 \ln(\text{RRCOMP}) + \beta_7 \ln(\text{MIBARGE})\ln(\text{RRCOMP}) + \beta_8 \text{Q2} + \beta_9 \text{Q3} + \beta_{10} \text{Q4} + \mu .$$

$$E_{RTM,MIb\arg e} = \frac{\partial \ln(RTM)}{\partial \ln(MIb\arg e)} = \beta_5 + \beta_7 \ln(RRCOMP)$$

[16] Peter Dahlberg with Mn/DOT estimated the nearest grain barge loading location for each origin freight station.

$$\Rightarrow \frac{\partial(RTM)}{RTM} = [\beta_5 + \beta_7 \ln(RRCOMP)] \times \frac{\partial(MIb\arg e)}{MIb\arg e}$$

$$\Rightarrow \int \frac{d(RTM)}{RTM} = \int [\beta_5 + \beta_7 \ln(RRCOMP)] \times \frac{d(MIb\arg e)}{MIb\arg e}$$

$$\Rightarrow \int_{RTM1}^{RTM2} \frac{d(RTM)}{RTM} = \int_{MIb\arg e1}^{MIb\arg e2} [\beta_5 + \beta_7 \ln(RRCOMP)] \times \frac{d(MIb\arg e)}{MIb\arg e}$$

$$\Rightarrow \frac{RTM_2}{RTM_1} = \left(\frac{MIb\arg e_2}{MIb\arg e_1}\right)^{[\beta_5 + \beta_7 \ln(RRCOMP)]}$$

Following the same formula derivation, here is the elasticity of rail rates with respect to inter-railroad competition (RRCOMP):

$$E_{RTM,RRCOMP} = \frac{\partial \ln(RTM)}{\partial \ln(RRCOMP)} = \beta_6 + \beta_7 \ln(MIb\arg e)$$

$$\Rightarrow \frac{RTM_2}{RTM_1} = \left(\frac{RRCOMP_2}{RRCOMP_1}\right)^{[\beta_6 + \beta_7 \ln(MIb\arg e)]}$$

III. Minnesota Waybill Sample and Variables

There were 63,214 freight movements recorded by the 2007 confidential Waybill Sample. The sample includes most 2007 freight movements and some 2006 observations. The 2006 observations were shipments that occurred in the fourth quarter of 2006 and reported in early 2007. For the same reason, some freight shipments that occurred in late 2007 and reported in 2008 were not included in the 2007 Sample. Since the 2008 Waybill Sample was not available during the study period, we weren't able to include those late 2007 shipments reported in early 2008. Therefore, we assume the 2007 Waybill Sample has 2007 observations for the study.

The following table (Table 1: Dependent and Explanatory Variable List) defines the dependent and independent variables.

Table 1: Dependent and Explanatory Variable List

Variable	Definition
Dependent Variable	
RTM*	Revenue per ton-mile in cents
Independent Variables	
Miles	Shipment distance in miles
Tons	Shipment tons
Volume**	Sum of all grain tonnage shipped between specific origin and destination point
MIBarge	Number of miles to ocean port or barge loading location
RRCOMP	Index measuring inter-railroad competition
Q1	1 if shipment occurred during January-March;=0 otherwise
Q2	1 if shipment occurred during April-June;=0 otherwise
Q3	1 if shipment occurred during July-September;=0 otherwise
Q4	1 if shipment occurred during October-December;=0 otherwise
n	Total shipments

*RTM=Total Revenue/(Expended Tons*Total Distance)
**the sum of all grain tonnage shipped between origin FIPS code and destination state, calculated by author.

IV. Study Findings

A. Waybill Analysis

Mean Results

The data from the waybills (Table 2: Variable and Means) summarizes the mean amount for each of the variables for the corn, soybean and wheat shipments.

Table 2: Variable and Means from
2007 MN Waybill Sample Shipments

Variable	Corn	Wheat	Soybean
	Mean		
RTM	3.67	3.93	2.98
Miles	1,340	707	1,479
Tons	17,303	12,281	16,177
Volume	415,944	97,313	500,371
MIBarge	104	182	127
RRCOMP	1.352	1.531	1.646
Q1	0.247	0.203	0.316
Q2	0.31	0.208	0.153
Q3	0.236	0.269	0.209
Q4	0.207	0.321	0.321
n	648	212	215

Based on the above means, important differences were noted for corn, wheat, and soybean shipments.

Corn. Corn shipments had the second highest RTM (revenue per ton-mile).

- The inter-rail competition (RRCOMP) is the lowest of the three grains.
- The corn regions generate slightly less grain freight Volume than soybean regions.
- A total of 56% of corn shipments occur in the first and second quarters.

Wheat. The wheat shipments pay the highest RTM in comparison to corn and soybean – 7% higher than corn shipments, and 32% higher than soybean shipments.

- The average Miles to the nearest barge loading location is 182 miles which is significantly further than for corn and soybeans.
- Wheat has the lowest Volume and Tons which may greatly affect the rail rate as unit train services would provide better rates and more frequent service for regions with more demand.
- Wheat is shipped the shortest distance compared to corn and soybeans by all carriers in the route.
- Most wheat shipments occur in the third and fourth quarters.

Soybean. Shipments of soybeans pay the lowest RTM compared to corn and wheat shipments.

- Soybean regions generate more Volume than corn and wheat regions.
- Soybeans have the highest inter-rail competition index (RRCOMP) indicating that there is more competition in rail rates than in corn and wheat regions.
- Since soybeans have the longest distance traveled, this may indicate that most soybean shipments are for export markets.
- Most soybean shipments occur in the first and fourth quarters.

Counties With Highest RTM

The waybill data found the following counties paid the highest RTM for their rail shipments.

Table 3: Top 10 Counties in MN That Pay Highest RTM for Their Field Crop Shipments

Ranking	Origin County	Average RTM Cents	Total Tonnage	Miles to Barge	Mean Actual Miles Moved
1	Lyon	9.06	60,984	119	59
2	Wilkin	8.76	1,461,676	185	1,395
3	Winona	8.18	9,848	5	332
4	McLeod	8.14	5,940	54	140
5	Hennepin	9.06	212,060	6	595
6	Chippewa	8.76	957,650	110	948
7	St. Louis	8.18	312,876	1	553
8	Steele	8.14	156,048	54	986
9	Becker	6.26	59,400	182	756
10	Kittson	6.23	99,204	267	1,193
Average RTM state-wide		2.43			

Counties With Lowest RTM

The waybill data found the following counties paid the lowest RTM for their rail shipments.

Table 4: Top 10 Counties in MN That Pay Lowest RTM for Their Field Crop Shipments

Ranking	Origin County	Average RTM Cents	Total Tonnage	Miles to Barge	Mean Actual Miles Moved
1	Big Stone	1.52	7,128	160	1,287
2	Pipestone	1.71	660,532	153	1,885
3	Rock	1.83	92,958	172	1,847
4	Brown	1.92	909,596	81	1,938
5	Stevens	1.94	565,572	141	1,761
6	Meeker	2.02	104.804	61	1,278
7	Swift	2.16	826,453	126	1,447
8	Nobles	2.18	174,670	129	1,691
9	Redwood	2.21	1,261,034	101	1,845
10	Cottonwood	2.23	237,893	96	1,697
Average RTM state-wide		2.43			

B. Regression Analysis

The findings of the regression model are summarized below.

Revenue Per Ton-Mile Variable

The regression analysis model (Table 5: Multiple Regression Analysis of Rail Rates) explains approximately:

- 79% of the variation in dependent variable RTM (revenue per ton-mile) for corn rail shipments.
- 69% of the variation in dependent variable RTM for wheat shipments.
- 45% of the variation in dependent variable RTM for soybean shipments.

Thus, the R-squares for corn and wheat capture more rate variation than for soybeans.

Table 5: Multiple Regression Analysis of Rail Rates
for Corn, Soybean, and Wheat Shipments Originated from MN, 2007

Dependent Variable: Revenue per Ton-Mile1				
Independent Variable	Regression Coefficients and Standard Errors2			
	Corn	Soybean	Wheat	
β_0 Intercept	-0.5425	-2.2324	-4.4880***	
	0.7353	1.4918	1.8169	
β_1 Miles	-0.4187***	-0.3336***	-0.4228***	
	-0.0100	0.0363	0.0236	
β_2 Tons	-0.0336	-0.0243	-0.1821***	
	0.0223	0.0425	0.0374	
β_3 Volume	-0.0180	0.3291	0.8815***	
	0.1191	0.2344	0.3343	
β_4 Volume*Volume	0.0002	-0.0173*	-0.0444***	
	0.0051	0.0101	0.0156	
β_5 MIBarge	0.0636**	-0.0459	0.2159**	
	0.0293	0.0756	0.0887	
β_6 RRCOMP	-0.3626*	-0.4355	1.2648***	
	0.2253	0.4257	0.4542	
β_7 RRCOMP*MIBarge	0.0952*	0.0855	-0.2246***	
	0.0490	0.0865	0.0861	
β_8 Q2	0.0543**	-0.1097	-0.0157	
	0.0277	0.0706	0.0563	
β_9 Q3	0.0508*	-0.0695	-0.0161	
	0.0300	0.0669	0.0536	
β_{10} Q4	-0.0131	0.0214	0.0339	
	0.0305	0.0608	0.0521	
R-square	0.7907	0.4547	0.6925	
n	648	215	212	
(*),(**),and(***) indicate statistical significance at the 0.10, 0.05, and 0.01 levels of significance, respectively.				
1: All continuous variables are specified in natural logarithms.				
2: Standard errors are in parentheses.				
3: Field crops are commodities with the first three STCC digits starting with '011'. Soybean, corn and wheat consist of 95% field crops originated from MN in 2007.				

