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## EFFECTIVENESS OF COMPETITION TO LIMIT RAIL RATE INCREASES UNDER DEREGULATION: THE CASE OF WHEAT EXPORTS FROM THE SOUTHERN PLAINS

Stephen Fuller and C. V. Shanmugham

Much of the early 1860s discontent with railroads was centered in agricultural regions, particularly the new regions of the West, where monopolistic price discrimination was most easily practiced by railroads. Because of unavailable or inaccessible forms of competing transportation and numerous small shippers, railroads were able to exploit their monopolistic position (Meyer et al.). Agrarian political action in the 1860s resulted in unsuccessful regulatory efforts by states, but laid the base for the cornerstone of federal transportation regulation, the Act to Regulate Commerce, which was passed in 1887. The Act requires that all rates be "just and reasonable" and provides that "every unjust and unreasonable charge" is unlawful. Various sections deal with discrimination, pooling, publication of rates, and the unlawful practice of charging higher rates on short hauls than on long hauls. In addition, the Act created the Interstate Commerce Commission (ICC), an agency with powers to enforce provisions of the Act. By the 1930s, the growth of alternative transportation modes and the corresponding decline in railroads' traffic share led to the economic decline of many rail carriers. Since then, much of the federal railroad legislation has been designed to curtail the economic demise of the nation's railroad industry. Unfortunately, legislative attempts to rehabilitate that industry have not been completely successful, and the economic condition of many carriers continues to worsen.

A large and growing body of literature has criticized the ICC for inefficiencies generated by the regulatory process (Friedlaender; Moore). It is argued that the outdated regulatory process hinders railroads' ability to adjust their altered competitive environment. Experts contend that the growth in alternative modes has removed the railroads' ability to adjust their altered competitive environment, that is, the growth of competing modes has removed the rails' previous monopoly position, and protective legislation is no longer required. This persuasion, coupled with the current economic climate, has yielded the Staggers Rail Act of 1980, designed "to allow . . . competition and demand . . . to establish . . . rates for transportation" (U.S. House of

Representatives). This deregulatory action permits greater reliance on the marketplace for purposes of rate determination. Accordingly, many producers and agricultural shippers believe that regional or geographic discrimination will occur because of ineffective competition from competing modes.

This study was designed to determine the effectiveness of competitive forces in limiting rail rate increases in the South Plains hard winter wheat-producing region. Since the study area has historically exported more than three-fourths of its production, the analysis centers on this movement. The research focuses on the ability of intra- and intermodal competition to constrain rail rate increases. Analysis proceeds under two alternative assumptions regarding the rate-setting behavior of regional railroads.

In the intramodal analysis, it is assumed that the dominant railroad alters its rates without corresponding changes from other transportation firms in the region. In which case, rate competition is provided by competing railroads, trucks, and the truck-barge combination. This analysis measures the capacity of a single carrier to improve its profitability without collaborative action from competing railroads, that is, the dominant firm finds competing rail carriers unwilling to follow its rate increases. Since other modes may increase haulage as the dominant railroad adjusts rate levels upward, an element of intermodal competition exists in the intramodal analysis.

The intermodal competitive analysis centers on the ability of competing modes to constrain rail rate increases. In this analysis, it is assumed that no rate competition exists between railroads, in which case, the railroads adjust rates in unison. It is assumed that competing modes do not make rate changes in response to the railroads' rate increases.

The intramodal analysis is carried out in a short-run time frame, while the intermodal analysis is examined in the short run and long run. Historically, about 95 percent of the study region's wheat exports have been handled by Texas ports. Port elevators on the lower Mississippi River are operating at near full capacity

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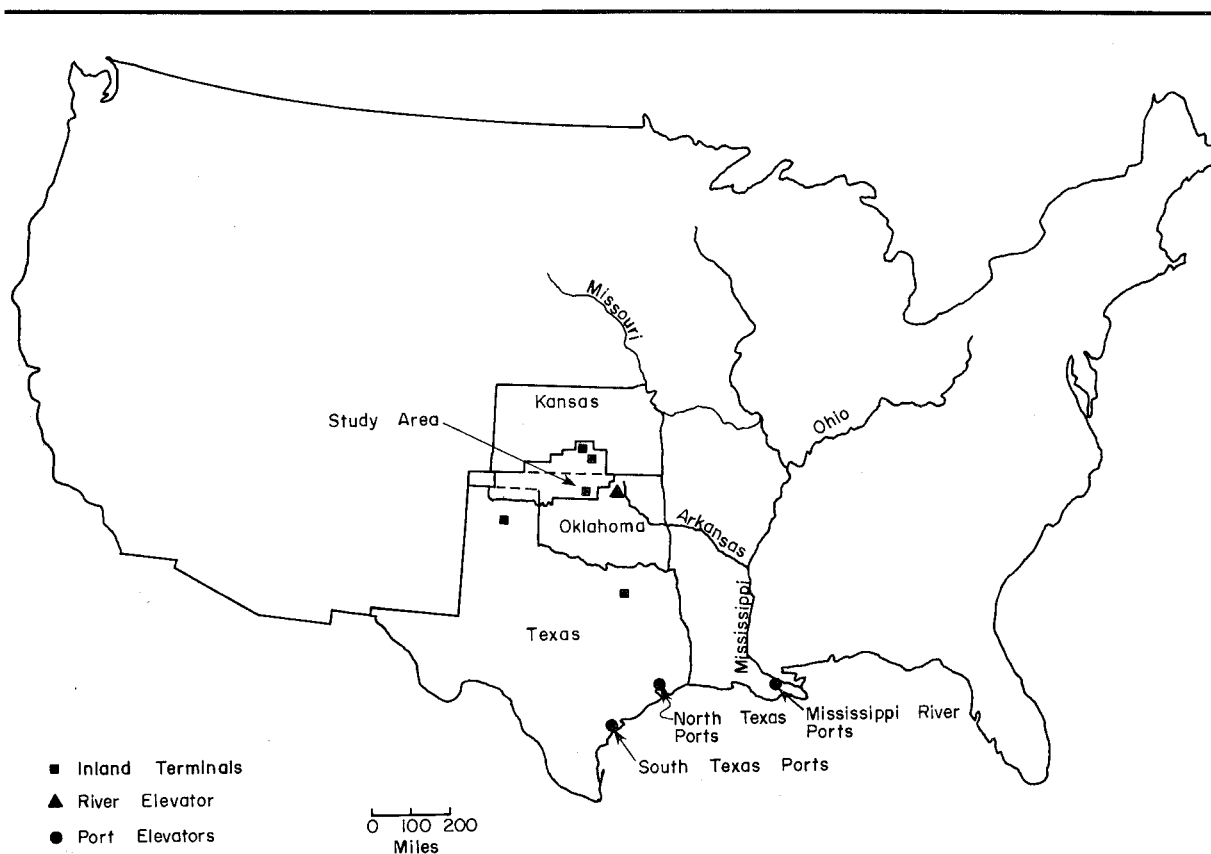
with Midwest corn and soybean exports, and would be unable to accommodate any substantial increase in wheat exports.<sup>1</sup> Therefore, in the short-run analysis, each port area is assumed to handle the same level of study region production as has historically occurred. To analyze more fully the effect of intermodal competition, the analysis was extended to allow for new capital in river and port elevator facilities. Because the barge rate from the study region to the lower Mississippi River port is substantially less than to Texas ports, an incentive to invest in additional Arkansas River elevator and Mississippi River port facilities may develop if railroads adjust rates upward. For this reason, the intermodal analysis includes a long-run perspective.

Three specific scenarios are examined in this study. These include (1) effectiveness of intramodal competition to limit rail rates in the short-run, referred to as intramodal analysis; (2) effectiveness of intermodal competition to limit rail rates in the short run, referred to as short-run intermodal analysis; and (3) effectiveness of intermodal competition to limit rail rates in the long run, referred to as long-run intermodal analysis.

## STUDY REGION

The study region is a contiguous 27-county area in portions of Kansas, Oklahoma, and Texas (Figure 1). The region is approximately 288 miles long, 144 miles at its widest location, and is located an average of 625 miles from the principal Texas ports. Historically, the region has had annual wheat production of approximately 160 million bushels, approximately 75 percent of which has been exported. Within this region there are 347 country elevators, which operate at 244 locations. In addition, there are 34 inland terminals (secondary holders), which operate at 5 locations and receive wheat from study region country elevators. Historically, about 90 percent of the study region's export-destined wheat has moved to North Texas ports. North Texas ports include the 8 export elevators located at Houston, Galveston, Beaumont, and Port Arthur. The remainder of the export-destined wheat has exited through South Texas and Mississippi River ports (Figure 1).