Shipment Miles and Tons Variables

As expected, the Miles and Tons variables in Table 5 for all three grains have negative coefficients, indicating that shipping longer distances and shipping larger tonnages coincide with lower rail RTM rates.

Volume and Volume*Volume Variables

The Volume and Volume*Volume coefficients in Table 5 are significant only for wheat. The results suggest that for wheat, rates decline only after volume has reached a particular level. Prior to reaching that, the rate will increase as the volume increases.

Volume is not particularly important in determining corn and soybean rates. For soybean, only the squared Volume term is significant.

The results for Volume and its squared term are contrary to our expectations. We assume that increases in traffic volume should generally have a negative impact on rail rates. However, for wheat, it shows Volume has a positive impact on rates. It indicates there are factors not measured in this model (e.g., capacity constraints, other service issues that can affect shipping costs) that may have an influence on the impact of the Volume variable.

Q1, Q2, Q3, Q4 Variables

The seasonal variations are significant for corn shipments. However, the seasonal variations are not significant for soybean and wheat shipments.

Corn shippers pay higher rates if they do the shipments during the second and third quarters. *This is contrary to our expectations as we assume the rates would be higher in winter when the barge shipment is shut down due to frozen water*.

Barge Competition Variable

The coefficients for the MIBarge and interaction term (RRCOMP*MIBarge) are significant in the corn and wheat models. (Table 6: Effects of MIBarge on Rail Rates.) The further a shipment originates from water transport, the higher the rail rates.

Table 6: Effects of MIBarge on Rail Rates for Corn and Wheat Shipments

Changes in the distance from closest barge location	Elasticity of rail rates with respect to MIBarge	
	Corn	Wheat
	0.0923	0.1202
From 50 miles to 100 miles	6.6%	8.7%
From 25 miles to 75 miles	10.7%	14.1%
From 50 miles to 200 miles	13.7%	18.1%

Holding all other variables at their means, the elasticity of rail rates with respect to distance from a barge loading location (MIBarge) is 0.0923 for corn and 0.1202 for wheat.

Corn shipments originating 100 miles from water transport pay rates that are 6.6 percent higher than those shipments originating 50 miles from water.

Wheat shipment originating 100 miles from water transport pay rates that are 8.7 percent higher than those shipments originating 50 miles from water.

Inter-Rail & Barge Competition Variable

The effects of inter-railroad competition may vary with the extent of water competition.

Nearby water competition may constrain railroad ratemaking, even when there is a single railroad. Correspondingly, the effects of inter-rail competition on rates may be greater in areas where water competition is not an active force.

The interaction term, RRCOMP*MIBarge helped us to estimate the effect of inter-rail competition and barge competition.

The interaction between inter-rail competition and barge competition is quite strong in the corn and wheat regression analysis, but the associated coefficient signs have different implications.

Corn Shipping Rates. With regard to corn (Table 7: Effects of RRCOMP on Rail Rates):

- Results for corn suggest that competition among railroads most notably lowers rail rates where there is nearby competition from water transport.
- The elasticity of corn rates with respect to changes in RRCOMP is 0.056 at 25 miles from water, 0.048 at 75 miles from water, and 0.114 at 150 miles from water.

Table 7: Effects of RRCOMP on Rail Rates for Export Shipments of Corn

Assuming equal market share between railroads, if move from:	Changes in the distance from closest barge location					
	25 Miles	50 Miles	75 Miles	100 Miles	150 Miles	200 Miles
	Elasticity of rail rates with respect to RRCOMP					
	-0.056	0.010	0.048	0.076	0.114	0.142
	Percentage change in rates					
1 to2 railroads	-3.8%	0.7%	3.4%	5.4%	8.3%	10.3%
2 to 3 railroads	-2.3%	0.4%	2.0%	3.1%	4.7%	5.9%
1 to 3 railroads	-6.0%	1.1%	5.5%	8.7%	13.4%	16.9%

The elasticity shows the nearby competition from water transport has a strong effect on rates when water transportation is about 25 miles away. The farther the origin point is away from water transport, the less the effect.

A movement from a monopoly to two railroads (1 to 2 railroads) causes corn rail rates to decline by 3.8 percent at 25 miles from water transportation, and increase by 3.4 percent at 75 miles from water transportation.

A movement from monopoly to three railroads (1 to 3 railroads) causes a further drop in prices at 25 miles. Rail rates for corn fall 6 percent at 25 miles from water transportation, and increased by 5.5 percent at 75 miles, a difference of 11.5 percent.

Beyond 50 miles or so from water transportation, the benefits of water competition among railroads on corn shipments diminish quickly.

Wheat Shipping Rates. For wheat, the advantages of competition among railroads become more important the further it is from water transportion.

The elasticity of rail rates with respect to RRCOMP is -0.016 at 300 miles from water and is -0.081 at 400 miles from water (Table 5: Effects of RRCOMP Rail Rates). This difference implies a reduction in rates by about 1.1 percent (-1.1 percent) at 300 miles from water transportation when a monopoly has one additional competitor (move from 1 to 2 railroads) and a reduction of 0.7 percent (-0.7 percent) in the presence of a third competitor (move from 2 to 3 railroads).

Table 8: Effects of RRCOMP on Rail Rates for Export Shipments of Wheat

Assuming equal market share between railroads, if move from:	Changes in the distance from closest barge location		
	200 Miles	300 Miles	400 Miles
	Elasticity of rail rates with respect to RRCOMP		
	0.075	-0.016	-0.081
	Percentage change in rates		
1 to2 railroads	5.3%	-1.1%	-5.5%
2 to 3 railroads	3.1%	-0.7%	-3.2%
1 to 3 railroads	8.6%	-1.8%	-8.5%

The reduction in rates increases as the distance to water transportation increases. For instance, at 400 miles from water transportation, rates drop by 5.5 percent when moving from a monopoly to a duopoly (move from 1 to 2 railroads) and by 8.5 percent when there is a movement from monopoly to three railroads (mover from 1 to 3 railroads).

When moving from one railroad to competition between two railroads, rail rates for wheat dropped 1.1 percent at 300 miles from water transportation and dropped by 5.5 percent at 400 miles from water transportation. When moving from one railroad to competition among three railroads, rail rates for wheat dropped 1.8 percent at 300 miles from water transportation and dropped by 8.5 percent at 400 miles from water transportation.

The regression results for wheat imply that the availability of effective barge competition constrains rail rates, and in areas closest to the river, competition among railroads and water transport is less important.

Differences Between Corn and Wheat Shipping Rates. Contrary to the regression results for wheat, the regression results for corn shows that competition among railroads is most important close to the river. Therefore, the availability of water transport in close proximity causes the greatest reduction in corn rail rates.

Why are there different results for the two commodities? The availability of a reliable alternative freight transport may be a reason.

- Minnesota produced 29 million tons of corn in 2007[17]. Corn shipments that originated from Minnesota were only about 11 million tons in 2007. Therefore, only about 39 percent of Minnesota's corn was moved by rail. This implies railroads may have to compete more vigorously among themselves and with barge companies for corn shipments in Minnesota.
- In comparison, Minnesota produced approximately 2 million tons of wheat in 2007. The wheat shipments that originated from Minnesota were approximately 2 million tons during the same calendar year. Thus, 100 percent of the wheat was moved by rail. This means Minnesota wheat shippers have no other reliable alternative freight transport method that could compete with rail.
- The availability of barge transportation for corn and the unavailability of barge transportation for wheat explains why the effect of water competition on rates is weaker for wheat than corn shipments in Minnesota.

Soybean Shipping Rates. In the soybean analysis, the competition among railroads and water transport didn't show any effects on rail rates.

The significance of the regression analysis for soybeans is much lower than the regression analysis for corn and wheat. The difference indicates there may be other factors that impact the pricing on soybean freight that we didn't include in the model and suggests further studies are needed. For example: Is the pricing strategy for soybean shipments in Minnesota different from that of corn and wheat? Are there additional factors that should be investigated to explain the difference in model performance and results for soybean shipments?

[17] /www.nass.usda.gov/QuickStats

V. Summary of Findings

A. Study Purpose

The study proposed to determine if a lack of competition among railroads and between railroads and water transportation is resulting in railroads charging corn, wheat, and soybean shippers excessive shipping rates in locations with low levels of competition.

B. Study Findings

The study confirms that the less competition there is among railroads and between railroads and water transportation, the higher the shipping rates that will be paid by corn, wheat, and soybean shippers.

General Findings

Revenue Per Ton-Mile Variable. The variation in RTM for corn and wheat is explained to a greater extent by the study than is the variation for soybeans.

Shipment Miles & Tons Variables. Shipping longer distances and large volumes generally coincides with lower rail rates.

Volume Variable. Volume is not particularly important in determining rail rates for corn and soybeans. However, contrary to expectations, the study suggests that rates for wheat increase until volume reaches a particular level after which the rates begin to decline.