Railroads operate 2,200 miles of track within the region and are the dominant transporters of



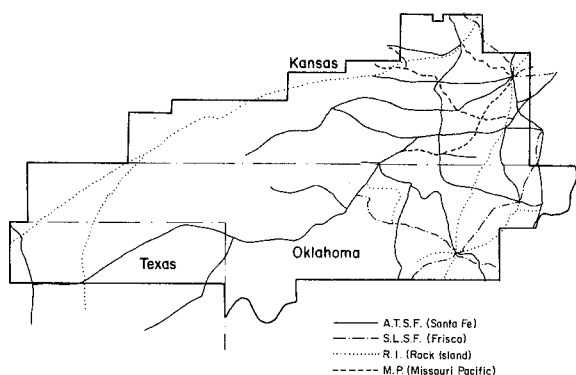
**FIGURE 1. U.S. Outline Map of the Study Area**

<sup>1</sup> Lower Mississippi River port elevators are the most intensively utilized port elevators in the United States. The nine elevators operating on the Mississippi River exported 1.65 billion bushels of grain and soybeans in 1978, or nearly 40 percent of the total U.S. outflow. The 58 remaining U.S. port elevators handled 60 percent of the nation's exports. In 1978, Mississippi River port elevators had a turnover ratio (volume handled ÷ storage capacity) of 31. In the same year, the Atlantic, Pacific, and Great Lakes port elevators had average turnover ratios of 12.6, 9.9, and 2.8, respectively. More than 90 percent of the Mississippi River port volume is corn and soybeans. A substantial increase in the volume of a third commodity handled at Lower Mississippi River port elevators would create difficult logistics problems.

the region's wheat production (Figure 2). Four railroad companies operate in the study area; the Atchison, Topeka, and Santa Fe (Santa Fe); Chicago, Rock Island, and Pacific (Rock Island); Missouri Pacific; and St. Louis-San Francisco (Frisco).<sup>2</sup> The dominant carrier Santa Fe operates about 54 percent of the region's track and annually handles about half of the region's rail wheat movement. The Rock Island, Missouri Pacific, and Frisco railroad companies operate 575, 245, and 185 miles of track, respectively (Figure 2). All 4 railroad firms operate in the eastern third of the region, while only the Santa Fe and Rock Island traverse the western two-thirds of the region.

The region's single-car rate structure allows for storage-in-transit at the inland terminal locations. Wheat may be shipped from country elevators to Gulf of Mexico ports on a single through-rate that includes a stopover at inland terminals. The rate on a direct shipment from country elevator to inland terminal and from inland terminal to Gulf port is equal to the sum of the rates from country elevator to inland terminal and from inland terminal to Gulf port. In addition, all export rates are equalized with respect to Gulf ports.

Although railroads currently transport nearly all of the study region's wheat exports, several alternative modes or modal combinations are available for the export movement. One alternative includes direct truck shipment from study region origins to port elevators. An alternative routing involves the truck-barge combination, in which trucks deliver wheat to an Arkansas River elevator for subsequent haulage by barge to Gulf port elevators. At present, the nearest river elevator is located at the terminus of the navigable portion of the Arkansas River (Catoosa, Oklahoma) and lies approximately 100 miles east of the study region's eastern boundary.



**FIGURE 2.** Study Region Rail System

## ANALYTICAL PROCEDURE

The analysis was accomplished with a network flow model that minimized total annual costs and rates associated with the export wheat handling, storage, and transportation system.<sup>3</sup> It was assumed that grain shippers would seek to minimize those costs associated with moving export wheat to port areas and, accordingly, maximize study region site price. Consequently, the cost-minimizing framework was adopted.

The model is structured to include grain movement from production origins (farms), through country elevators and secondary holders (inland terminals, river elevators), to port terminal destinations. The 27-county region was subdivided into 3-by-3-mile areas (9 square miles) resulting in 3,225 production origins. The model is structured so that the harvest-time supply of wheat may be stored at production origins or shipped directly by farm truck to nearby country elevators for storage and/or subsequent shipments. The region's 347 country elevators may receive wheat from production origins within a 30-mile radius. If wheat is farm stored, producers deliver to country elevators in later time periods. The model requires that wheat must be assembled to country elevators prior to further movement through the system.

The model is developed so that country elevators may ship to inland terminals, Gulf port terminals, or the river elevator on the Arkansas River. Truck and rail modes are available for all country elevator shipments except for those to the river elevator, in which case only truck carriage is available. Export rail rates connect country elevators, inland terminals, and Gulf port areas. The river elevator is linked to the lower Mississippi River, North Texas and South Texas ports via barge transportation rates.

To accomplish the intramodal analysis with the cost-minimizing model, two steps were followed. First, the model was solved with current rates. This solution related least-cost distribution patterns for each country elevator location and the revenues generated by the dominant and competing railroads. Second, the export rail rates for those country elevator locations served by the dominant carrier were adjusted. Again, the model was solved and the revenue generated by the dominant carrier at each served location recorded. If the dominant carrier's revenue increased above the initial or previous solution, then rates were again adjusted at that location and the model again solved. Rates at each country elevator location were adjusted until the dominant carriers revenue commenced to decrease. To gain insight into the effect of rate manipulation on profitability, the variable costs of the

<sup>2</sup> After this study's completion the Rock Island was declared bankrupt, and its assets are currently being liquidated. Service is being maintained on all of the study region's Rock Island lines, except for several branches in the proximity of Enid, Oklahoma, and a branch line connecting Liberal, Kansas, and Morse, Texas. Approximately 160 of Rock Island's 575 miles are currently receiving no service.

<sup>3</sup> A mathematical representation of the problem is available from the authors.

several rail movements were estimated for each country elevator location.<sup>4</sup> Subtracting the appropriate variable cost from revenue yielded an estimate of railroads' revenue above variable cost for each location served. It was assumed that a railroads' unit variable cost of transporting wheat from a particular country location was not affected by annual volume. Variable rail costs were not entered in the model to determine least-cost flow patterns, only rates were used for this purpose.

The procedure used to accomplish the intermodal analysis was similar to that employed to accomplish the intramodal analysis. The principal modification in procedure was a result of the assumed change in railroads' pricing behavior. Since all railroads were assumed to follow a price leader in the intermodal analysis, railroad rates at all locations were adjusted simultaneously. Because of the short-run time frame of the intramodal and short-run intermodal scenarios, the model was constrained so that study-region flows to the various port areas could not exceed historic levels. In contrast, the long-run intermodal analysis allows for new capital to be invested in order to expand river elevator and Mississippi River port terminal capacity. In which case, the historic flow to a port area was not an upper bound. The long-run time frame was effected in the model by allowing historic flows to continue at the current elevator (variable costs) cost level, but necessitates that any flow in excess of historic levels can only be accomplished at costs that include new investment in land and capital.

## DATA

All transportation of wheat by rail and barge is represented in the model with rates, while commercial truck haulage and farm truck assembly are represented by total costs. Because of the competitive environment in which commercial grain truckers operate, total costs were assumed to approximate rates. The model includes variable costs for existing grain handling and storage facilities and total costs when new capital is invested for purposes of altering elevator capacity (long-run intermodal analysis). Rates and costs are applicable for 1978.

Export rail rates were collected for all country elevator locations and were those applicable with Ex Parte 343. To estimate railroad revenue above variable cost, it was necessary to estimate per bushel variable cost associated with each rail movement. Because of the single-car rate structure, only single-car costs were estimated. Variable rail cost estimates were based on costs published in the Interstate Commerce Commission's Statement No. 1C1-76, *Railroad Carload Cost Scales*, 1976. This document is based on applica-

tion of Rail Form A, reflecting the 1976 operations of Class I line-haul railroads. The Bureau of Accounts rail update ratios were used to estimate rail cost parameters for 1978.

Waterway transportation rates for bulk grain are closely tied to the Waterways Freight Bureau, Freight Tariff No. 7. Rates for this study were estimated by using the published barge rates, which were assumed to be representative of rates charged by barging firms.

Because of the relative ease of entering agricultural trucking, this industry approximates the pure competition model. Therefore, when costs are calculated to include a normal return on resources, truck costs approximate rates. Two truck-cost (rate) functions were estimated—one for trip distances less than 350 miles, the other for distances that were equal to or in excess of 350 miles. Hauls of less than 350 miles were assumed to have no backhaul, while the longer distances (specifically from the study area to Gulf ports) were assumed to have a backhaul on 20 percent of all trips.

Cost of assembling wheat from farm to country elevator was based on a producer survey that provided information on farm truck size and utilization characteristics. The economic-engineering cost estimation technique was used to estimate an assembly cost function.

A series of studies by the U.S. Department of Agriculture on grain handling and storage costs at country elevators, inland and port terminals provided data to estimate these costs (Schienbein). The USDA cost estimates were updated to 1978 with regression analysis. The cost parameters relate for each type of facility, the storage cost, and costs of receiving and loading truck, rail, and barge modes. The projected USDA cost estimates, in combination with information on Arkansas and lower Mississippi River land costs, were used to calculate total costs of adding grain handling capacity on the respective rivers.

A survey of wheat producers provided information on sizes and characteristics of the study region's farm storage. With this information, cost parameters were calculated using an economic-engineering technique. Estimated parameters include the costs of placing wheat in storage, and removing it from storage.