Seasonal Variables. The seasonal variable impacts only corn with shippers paying higher rates during the second and third quarters.

Barge Competition Variable. For corn and wheat, the further a shipment originates from water transportation, the higher the rail rates will be. The study did not find this variable significant in determining rail rates for soybeans.

Inter-Rail & Barge Competition Variables. For corn, the study found that rail rates dropped as inter-rail competition increased at 25 miles from competitive water transportation. However, rail rates increased for corn as inter-rail competition increased at 75 miles from water transportation. For wheat, rail rates dropped as inter-rail competition increased at 300 miles from competitive water transportation and dropped even further at 400 miles from competitive water transportation. This variable was not found to be significant for soybean rail rates.

Corn Findings

Mean Data. Inter-rail competition is the lowest for corn.

Revenue Per Ton-Mile Variable. 79% of variation in RTM is explained by the analysis.

Shipment Miles & Tons Variable. In general, longer distances and greater tonnage coincide with lower rail RTM rates.

Volume Variable. This variable is not particularly important in determining rail rates.

Seasonal Variable. Corn shippers pay higher rates for shipments during the second and third quarters. This is contrary to expectations as it would be assumed rates would be higher in the winter quarter when water transportation is shut down.

Barge Competition Variable. The further a shipment originates from water transportation, the higher the rail rates. Corn shipments originating 100 miles from water transportation pay rates that are 6.6 percent higher than those originating 50 miles from water transportation.

Inter-Rail & Barge Competition Variables. When moving from one railroad to competition between two railroads, rail rates for corn dropped 3.8 percent at 25 miles from water transportation but increased by 3.4 percent at 75 miles from water transportation. When moving from one railroad to competition among three railroads, rail rates for corn dropped 6.0 percent at 25 miles from water transportation but increased by 5.5 percent at 75 miles from water transportation.

Wheat Findings

Mean Data. Wheat shipments pay the highest RTM. The average miles to the nearest water transportation is significantly further than for corn and soybeans. Wheat has the lowest Volume and Tons and is shipped the shortest distance compared to corn and soybeans.

Revenue Per Ton-Mile Variable. 69% of variation in RTM is explained by the analysis.

Shipment Miles & Tons Variable. In general, longer distances and greater tonnage coincide with lower rail RTM rates.

Volume Variable. Contrary to expectations, the analysis suggests that rates decline only after Volume has reached a particular level. Prior to reaching that level rates increase as volume increases.

Seasonal Variable. This variable is not significant in determining rail rates.

Barge Competition Variable. The further a shipment originates from water transportation, the higher the rail rates. Wheat shipments originating 100 miles from water transportation pay rates that are 8.7 percent higher than those originating 50 miles from water transportation.

Inter-Rail & Barge Competition Variables. When moving from one railroad to competition between two railroads, rail rates for wheat dropped 1.1 percent at 300 miles from water and dropped by 5.5 percent at 400 miles from water transportation. When moving from one railroad to competition among three railroads, rail rates for wheat dropped 1.8 percent at 300 miles from water transportation and dropped by 8.5 percent at 400 miles from water transportation.

Soybeans Findings

Mean Data. Inter-rail competition is the highest for soybeans. Soybeans also have the highest Volume of shipments and are shipped the longest distance.

Revenue Per Ton-Mile Variable. 45% of the variation in RTM is explained by the analysis. The significance of the analysis findings is much lower for soybeans than for corn and wheat, and this difference may be explained by factors that were not included in the analysis model.

Shipment Miles & Tons Variable. In general longer distances and greater tonnage coincide with lower rail RTM rates.

Volume Variable. This variable is not particularly important in determining rail rates.

Seasonal Variable. This variable is not significant in determining rail rates.

Barge Competition Variable. This variable is not important in determining rail rates.

Inter-Rail & Barge Competition Variables. This variable is not significant in determining rail rates.

Appendix

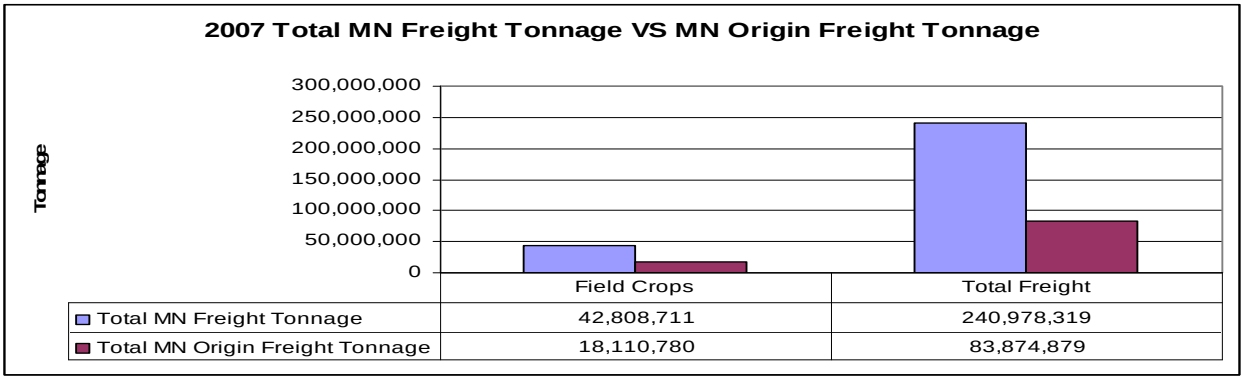
Total Minnesota Freight and Minnesota Origin Freight – Tonnage (Chart 1)

- The total MN freight movement (i.e., freight originated from and transferred through MN) was 240 million MT.
- The MN origin freight movements were 35% (84 million MT) of total MN movements.

- The total MN field crops movement (i.e., freight originated from and transferred through MN) was 42 million MT.
- The MN origin field crop freight movement was 43% (18 million MT) of total MN field crop movements.

- The major MN origin field crop movements were corn (62% or 11 million MT), soybean (19% or 3.5 million MT), wheat (14% or 2.5 million MT), barley, oats, field seeds and grains.
- Corn, soybean and wheat comprise 95% of total MN origin field crop shipments.

Chart 1: 2007 Total MN Freight Tonnage VS MN Origin Freight Tonnage

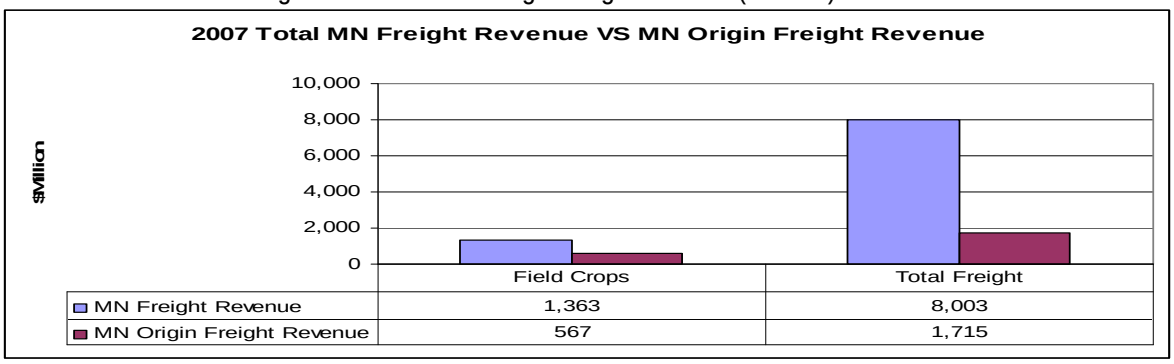


Total Minnesota Freight and Minnesota Origin Freight - Revenue [18] (Chart 2)

- The total MN freight movement (i.e., freight originated from and transferred through MN) was 8,000 million US$.
- The MN origin freight movements were 21% (1,700 million US$) by revenue of total MN movements.

- The MN origin crop freight by revenue was 33% (570 million US$) of total MN origin, the largest freight revenue generator in MN.
- The total MN field crops transported in and through MN was total revenue 1,400 million US$.
- The average actual distance traveled by all carriers in the route for MN origin field crops was 1,318 miles.

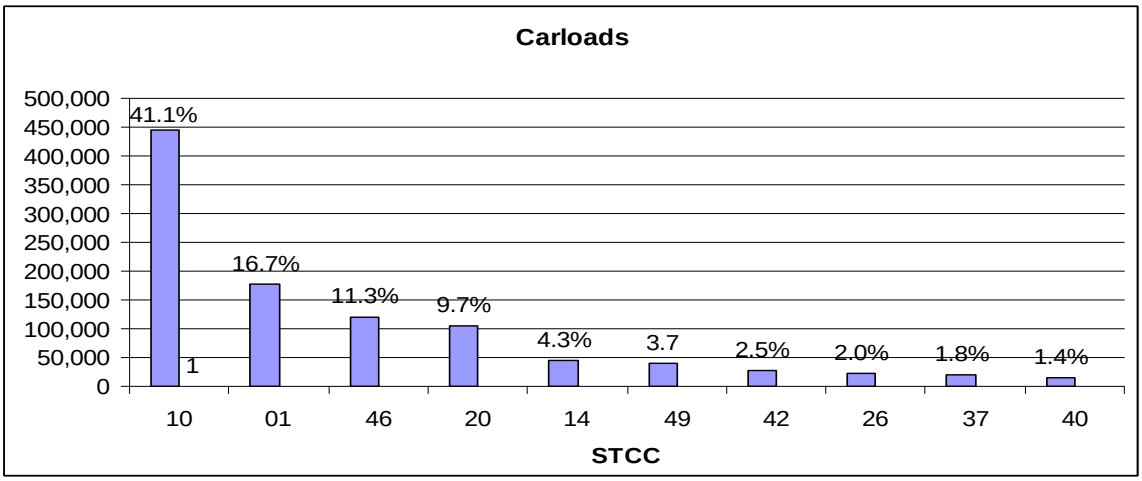
Chart 2: 2007 Total MN Freight Revenue VS MN Origin Freight Revenue (millions)



[18] In this study, STCC (The Standard Transportation Commodity Code) was used to identify the product designation for the commodity being transported. To extract major agricultural shipments, field crop with the first three STCC digits starting with '011' was extracted from the Waybill sample.

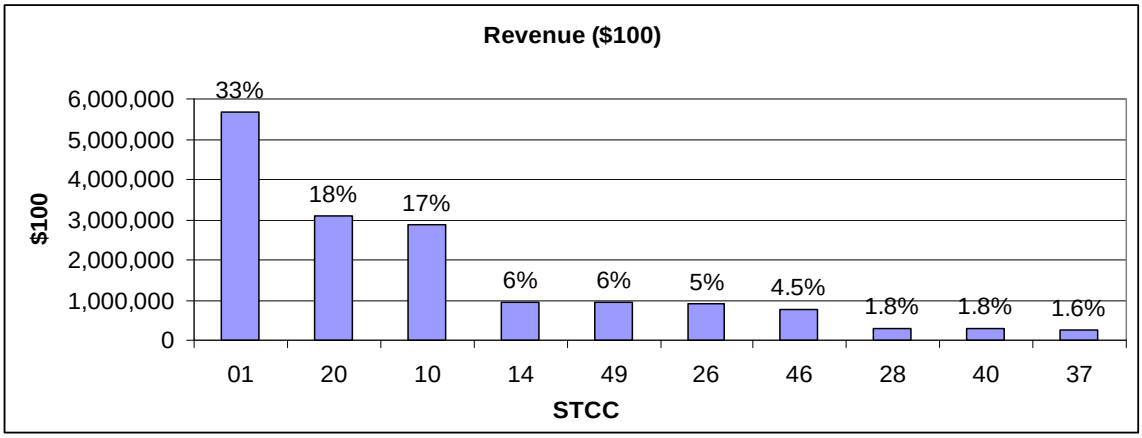
Comparison of All Commodities by Carloads, Revenues, and Tonnage

Figure 1. 2007 Waybill of MN Origin Top Ten Commodity by Carloads



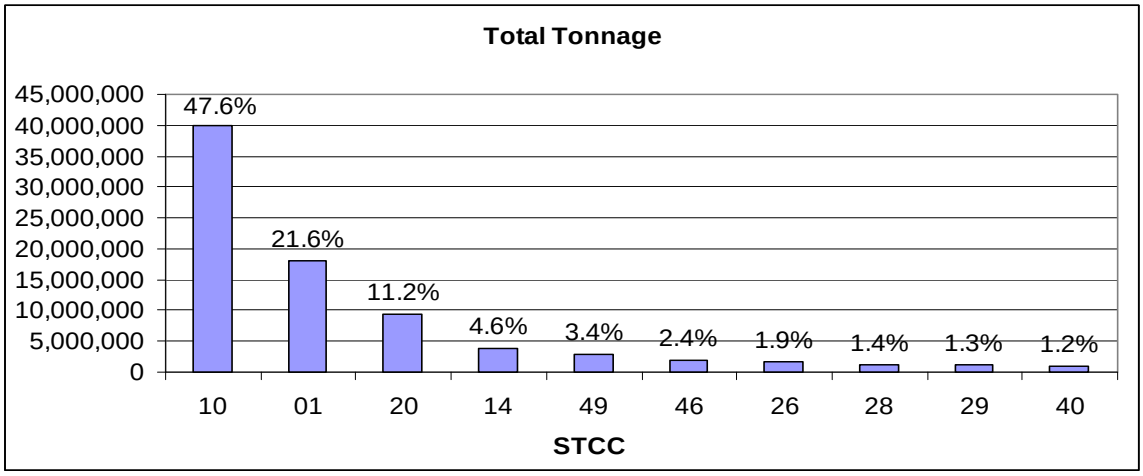
Note: 01 is Farm Products

Figure 2. 2007 Waybill of MN Origin Top Ten Commodity by Revenue



Note: 01 is Farm Products

Figure 3. 2007 Waybill of MN Origin Top Ten Commodity by Tonnage



Note: 01 is Farm Products

Comparison of Counties by Tonnage and Distance Traveled

Table 9: Top 10 Counties in MN by Actual Distance Traveled by Their Field Crops

Ranking	Origin County	Mean Actual Miles Moved	RTM Cents	Total Tonnage
1	Brown	1,938	0.0192	909,596
2	Pipestone	1,885	0.0171	660,532
3	Roseau	1,859	0.0239	47,720
4	Rock	1,847	0.0183	92,958
5	Redwood	1,845	0.0221	1,261,034
6	Pope	1,832	0.031	314,574
7	Yellow Medicine	1,794	0.0178	848,074
8	Stevens	1,761	0.0194	565,572
9	Kandiyohi	1,722	0.0257	12,660
10	Cottonwood	1,697	0.0223	237,893

Comparison of Railroads by RTM, Carloads, Revenue, and Tonnage

Table 10: Grain Market Share of Each Railroad Serving MN by Tonnage

Origin Railroads	Total Samples	RTM Cents	Total Carloads	Total Revenue ($100)	Total Tonnage	% Tonnage
BNSF	626	0.0262	81,429	2,479,149	8,322,683	46.3%
CNUS	42	0.0376	3,268	68,457	311,316	1.7%
CPRS	1	0.0259	40	1,540	4,040	0.0%
CPUS	185	0.0358	26,517	1,059,696	2,661,526	14.8%
DME	119	0.0255	21,352	753,810	2,222,514	12.4%
ICE	99	0.0288	10,064	249,967	987,324	5.5%
MPLI	8	0.0344	880	14,175	87,120	0.5%
RRVW	6	0.8617	1,600	3,379	159,910	0.9%
TCWR	92	0.0601	8,904	92,019	869,424	4.8%
UP	127	0.0421	21,893	891,533	2,334,807	13.0%
Total	1305		175,947	5,613,725	17,960,664	1

Comparison of Commodities by Carloads, Revenues, and Tonnage

Table 11. 2007 MN Confidential Waybills of MN Origin by Commodity

2007 MN Waybill Sample—MN (Carloads, Revenue, and Tonnage by STCC Code)

2digitSTCC	Total Carloads	Percent of Population	Total Revenue ($100)	Percent of Population	Total Tonnage	Percent Population
01FarmProducts	178,391	16.7%	5,672,730	33.1%	18,110,780	21.6%
10Metallic Ores	445,483	41.6%	2,885,968	16.8%	39,959,029	47.6%
11Coal	8,504	0.8%	35,259	0.2%	921,406	1.1%
14Nonmetallic Minerals	46,168	4.3%	961,110	5.6%	3,853,508	4.6%
20Food /Kindred Products	103,935	9.7%	3,082,585	18.0%	9,399,501	11.2%
23Apparel	600	0.1%	8,674	0.1%	9,720	0.0%
24Lumber/Wood Products	7,216	0.7%	202,124	1.2%	629,828	0.8%
25Furniture	80	0.0%	455	0.0%	1,040	0.0%
26Pulp/Paper	21,280	2.0%	893,586	5.2%	1,611,160	1.9%
27Printed Matter	240	0.0%	3,707	0.0%	4,680	0.0%
28Chemicals	11,926	1.1%	304,967	1.8%	1,138,015	1.4%
29Petroleum/Coal	12,883	1.2%	236,248	1.4%	1,123,674	1.3%
30Rubber/Misc.	440	0.0%	11,297	0.1%	20,240	0.0%
31Leather/Products	40	0.0%	1,064	0.0%	400	0.0%
32Clay/Concrete	3,192	0.3%	75,253	0.4%	241,544	0.3%
33Metal Products	3,000	0.3%	114,796	0.7%	272,960	0.3%
34Fabricated Metal Products	760	0.1%	12,441	0.1%	15,200	0.0%
35Machinery	1,020	0.1%	187,408	1.1%	38,484	0.0%
36Electrical Machinery	3,600	0.3%	27,138	0.2%	35,000	0.0%
37Transportation Equipment	19,294	1.8%	271,847	1.6%	409,470	0.5%
39Misc. of Manu.	160	0.0%	1,538	0.0%	1,600	0.0%
40Waste	14,680	1.4%	301,964	1.8%	1,036,704	1.2%
41Misc. Freight	120	0.0%	623	0.0%	1,000	0.0%
42Containers Empty	26,280	2.5%	118,078	0.7%	112,080	0.1%
43Mail	960	0.1%	10,739	0.1%	10,120	0.0%
46Misc. Shipments	120,760	11.3%	763,453	4.5%	2,014,920	2.4%
47Small Freight	280	0.0%	2,178	0.0%	4,080	0.0%
48Hazardous Waste	120	0.0%	4,500	0.0%	10,600	0.0%
49Hazardous /substance	39,291	3.7%	955,162	5.6%	2,885,736	3.4%
50Bulk Shipments/Boxcars	120	0.0%	1,091	0.0%	2,400	0.0%
Total	1,070,823	100.0%	17,147,983	100.0%	83,874,879	100.0%