## RESULTS

### Intramodal Competition

The intramodal analysis is based on the assumption that competing rail, truck, and barge firms do not alter their rates in response to rate manipulation by the dominant rail carrier. Because Santa Fe operates 1,200 miles of track (54

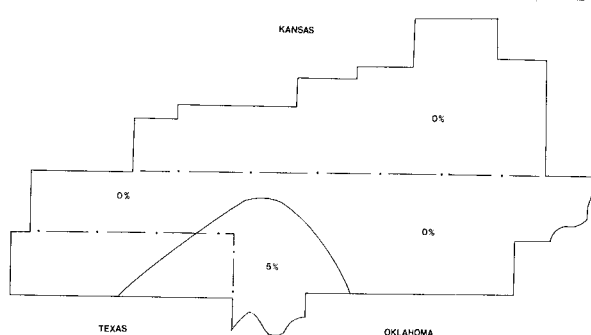
<sup>4</sup> Railroad fixed cost cannot be assigned to any particular rail movement, in which case, any estimate of per-bushel fixed cost is arbitrary. For this reason, only variable costs were calculated. Revenue above variable cost represents a contribution to fixed cost.

percent of region's total trackage), it was designated the study region's dominant carrier.

At current (1978) rate levels, the model shows the dominant carrier to generate revenues of \$30.65 million and to transport 62.95 million bushels of the study region's wheat exports. All other railroads generated revenues of \$24.96 million and transported 51.55 million bushels. The study region's remaining 3.7 million bushels of export wheat was barged.<sup>5</sup>

Analysis indicates that upward rate adjustments by the dominant carrier would decrease its revenue, revenue above variable cost, and volume at all served locations, except for those in the southwest portion of the study region (Figure 3). In this area, the dominant carrier could profitably increase rail rates an average of 5 percent. This upward rate adjustment would yield additional rail revenue of \$.027 per transported bushel and increase the dominant carrier's revenue from the current \$30.65 million to \$30.87 million (Table 1).

In an effort to learn more about the demand characteristics for the dominant carrier's transportation service, rates at all served locations were simultaneously adjusted. Analysis showed that if the dominant carrier's rates were adjusted upward by 5 percent, its revenue would decrease from \$30.65 to \$17.19 million, while transported volume would decrease from 62.95 to 33.47 million bushels. Similarly, revenue above variable cost would decrease from \$9.63 to \$5.99 million. Approximately 95 percent of the dominant carrier's lost volume would be carried by competing railroads. The remaining portion would be carried via the truck-barge combination. Conversely, if Santa Fe were to adjust rates downward by 5 percent and competing carriers left their rates unaltered, Santa Fe's revenue, revenue above variable cost, and volume would increase. In this case, revenue would increase from



**FIGURE 3.** Percentage Increase in Rail Rates Available to the Dominant Carrier in Various Areas of the Study Region, Intramodal Analysis

<sup>5</sup> In an effort to validate the model, the models predicted flows were compared with data on actual flows. In general, the model's predicted flow patterns correlated closely with actual haulage by each mode. The principal exception was truck transportation to port areas. The model showed no grain moving by truck from study-region origins to the North Texas port area, when, actually, wheat is trucked to this port area from the southern portion of the study region. Only when the lower costs associated with overloaded trucks were entered into the model did truck haulage commence. The model's predicted movement by barge approximated export flows occurring in the mid-1970s, but slightly underestimated 1977-78 flows. In 1980, the river elevator handled about 21 million bushels of wheat, only a portion of which was destined for the export market. About a fourth of this flow moved to domestic markets.

**TABLE 1.** Dominant Carrier's, Other Railroads' and Barges' Revenue and Volume Transported at Current and Feasible Rate Levels for the Dominant Carrier, Intramodal Analysis, 1978

Type of Carrier	Volume Transported to Export (1,000,000 bu.)	Generated Revenues (\$1,000,000)
Current Rates <sup>a</sup>		
Dominant Carrier <sup>b</sup>	62.95	30.65
Other Railroads <sup>c</sup>	51.55	24.96
Barge	3.70	.71
Feasible Dominant Carrier Rate <sup>d</sup>		
Dominant Carrier	62.11	30.87
Other Railroads	52.39	25.38
Barge	3.70	.71

<sup>a</sup> 1978 Rate Level

<sup>b</sup> Santa Fe

<sup>c</sup> Includes Rock Island, Missouri Pacific, and Frisco railroad companies.

<sup>d</sup> Reflects volume and revenues generated when the dominant carrier adjusts rates upward so as to maximize its revenue and revenue above variable cost in the study region.

\$30.65 to \$42.92 million and volume from 62.95 to 93.04 million bushels; revenue above variable cost would increase from \$9.63 million to \$11.92 million. The increase in dominant carrier's market share would be at the expense of competing rail lines.

The favorable outcome of downward rate adjustments by the dominant carrier invites inquiry. The assumption that competing railroads will not alter their rates as the dominant carrier adjusts rate levels downward is probably unrealistic. It is doubtful that competing railroads would allow Santa Fe to increase its market share via rate reductions. Rate decreases by Santa Fe would likely result in corresponding decreases by competing railroads, in which case, rate reductions by Santa Fe would bring about a decrease in revenue for their firm and for competing railroads. For example, if both the dominant carrier and competing railroads adjust rates downward by 5 percent, the combined revenues of the railroads decrease from \$55.61 to \$53.39 million. This implies that the demand for Santa Fe's service may be inelastic as rate levels are reduced below current levels.