Waybill Sample by County

Table 12: MN Originated Field Crop Freight Data Summary, 2007 MN Waybill Sample

Origin County	Termination State / Province	Origin Railroads	Average RTM (Cents)	Average MIBarge	Average RRCOMP	Total Carloads	Total Revenue ($100)	Total Tonnage	Average Miles Traveled
Becker	IL	CPUS	4.46	182	1	100	2,850	9,900	646
	MN		6.07	182	1	100	1,365	9,900	227
	WA		3.41	182	1	200	12,029	19,800	1,781
	WI		3.07	182	1	200	2,246	19,800	369
	Total Sample	4	4.25	182	1	600	18,490	59,400	756
Big Stone	AB	TCWR	1.52	160	1	72	1,396	7,128	1,287
	Total Sample	1							
Brown	OR	DME	2.01	89	1	976	33,248	91,628	1,880
	TX		2.84	65	1	40	1,688	4,000	1,485
	WA		1.88	78.9	1	7,680	290,656	813,968	1,963
	Total Sample	57	1.92	80.6	1	8,696	325,592	909,596	1,938
Chippewa	IL	BNSF, TCWR	2.89	110	1.745	280	4,428	27,720	549
	MN		11.27	111	1.745	2,844	7,437	268,160	56
	OR		1.89	98	1.745	108	3,618	10,876	1,759
	WA		1.77	100	1.745	5,839	206,242	650,894	1,808
	Total Sample	58	6.23	106	1.745	9,071	221,725	957,650	948
Clay	IL	BNSF	2.75	198	1	552	9,635	57,516	691
	MN		6.52	205	1	196	3,885	19,180	284
	MO		2.09	198	1	436	8,929	48,864	874
	MT		2.27	207	1	80	1,675	8,400	881
	OK		2.88	216	1	40	1,300	3,960	1,142
	OR		2.47	198	1	180	7,574	18,300	1,633
	WA		2.01	201	1	7,426	271,660	825,326	1,683

	WI		5	209	1	546	7,852	58,360	412
	Total Sample	58	2.57	202	1	9,456	312,510	1,039,906	1,353
Cottonwood	CA	UP	2.05	96	1	1,010	45,371	109,850	2,041
	ID		2.44	96	1	885	32,141	96,405	1,367
	UT		2.35	96	1	288	9,746	31,638	1,310
	Total Sample	8	2.23	96	1	2,183	87,258	237,893	1,697
Faribault	AR	ICE, UP	3.76	78.5	1.638	1,804	62,142	185,636	945
	IL		3.93	80	1.638	100	1,791	9,900	460
	MO		3.62	83.5	1.638	200	4,619	20,660	629
	MS		2.16	72.5	1.638	1,192	39,275	118,848	1,531
	OK		2.85	73.3	1.638	2,180	60,372	214,876	1,001
	TX		2.81	87	1.638	222	7,870	23,553	1,189
	Total Sample	51	3	75.4	1.638	5,698	176,069	573,473	1,078
Freeborn	IA	CNUS, ICE	5.1	80	1.934	168	1,503	16,464	235
	IL		3.55	71.3	1.934	584	9,169	59,052	493
	LA		2.22	73.8	1.934	328	9,191	32,664	1,279
	MO		2.2	64	1.934	200	2,297	20,804	502
	MS		2.21	76	1.934	1,220	31,028	120,256	1,170
	ON		4.25	77	1.934	140	4,075	14,004	696
	Total Sample	27	2.78	74.4	1.934	2,640	57,263	263,244	932
Grant	IL	BNSF, CPUS	2.8	153	1.976	210	3,588	22,125	579
	MN		3.85	153	1.976	242	2,592	25,354	310
	MO		2.26	153	1.976	300	5,663	31,746	788
	ND		4.66	149	1.976	214	4,023	23,984	360
	NE		4.36	149	1.976	40	820	4,200	448
	OR		2.08	149	1.976	300	10,320	30,180	1,667
	WA		2.38	148	1.976	8,901	394,874	966,221	1,734
	Total Sample	51	2.51	149	1.976	10,207	421,880	1,103,810	1,581

Hennepin	BC	BNSF, CNUS, CPUS,UP	1.08	6	2.641	80	349	1,800	1,794
	IA		8.39	14	2.641	76	2,001	7,112	328
	IL		3.12	14	2.641	100	1,261	8,900	439
	IN		4.16	14	2.641	40	578	2,640	527
	LA		2.58	14	2.641	864	29,229	85,212	1,325
	MN		18.62	14	2.641	148	1,357	12,720	68
	OK		2.75	14	2.641	160	2,896	12,000	877
	TX		2.09	14	2.641	36	704	2,700	1,246
	WI		6.99	14	2.641	844	11,370	78,976	266
	Total Sample	33	6.26	13.5	2.641	2,348	49,745	212,060	595
Jackson	AR	ICE,UP	2.51	110	1.916	1,176	33,157	116,752	1,139
	CA		1.95	110	1.916	3,088	137,310	346,605	2,021
	IA		3.96	109	1.916	288	2,581	28,512	265
	ID		2.36	117	1.916	300	10,872	32,409	1,419
	MO		2.34	109	1.916	104	1,434	10,296	596
	MS		2.12	109	1.916	500	16,738	49,732	1,589
	OK		2.3	110	1.916	788	19,963	78,756	1,113
	UT		2.31	117	1.916	300	9,924	33,519	1,279
	WA		2.46	109	1.916	202	11,011	21,418	2,087
	Total Sample	46	2.34	110	1.916	6,746	242,990	717,999	1,412
Kandiyohi	CA	BNSF	1.57	79	1	80	3,200	8,760	2,321
	IL		4.57	79	1	36	938	3,900	526
	Total Sample	3	2.57	79	1	116	4,138	12,660	1,722
Kittson	IL	BNSF, CNUS, CPRS	2.67	267	1.367	216	5,069	22,096	859
	MN		4.6	272	1.367	280	5,627	28,300	440
	ND		9.21	271	1.367	216	2,069	22,048	102
	PQ		2.59	278	1.367	40	1,540	4,040	1,474

	TX		3.18	278	1.367	240	14,370	22,720	1,997
	Total Sample	14	4.23	274	1.367	992	28,675	99,204	1,193
Lac qui Parle	MT	BNSF	3.42	137	1	160	4,800	15,840	890
	WA		1.69	141	1	774	27,176	85,116	1,948
	Total Sample	8	2.34	140	1	934	31,976	100,956	1,551
Lyon	SD	DME	9.06	119	1	616	3,237	60,984	59
	Total Sample	6							
McLeod	WI	TCWR	8.14	54	1	60	678	5,940	140
	Total Sample	1							
Mahnomen	IL	CPUS	2.89	179	1	200	3,824	19,800	669
	MN		2.9	179	1	180	2,069	17,820	400
	PA		2.61	179	1	196	7,497	19,404	1,482
	WA		3.26	179	1	500	26,497	49,500	1,830
	Total Sample	6	3.03	179	1	1,076	39,887	106,524	1,340
Marshall	IL	BNSF, CPUS	2.8	241	1.947	1,036	23,596	107,116	793
	LA		3.23	235	1.947	300	17,978	29,700	1,877
	MN		5.03	238	1.947	844	17,717	84,440	413
	MO		1.84	250	1.947	830	18,147	99,624	1,009
	ON		1.9	248	1.947	72	869	7,620	600
	OR		2.04	250	1.947	216	8,335	24,206	1,686
	PA		3.15	239	1.947	560	28,591	55,348	1,611
	WA		2.86	247	1.947	906	45,191	98,190	1,717
	WI		3.79	241	1.947	1,576	29,634	164,468	568
	Total Sample	50	3.33	242	1.947	6,340	190,058	670,712	905
Martin	AR	UP	3.89	96.3	1	689	22,392	72,363	814
	AZ		2.09	97	1	873	38,251	96,978	1,907
	CA		2.13	96.6	1	2,456	119,269	265,250	2,112
	ID		3.29	97	1	294	14,677	31,416	1,421

	MO		3.73	96	1	100	2,396	10,748	598
	TX		2.75	96.7	1	729	24,228	77,616	1,145
	UT		3.22	96.3	1	802	37,331	87,829	1,341
	Total Sample	25	2.72	96.6	1	5,943	258,544	642,200	1,583
Meeker	AL	BNSF	2.15	61	1	564	15,809	57,628	1,282
	CA		1.54	61	1	60	2,251	6,156	2,376
	TN		1.99	61	1	404	8,604	41,020	1,055
	Total Sample	11	2.02	61	1	1,028	26,664	104,804	1,278
Mower	AR	ICE	3.05	60	1	200	5,570	19,000	980
	IA		3.58	68.7	1	292	3,347	28,616	328
	IL		4.42	60	1	796	12,530	72,988	399
	MO		2.79	60	1	200	2,207	16,564	493
	MS		2.28	60	1	100	3,589	10,592	1,485
	OK		2.52	60	1	200	5,323	19,600	1,077
	Total Sample	18	3.62	61.4	1	1,788	32,566	167,360	598
Nobles	CA	UP	1.99	129	1	885	37,172	96,768	1,935
	ID		2.6	129	1	300	11,202	33,186	1,300
	OR		2.13	129	1	204	8,503	22,494	1,772
	UT		2.42	129	1	202	6,814	22,222	1,269
	Total Sample	6	2.18	129	1	1,591	63,691	174,670	1,691
Norman	IL	BNSF	2.59	216	1	148	3,148	14,292	840
	MN		6.27	222	1	212	3,892	20,988	296
	WA		2.19	221	1	80	3,608	8,520	1,936
	total	5	3.98	219	1	440	10,648	43,800	842
Otter Tail	IL	BNSF	2.81	167	1	144	2,943	14,184	739
	MN		4.97	167	1	232	4,147	22,932	356
	MO		2.81	167	1	100	2,599	9,900	934
	MT		3.59	167	1	60	1,698	5,484	863
	NE		3.67	167	1	108	2,276	10,644	583