Based on the assumptions of the intramodal analysis, the dominant carrier has limited ability to increase revenue and revenue above variable cost through upward rate adjustments. The assumption that competing railroads will not follow

the upward rate adjustment of the dominant carrier is debatable. Friedlaender argues that intra-modal price competition is an unlikely course of action with deregulation, even if deregulatory action abolished rate bureaus. The following inter-modal analysis addresses the situation in which railroads are assumed to coordinate rate adjustments.

### Short-run Intermodal Competition

The intermodal analysis is designed to determine the effectiveness of truck and truck-barge competition in restraining rail rate increases. The short-run analysis does not include the opportunity for capital investment for purposes of altering port or river elevator capacities; accordingly, flows to the various port areas are constrained to historical levels.

At current rate levels, the railroads are earning revenues of \$55.61 million while transporting 114.5 million bushels. The study region's remaining 3.7 million bushels are transported via barge to the lower Mississippi River port area (Table 2).

To gain general insight into railroads' ability to increase revenues through rate adjustments, rates were adjusted upward and then downward at all country elevator locations. Results indicate that a uniform 5-percent rate increase or decrease would marginally reduce aggregate railroad revenue. However, a more in-depth analysis shows that through rate increases at selected locations, railroads can increase their revenue.

Analysis indicates that railroads can more eas-

**TABLE 2.** Railroads' and Barges' Revenue and Volume Transported at Current and Feasible Rate Levels for Railroads, 27-County Study Region, Short-Run Intermodal Analysis, 1978

Type of Carrier	Volume Transported to Export (1,000,000 bu.)	Generated Revenues (\$1,000,000)
<b>Current Rates <sup>a</sup></b>		
Railroads <sup>b</sup>	114.50	55.61
Barges	3.70	.71
<b>Feasible Railroad Rate <sup>c</sup></b>		
Railroads	109.50	58.10
Barge	8.70	1.61

<sup>a</sup> 1978 Rate Level

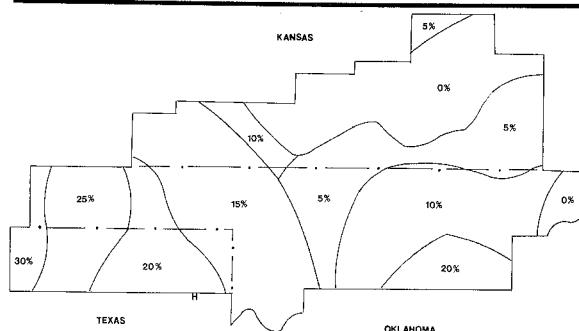
<sup>b</sup> Includes Santa Fe, Rock Island, Missouri Pacific, and Frisco railroad companies.

<sup>c</sup> Reflects volume and revenues generated when the collaborating railroads adjust rates upward so as to maximize their revenue and revenue above variable cost in the study region.

<sup>d</sup> Because some grain truckers are alleged to operate overweight, analysis was carried out to determine the effect of increased truck weights on the short-run intermodal model. Truck rates were adjusted downward to reflect the reduction in unit trucking costs. Gross vehicle weight was adjusted from the current 80,000 pounds to 95,000 pounds. Results indicate that railroads' capacity to increase the rate levels would be limited, when compared to that situation in which truck weights are held at 80,000 pounds. Direct truck movement to port areas and additional truck-barge competition provide a restraint in rail rate increases for all areas except the westernmost portion of the region. In general, the truck-barge combination is most effective in that area nearest the river elevator (eastern portion of region); whereas, direct truck movement is the most effective restraint in the western portion of the region.

ily increase revenue and revenue above variable cost if they collaborate in upward rate adjustments while other modes represent the only price competition. Figure 4 suggests the extent to which cooperating railroads can profitably increase rates in various portions of the study region. In general, railroads have the greatest ability to increase rates in the Texas and Oklahoma portion of the study region. In the western portion of the region, railroads have the potential to increase rates 15 to 30 percent. Railroads operating in the Panhandle counties of Texas and Oklahoma could increase rates an average of \$.09 per bushel. Clearly, the increased distance of these locations from the river elevator decreases the effectiveness of intermodal competition, in particular, the truck-barge combination. In spite of the proximity of the river elevator to the eastern Oklahoma portion of the study region, railroads have the ability to adjust rates upward. This seems to be best explained by the relatively low rail rates charged by railroads operating in this area. Because of the railroads' relatively low current rates when compared to competing modes, there is the capacity to adjust rail rates upward 10 to 20 percent without losing significant quantities of traffic. Upward rate adjustments would increase rates an average of \$.024 per transported bushel. The rate structure in the eastern part of the study region may have evolved because of its proximity to the river elevator and railroads' concern about losing grain traffic to the truck-barge combination.