	WA		1.81	167	1	1,810	64,703	201,852	1,764
	WI		2.57	167	1	440	4,021	49,342	317
	Total Sample	19	2.85	167	1	2,894	82,387	314,338	1,108
Pennington	IL	BNSF, CPUS	2.73	213	1.033	1,108	22,814	109,692	778
	MN		4.1	212	1.033	580	9,766	58,696	406
	PA		3.24	212	1.033	700	34,422	69,252	1,533
	WA		4.5	213	1.033	1,417	105,266	137,583	1,730
	WI		2.94	213	1.033	1,125	18,282	111,375	610
	Total Sample	35	3.37	213	1.033	4,930	190,550	486,598	963
Pipestone	CA	BNSF	1.46	162	1	218	8,359	24,402	2,352
	ND		3.05	162	1	220	4,136	24,648	551
	TX		2.04	162	1	218	6,801	24,322	1,373
	WA		1.65	152	1	5,253	188,236	587,160	1,940
	Total Sample	28	1.71	153	1	5,909	207,532	660,532	1,885
Polk	AL	BNSF	1.75	194	1	120	3,335	11,968	1,595
	IA		2.59	227	1	60	1,373	6,048	877
	IL		2.5	214	1	2,132	39,318	211,416	797
	KS		2.49	194	1	96	2,072	10,560	789
	MN		4.51	204	1	1,276	20,938	132,388	374
	MO		1.95	221	1	216	4,615	24,188	979
	ND		5.44	227	1	48	492	4,752	190
	OR		2.54	194	1	216	9,396	21,488	1,719
	TX		3.92	243	1	40	1,870	3,000	1,592
	WA		1.92	208	1	3,814	143,498	419,640	1,791
	WI		4.18	221	1	332	3,877	35,734	265
	Total Sample	64	2.85	210	1	8,350	230,784	881,182	1,008
Pope	WA	CPUS	3.1	117	1	3,162	177,381	314,574	1,832
	Total Sample	15							

Ramsey	AB	BNSF, CNUS, CPUS,UP	1.38	3	2.523	336	5,660	34,440	1,180
	IA		5.03	6	2.523	40	652	4,040	321
	IL		3.1	3.2	2.523	1,452	18,101	144,240	408
	MN		48.68	4	2.523	144	1,883	10,684	93
	OK		2.14	6	2.523	40	755	3,080	1,148
	SK		5.35	3	2.523	64	1,913	6,336	564
	TX		4.82	6	2.523	460	30,012	44,280	1,404
	WA		2.46	6	2.523	6,536	73,062	171,064	1,786
	WI		11.78	6	2.523	40	483	1,440	285
	Total Sample	193	3.38	5.69	2.523	9,112	132,521	419,604	1,604
Redwood	IL	DME,MPLI	2.96	89	1.016	100	1,578	9,900	538
	SD		8.98	112	1.016	604	3,549	59,796	66
	WA		1.8	101	1.016	11,396	420,752	1,191,338	1,972
	Total Sample	56	2.21	101	1.016	12,100	425,879	1,261,034	1,845
Renville	AB	MPLI, TCWR	1.39	70.6	1.275	1,344	22,523	133,676	1,226
	BC		1.16	77	1.275	40	747	4,040	1,598
	IL		2.86	74.3	1.275	1,348	19,436	133,308	512
	MB		1.99	73	1.275	120	1,761	12,348	718
	MN		9.15	72.8	1.275	860	2,405	85,140	46
	SK		3.22	71.1	1.275	884	18,618	87,988	654
	WI		6.92	68.9	1.275	760	8,415	75,040	164
	Total Sample	56	3.98	71.8	1.275	5,356	73,905	531,540	629
Rock	WA	BNSF	1.83	172	1	856	30,043	92,958	1,847
	Total Sample	5	1.83	172	1	856	30,043	92,958	1,847
Roseau	CA	BNSF, CPUS	1.65	239	1.887	40	1,483	3,600	2,502
	NM		2.27	239	1.887	40	1,457	3,600	1,786
	OR		2.18	228	1.887	112	4,290	10,820	1,770

	PA		3.52	217	1.887	100	5,577	9,900	1,602
	WA		2.48	231	1.887	200	8,777	19,800	1,790
	Total Sample	7	2.39	230	1.887	492	21,584	47,720	1,859
St. Louis	LA	BNSF, CNUS, CPUS, UP	3.13	1	3.32	40	1,537	3,240	1,517
	MN		5.41	1	3.32	1,100	9,909	96,732	190
	MO		2.33	1	3.32	328	4,840	26,500	781
	ND		5.44	1	3.32	144	2,653	14,004	348
	TX		3.16	1	3.32	352	11,633	29,188	1,274
	WI		8.7	1	3.32	1,488	16,546	143,212	322
	Total Sample	48	5.86	1	3.32	3,452	47,118	312,876	553
Scott	AB	CPUS,UP	1.34	1	1.406	544	8,126	53,856	1,146
	OR		2.89	7	1.406	40	1,923	3,200	2,079
	TX		4.05	7	1.406	40	1,780	3,560	1,234
	WI		9.57	1	1.406	48	779	4,656	175
	Total Sample	9	2.73	2.33	1.406	672	12,608	65,272	1,151
Steele	AR	DME, ICE,UP	0						
	AZ		2.75	54	1.107	60	3,049	6,144	1,804
	CA		3.52	54	1.107	60	4,576	6,156	2,113
	CO		3.24	54	1.107	48	1,546	5,124	933
	IL		7.83	53.2	1.107	240	5,332	21,760	450
	MO		4.61	52.5	1.107	220	4,133	19,860	448
	OK		4.07	54	1.107	48	1,592	4,848	807
	TX		3.51	54	1.107	740	33,141	77,900	1,215
	Total Sample	21	4.63	53.7	1.107	1,560	58,666	156,048	986
Stevens	CA	BNSF	2.29	139	1	40	2,056	3,960	2,265
	IL		4.77	139	1	40	1,104	3,960	585
	WA		1.81	141	1	4,996	178,839	557,652	1,789
	Total Sample	26	1.94	141	1	5,076	181,999	565,572	1,761

Swift	AB	BNSF, TCWR	1.23	132	1.253	96	1,512	9,648	1,275
	IL		2.82	132	1.253	788	12,523	77,928	573
	MN		7.12	132	1.253	68	758	6,700	159
	ND		4.02	130	1.253	220	4,136	24,678	417
	WA		1.77	123	1.253	6,328	223,915	707,499	1,792
	Total Sample	42	2.16	126	1.253	7,500	242,844	826,453	1,447
Watonwan	AZ	UP	2.53	82	1	288	12,974	28,512	1,798
	CA		1.98	74.7	1	802	34,149	83,925	2,055
	CO		3.62	71	1	120	3,662	12,320	836
	IA		4.6	71	1	591	11,399	64,272	386
	ID		2.59	79.3	1	1,188	43,945	121,161	1,401
	NV		2.59	71	1	84	4,048	9,060	1,727
	OR		2.13	71	1	291	12,624	32,415	1,832
	TX		2.85	71	1	294	9,341	31,419	1,043
	UT		2.64	82	1	300	11,284	29,700	1,438
	WA		2.15	82	1	202	7,873	20,008	1,832
	Total Sample	17	2.8	75.5	1	4,160	151,299	432,792	1,405
Wilkin	CA	BNSF, CPUS, RRVW	1.89	185	2.075	260	11,751	25,240	2,510
	IL		2.65	185	2.075	968	16,434	98,116	657
	MN		4.82	185	2.075	208	2,996	21,092	295
	MO		3.44	185	2.075	80	1,814	8,120	650
	ND		74.64	185	2.075	1,820	7,691	184,544	60
	OR		2.15	185	2.075	96	3,264	9,504	1,594
	TX		2.54	185	2.075	582	22,237	61,006	1,438
	WA		2.3	185	2.075	9,737	405,241	1,029,398	1,721
	WI		2.78	185	2.075	220	2,065	24,656	301
	Total Sample	80	8.76	185	2.075	13,971	473,493	1,461,676	1,395
Winona	MN	UP	8.18	5	1	100	2,677	9,848	332
	Total Sample	1							

Yellow Medicine	AB	BNSF, MPLI	1.22	107	1.028	120	1,979	11,880	1,370
	ND		3.81	122	1.028	220	4,128	22,152	489
	TX		1.91	122	1.028	218	6,801	24,406	1,457
	WA		1.73	118	1.028	7,096	251,867	789,636	1,857
	Total Sample	36	1.78	118	1.028	7,654	264,775	848,074	1,794

Table 12: MN Grain Barge Loading Facilities

	Name	Address	City	State	Zip code	System	Commodities Handled
0	Modern Transport Inc.	850 E Front St	Winona	MN	55987	Mississippi River	Dry Fertilizer, Corn, Soybeans, Cottonseed, Salt
1	CHS Inc.	988 Riverview Dr	Winona	MN	55987	Mississippi River	Grain
2	Archer Daniels Midland (ADM)	1155 Riverview Dr	Winona	MN	55987	Mississippi River	Corn, Soybeans, Non GMO Grains
3	Red Wing Grain, LLC	810 Levee Rd	Red Wing	MN	55066	Mississippi River	Grain
4	Dakota Bulk Terminal (Kinder Morgan)	925 Hardman Ave S	South St. Paul	MN	55075	Mississippi River	Grain, feed, steel & bulk commodities
5	Peavey Red Rock Elevator	1061 Red Rock Rd	St. Paul	MN	55119	Mississippi River	Grain, Fertilizer, Coal, Feed, Steel, Potash
6	Whitebox Riverport Savage	12100 Yosemite Ave	Savage	MN	55378	Minnesota River	Grain
7	CHS Inc. Savage Terminal	6200 W Highway 13	Savage	MN	55378	Minnesota River	Grain
8	Port Cargill-West Elevator	12100 Dakota Ave	Savage	MN	55378	Minnesota River	Grain
9	General Mills Elevator A	200 Garfield Ave	Duluth	MN	55802	Great Lakes	Grain
10	Whitebox Storage Duluth LLC (South)	250 Garfield Ave	Duluth	MN	55802	Great Lakes	Grain
11	Whitebox Storage Duluth LLC (North)	250 Garfield Ave	Duluth	MN	55802	Great Lakes	Grain
12	AGP Grain, LTD	602 Helberg Dr	Duluth	MN	55802	Great Lakes	Grain
13	Great Northern Elevators	200 Garfield Ave	Duluth	MN	55802	Great Lakes	Grain
14	CHS No. 1 and Gallery	41 Dock St	Superior	WI	54880	Great Lakes	Grain
15	CHS No. 2	41 Dock St	Superior	WI	54880	Great Lakes	Grain
16	Peavey Connor's Point Elevator	400 N Main St	Superior	WI	54880	Great Lakes	Grain
17	Con Agra	21 21st Ave E	Superior	WI	54880	Great Lakes	Grain

Economic Impact of Minnesota's Agriculture

Impact Summary

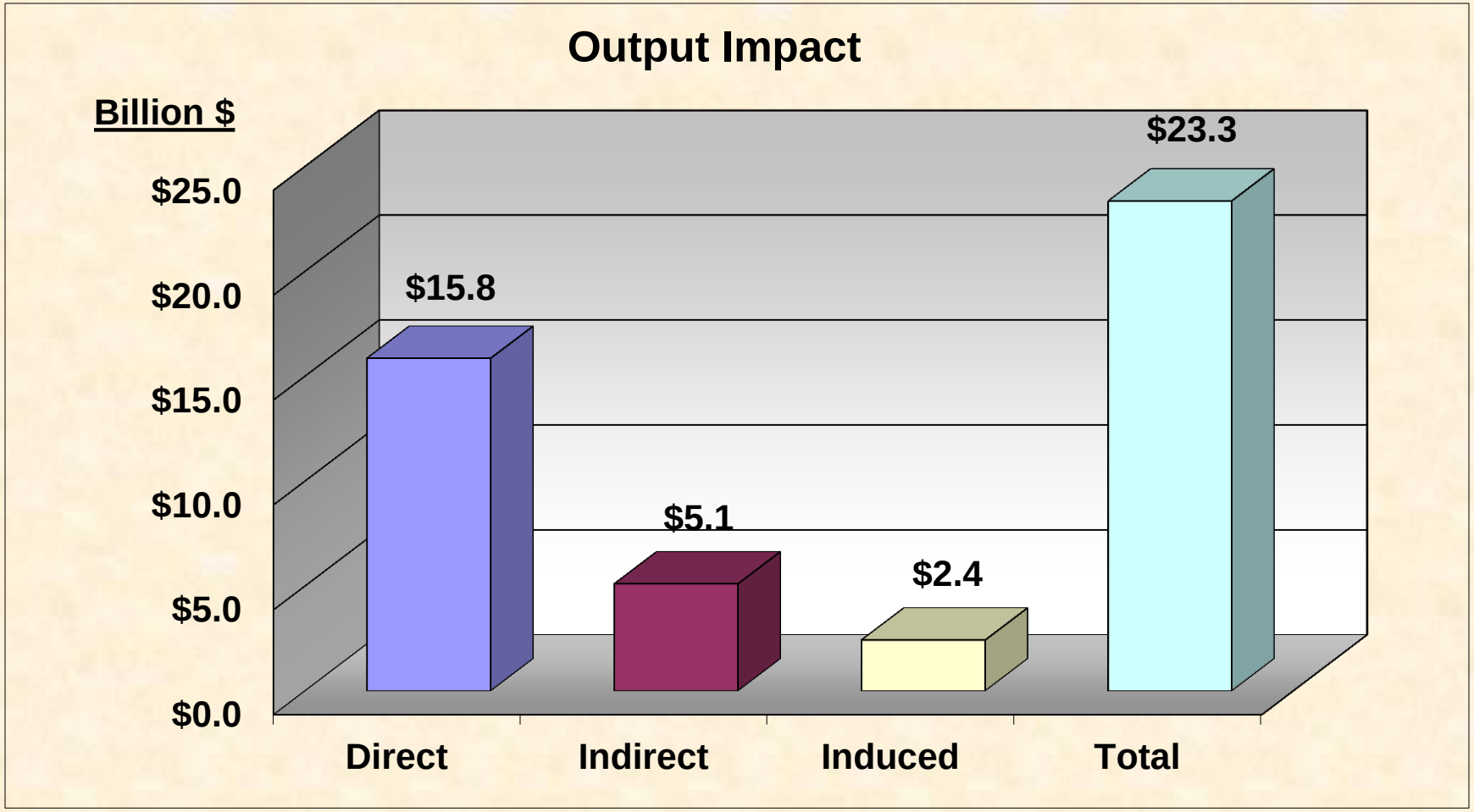
(Based on 2008 agricultural marketing of $15.8 billion):

Total Output Impact: $23.3 billion

Total Employment Impact: 149,384 jobs

Prepared by Su Ye
Agricultural Marketing Services Division
Minnesota Department Of Agriculture
2010