Through selective rate increases, railroads can increase annual revenue from \$55.61 to \$58.10 million, while transported volume decreases from 114.50 to 109.50 million bushels (Table 2). Increased revenue coupled with reduced haulage and the associated lower costs would increase railroad's revenue above variable cost from \$19.3 to \$22.5 million. The truck-barge combination gains the loss in railroad volume.<sup>6</sup>



**FIGURE 4.** Percentage Increase in Rail Rates Available to Collaborating Railroads in Various Areas of the Study Region, Short-run Intermodal Analysis

Historically, most of the study region's export wheat has flowed to North Texas ports. Because of the assumption accompanying the short-run analysis, flows to each port were constrained to historic levels. Therefore, as rail rates were adjusted upward, barge traffic was forced to bypass the lower Mississippi River port to be delivered to North Texas ports. Barge movement from the Arkansas River elevator to North Texas ports is at an additional rate of \$.099 per bushel over movement to the lower Mississippi River port. Because of transportation cost savings associated with barge movement to the lower Mississippi River port area, there exists the potential incentive to invest in additional river and port elevator capacity.

### Long-Run Intermodal Competition

The long-run intermodal analysis determines the effectiveness of truck and truck-barge competition in restraining rail rate increases when the time period is extended to allow for new capital investment. This scenario determines whether incentive exists for additional river and port elevator capacity so as to capture the lower barge rates associated with movement to the lower Mississippi River port area. The restructured network flow model no longer constrained the port areas to their historic volumes, rather, at additional cost, flow could be redirected to the lower Mississippi River port area.<sup>7</sup>

The long-run analysis indicated greater quantities of study-region wheat flowing to the lower Mississippi River port area via the truck-barge combination than occurred at 1978 rate levels. That is, based on analysis conducted at the 1978 rate level, incentive exists to add additional elevator capacity to increase flow to the lower Mississippi River port. Although wheat flow has increased substantially since completion of the Arkansas River project in 1971, the 1980 export flow was about 30 percent of the 51.49 million bushels projected by the model.<sup>8</sup> Sufficient time has elapsed to invest in necessary elevator facilities to accommodate flows that approximate those of the long-run solution. A plausible explanation of the divergence between the predicted and actual flow may be due to risk associated with river elevator investment. Because a large portion of railroad costs are fixed and nontraceable, railroads are capable of operating at relatively low rates in those areas where competitive threats exist. It follows that a firm contemplating an investment in a river elevator, with a 25 to 30-year life, could be reluctant to invest because of railroads' ability to keep rates low in the region. For this reason, it is difficult to determine precisely how effective truck-barge competition

**TABLE 3. Railroads' and Barges' Revenue and Volume Transported at Current and Feasible Rate Levels for Railroads, 27-County Study Region, Long-Run Intermodal Analysis, 1978**

Type of Carrier	Volume Transported to Export (1,000,000 bu.)	Generated Revenues (\$1,000,000)
Current Rates <sup>a</sup>		
Railroads <sup>b</sup>	66.71	31.64
Barge	51.49	8.71
Feasible Railroad Rate <sup>c</sup>		
Railroads	65.61	32.35
Barge	52.59	8.90

<sup>a</sup> 1978 Rate Level

<sup>b</sup> Includes Santa Fe, Rock Island, Missouri Pacific, and Frisco railroad companies.

<sup>c</sup> Reflects volume and revenues generated when the collaborating railroads adjust rates upward so as to maximize their revenue and revenue above variable cost in the study region.

would be in the long run. The methodology employed may over-estimate the effectiveness of the truck-barge competition in the long run.

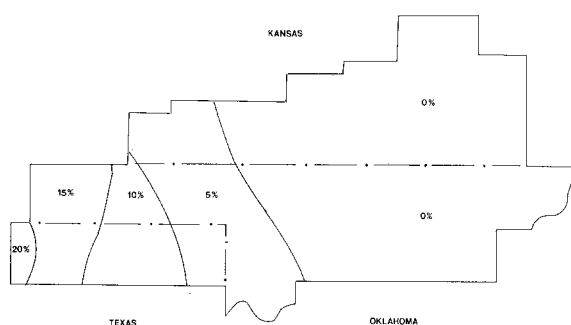
At 1978 rate levels, the analysis indicates railroads to be transporting 66.71 million bushels and generating revenues of \$31.64 million, while the barge mode would be hauling 51.49 million bushels (Table 3). The only unaffected area in the study region is the western portion. Through rate reductions, railroads have some ability to recapture lost volume. For example, with a 5-percent rate reduction, railroads can increase volume to 90.93 million bushels and revenue to \$41.19 million.