Economic Impact of Minnesota's Agriculture



Economic Impact of Minnesota's Agriculture

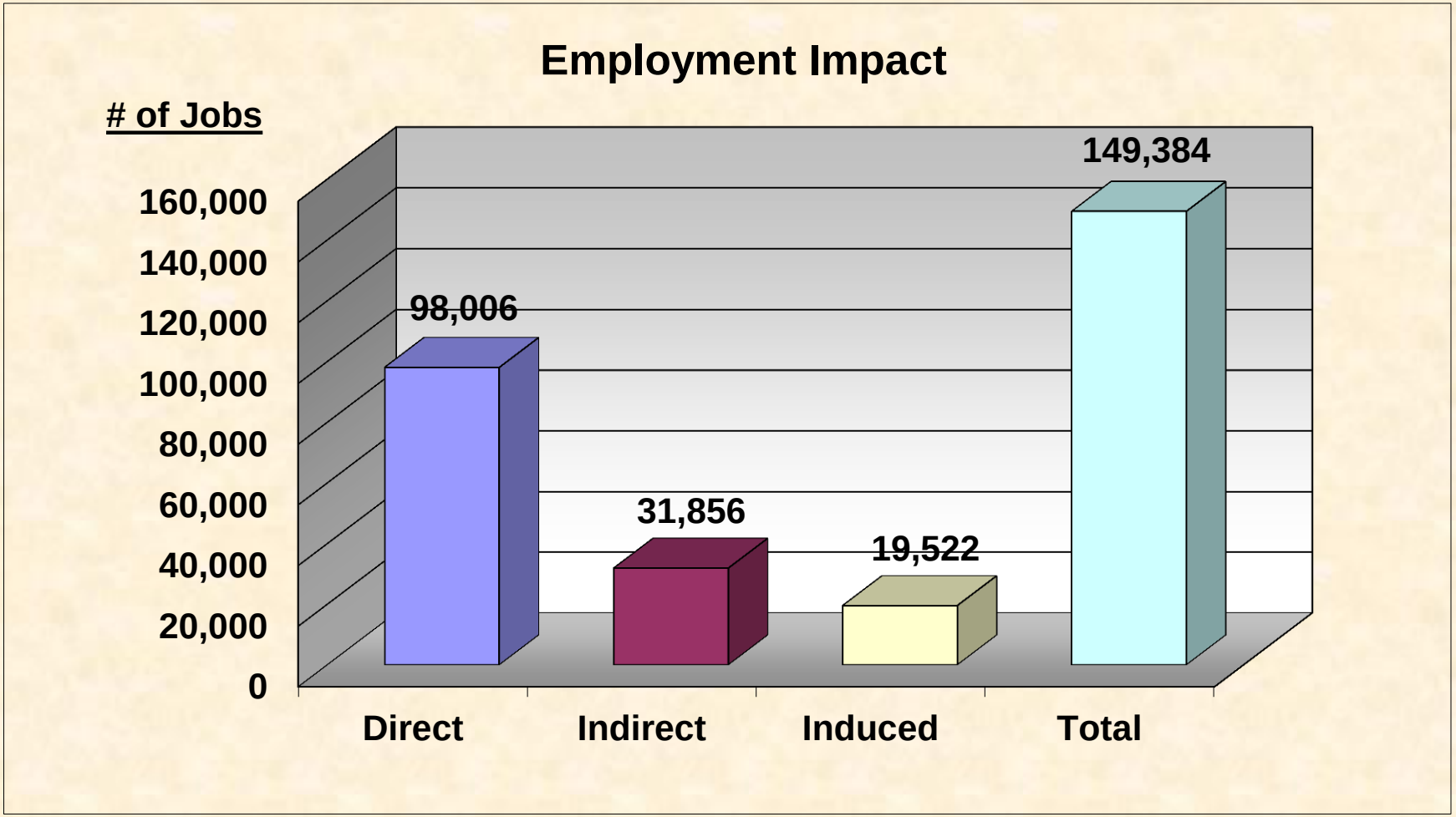


Figure 1: Revenue per Ton-Mile in Cents

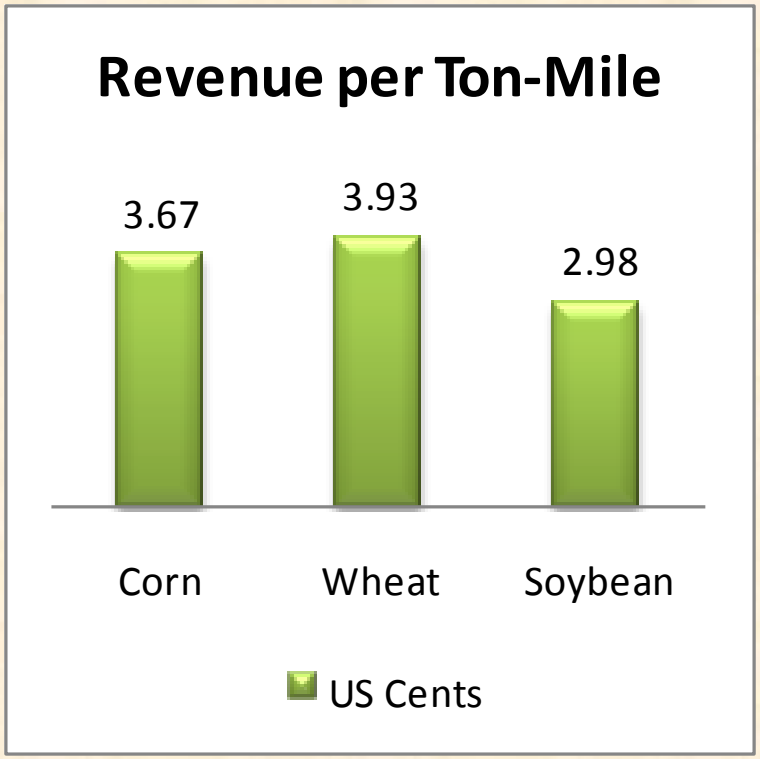


Figure 2: Index of Inter-Rail Competition

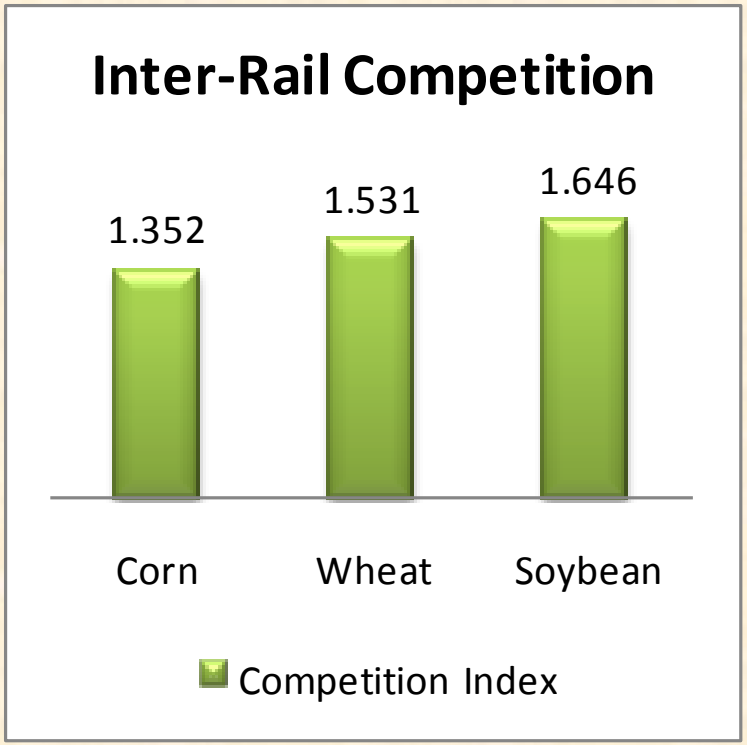


Figure 4: Corn Rate Change When Move from 1 to 2 Rail Competitors at 25 Miles and 75 Miles from Water Transportation

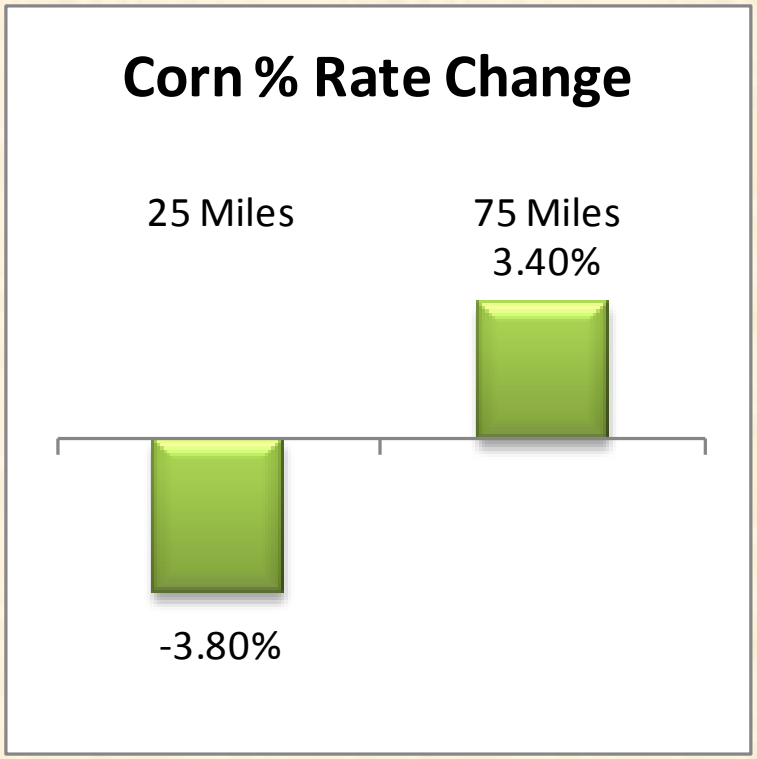
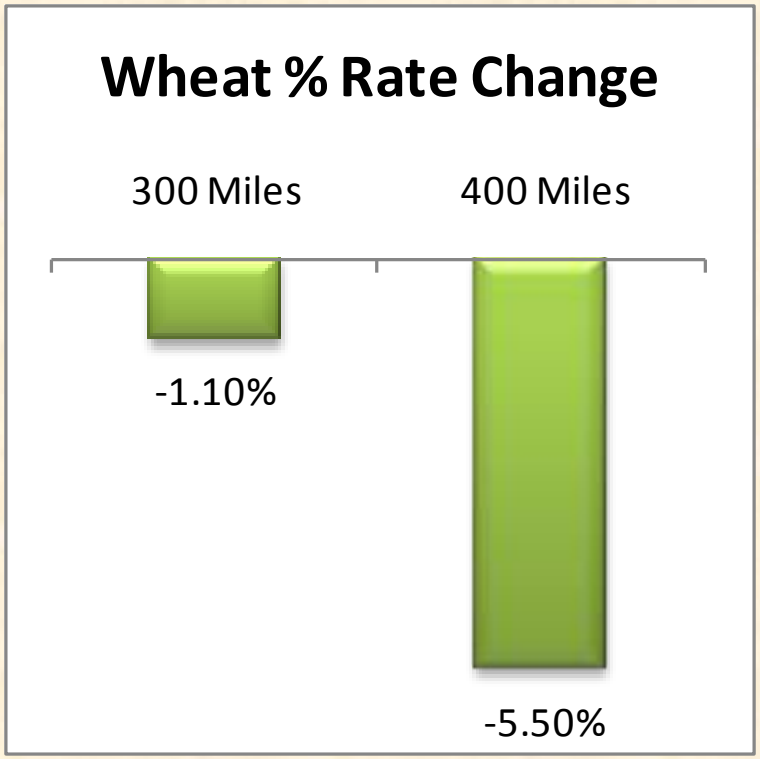



Figure 5: Wheat Rate Change When Move from 1 to 2 Rail Competitors at 300 Miles and 400 Miles from Water Transportation