Network flow model analysis indicates increased effectiveness of the truck-barge combination in restraining rail rates in the long run. Investment in river and port elevator facilities bring about redirection of wheat flows to the lower Mississippi River port area and restricts railroad's rate increasing ability to the western portion of the study region (Figure 5). Railroads have almost no ability to increase rates in the eastern one-half of the study region; only at country elevator locations in excess of 260 miles from the river elevator could railroads successfully adjust rates upward. In the extreme western portion of the study region, (at a distance of about 400 miles), collaborating railroads could increase rates up to 20 percent before truck-barge competition became an effective restraint.

<sup>7</sup>To accomplish the long-run intermodal analysis, the model was constructed so that flows in excess of 25 million bushels to the river elevator would incur additional expansion cost, whereas, flows to the lower Mississippi River port in excess of 15 million bushels would require additional investment.

<sup>8</sup>In 1980, construction of an additional river elevator commenced at Catoosa, Oklahoma. This facility would expand the Port of Catoosa's capacity to that volume estimated by the model.





**FIGURE 5.** Percentage Increase in Rail Rates Available to Collaborating Railroads in Various Areas of the Study Region, Long-run Intermodal Analysis

By optimally adjusting rates upward in the western portion of the region, railroads could increase their revenue from \$11.41 to \$12.12 million and simultaneously increase revenue above variable costs from \$3.62 to \$4.14 million.

## CONCLUSIONS AND OBSERVATIONS

Intramodal competition, if made to function, would appear to provide an effective means of restricting rail rate increases. However, it should be noted that the trend toward rail company merger tends to concentrate ownership spatially and reduce the effectiveness of intramodal competition. In general, the intramodal analysis indicates that if a dominant carrier were to increase rates, the competing railroads would benefit at the dominant carrier's expense. Conversely, if the dominant carrier were to reduce rates, it would benefit at the expense of competing lines. It seems that rate increases by the dominant carrier probably would not be followed by competing railroads, whereas, rate decreases would be duplicated. In this case, the dominant carrier would lose the initial gains associated with its rate reduction. If no rate bureau or formal mechanism exists for railroads to adjust rates jointly, there may be limited efforts by carriers to effect rate increases.

The intermodal analysis indicates that collective rate setting would allow railroads to increase rate levels in the short run. The truck-barge combination would be the most effective form of competition. Analysis indicates that, in the long run, an economic incentive exists to invest in additional river facilities to allow an increase in

barge movement. This action substantially improves the competitiveness of the truck-barge combination and restricts the ability of the railroads to increase rate levels in all but the most western portion of the study region. It is difficult to know how effective the truck-barge competition would be over time. Railroads' cost structure allows them substantial rate-setting freedom, thus creating some risk for river elevator investment.

Extrapolating the results of the 27-county study to the entire hard red winter wheat belt (including portions of Kansas, Oklahoma, Texas, Nebraska, and Colorado) must be done with caution. Just as the subregions in the study area exhibit differences in competitive forces, so would the multistate region. In the eastern portion of the belt (north-central Oklahoma, central Kansas, and southeastern Nebraska), the density of competing lines appears sufficient to restrict any particular railroad from arbitrarily adjusting rates upward. The density of competing lines in the western portion of the belt is less; accordingly, there is greater opportunity for selective rate increases by an individual railroad. If railroads were to set rates in a collective manner, they would be able to increase revenue and revenue above variable cost for areas in the western portion of the hard red winter wheat belt. The region's eastern portion would have greater access to the barge-navigable Missouri River, and the truck-barge combination would tend to limit rail rate increases. As indicated by the analysis, railroads' capacity to increase rate levels would tend to be reduced in the long run due to capacity-increasing investment in river facilities.

Most changes in public policy result in a gain in financial welfare for certain groups, while other groups experience a depreciated income stream and/or reduction in asset values. With rate deregulation, railroads would presumably be gainers to the extent that they can financially enhance their firms through upward rate adjustments. Potential losers are grain marketing firms and producers. It is hypothesized that most of the loss would be borne by the producer via lower grain prices. With current market organization, exporters appear to be price setters and country elevators price takers. The price negotiated between exporter and country elevator is generally determined by the exporter as dictated by international demand. Country elevators arrive at the farm price by subtracting their margin and the transportation rate to the port elevator from the exporter's purchase price. As a result, any increases in transportation rates that result from rate deregulation will reduce the price that the producer receives.

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