Effect of Contract Disclosure on Price: Railroad Grain Contracting in the Plains

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The Staggers Rail Act of 1980 granted railroads freedom to establish rates and enter into confidential contracts with grain shippers. Recent legislation (1986) required that certain contract terms be disclosed. This study shows rail rates in the Plains region commenced an upward trend after implementation of the disclosure policy. Results suggest contract disclosure and increased reliance on posted tariffs facilitated rate coordination within the oligopolistic railroad industry.

Key words: contract disclosure, railroads, rates.

Railroads were granted freedom to establish rates and enter into contracts with shippers/receivers by the Staggers Rail Act of 1980. This act reversed nearly a century of prohibiting private contracting.[1] Contracts have been used extensively to specify grain rates and services during the post-Staggers period. Typically, a grain contract commits a grain shipper to some minimum shipment size and volume while the railroad provides transportation service at below-tariff levels. Small shippers often find it difficult to meet volume and shipment size requirements of contracts offered to large shippers. By the early 1980s many small grain shippers believed they were disadvantaged by the more favorable contract rates offered by railroads to large grain shippers. In view of this alleged discrimination, Congress enacted Public Law 99-509 (21 October 1986) which required disclosure of essential grain contract terms.

The purpose of this study is to identify the effect of contract disclosure on railroad grain rate levels in the South and Central Plains. Some grain shippers, often the larger firms, hold that contract disclosure discourages interrail competition since railroads know precisely the prices against which they must compete in order to acquire traffic (*Milling and Baking News*). Post-Staggers studies have shown that deregulation led to significant rate reductions in the Central and South Plains (Klindworth et al.). Some believe this outcome partially was facilitated by confidentiality of rail contracts (Babcock et al.; Fuller et al.). Further, some argue that contracting promotes efficiency by allowing railroads to plan the deployment of equipment and personnel [Association of American Railroads (AAR) 1989]. Thus, disclosure of contract terms may threaten both interrail competition and the efficiency fostered by deregulation, thereby creating a force to increase railroad grain rates.

MacDonald (1989) offers an excellent synthesis of pre- and post-deregulation impact studies. Prior to deregulation, research by Babcock; Fuller, Makus, and Taylor; and Sorenson, Anderson, and Nelson suggested deregulation would not lead to general rate increases in the Plains because regulated rates were as high as intermodal competition would permit, i.e., railroads would lose substantial market share to trucks and barges if rail rates were increased above the regulated levels. Post-deregulation studies show rail rates in the South

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[1] The Railroad Revitalization and Regulatory Reform Act of 1976 permitted contracting but several unanswered concerns resulted in little contracting. It was not until passage of the Staggers Rail Act in 1980 that contracting became widespread.

and Central Plains declined about one-third by the 1985–86 period (Babcock et al.; Chow; Fuller et al.). They hold that rivalries in pricing behavior among railroads were facilitated by contracting and the removal of rate bureaus from antitrust immunity. After accounting for changes in transportation demands, costs, and a shift in shipment size, it was concluded that rate changes since deregulation have resulted in new and effective interrail competition in the South and Central Plains' grain transportation market (Fuller et al.; MacDonald 1989).

Neoclassical economic theory offers little definitive insight on the likely effect of contract disclosure. In those situations where the effect of a subtle change in market organization cannot be deduced through formal economic logic, experimental economics is increasingly employed. Hong and Plott employed the methods of experimental economics to examine a situation which has similarities to the rail contract disclosure issue, thus offering an expectation about its potential effect. They explored the consequences of a proposed rate publication policy for the barge industry operating on the domestic inland waterways. The proposed posted rate organization was contrasted with the existing organization which involved privately negotiated prices. Hong and Plott concluded that posting rate changes would lead to higher prices and reduced market efficiency. This finding suggests rail rates may increase if price information from privately negotiated contracts between grain shippers and railroads is disclosed. Coincidentally, this outcome supports the grain shippers' view that disclosure would discourage interrail competition. When rail rates are disclosed, there may be an opportunity for the oligopolistic rail industry to coordinate prices, and in a market where the demand for transportation service is inelastic, there is an incentive for a price leader to evolve and adjust rates upward.[2] This suggests contract disclosure, the focus of this study, may induce an upward movement in rail rates. In contrast, without contract disclosure rivalrous pricing behavior is precipitated since railroads do not know the price against which they must compete.

Background

Contract disclosure rules established by the Interstate Commerce Commission (ICC) in January 1987 require contracting parties to make public the following information: (*a*) carrier name(s); (*b*) commodity; (*c*) shipper identity; (*d*) specific origins, destinations, transit points and involved shipper facilities; (*e*) contract duration; (*f*) rail car usage; (*g*) base rates and charges; (*h*) volume; and (*i*) special features relating to transit time, credit terms, discounts, etc. A second-tier disclosure process is available to aggrieved parties who require additional contract information. If a party can prove itself to be an "affected party," the additional contract information may be made available (ICC 1987).

During the first three years of deregulation (1980–83), 1,344 grain contracts were written. In 1984, 1985, and 1986, the number of grain contracts written increased to 1,217; 2,770; and 2,935, respectively. After issuing disclosure rules in January 1987, written contract numbers declined to 2,148 in 1987 and to 1,625 in 1988. It is estimated that in 1986, the year prior to the ICC's issuance of the disclosure rules, 63% of all rail-transported grain was contracted, whereas in 1988 about 40% of rail-transported grain moved under a contract (AAR 1988e). The AAR maintains that the disclosure requirement reduced contracting since firms believed proprietary information would be disclosed (AAR 1988c).[3]

This study focuses on the rail transportation market for wheat in the South and Central Plains, a region including Kansas, Oklahoma, and Texas. The area is a major producer of hard red winter wheat. Because the region is landlocked and must ship extended distances to reach its principal markets, railroad carriage dominates. It is estimated that over half of the wheat production in the region goes to the ex-

[2] Wilson showed that the elasticity of demand for transport service can be estimated from product supply elasticity, product demand elasticity, price of transport service linking two regions, and product price in the destination market. Based on values which were believed representative of the South and Central Plains, the elasticity of demand for wheat transportation service was estimated to be very low, generally smaller than $-.07$ for the study region. It follows that carriers have an incentive to adjust rates upward as a result of the very inelastic demand.

[3] In 1989 the U.S. Court of Appeals for the Seventh Circuit upheld the Interstate Commerce Commission's rejection of a petition by the Western Fuels Association seeking disclosure of confidential rail coal contract terms. Opponents pointed out that contract disclosure could be a deterrent to the negotiation of new contracts.

port market with over 95% exiting via Texas ports. A 1985 survey of grain export firms operating on the Texas Gulf showed 93% of receipts from this region are rail-transported (North Central Regional Project 137). There are 10 Class I railroads operating in the region, six of which link the region with Texas ports. Based on the ICC's Rail Waybill Sample Master File for 1984, three rail carriers assemble nearly 90% of all export grain to Texas ports.

Conceptual Approach, Model, and Data

The demand for grain transportation is derived from the demand for the study region's grain in destination markets (D_d^w) and farm level supply of grain (S_f^w) (Wilson). These two functions can be expressed as:

$$D_d^w = D_d^w(P^w, \bar{D}, \epsilon_d) \tag{1}$$

and

$$S_f^w = S_f^w(P_{t-1}^w, \bar{S}, \epsilon_f), \tag{2}$$

where P^w refers to the price of grain and $\bar{D}$ and $\bar{S}$ are vectors of exogenous shifters. The derived demand for grain transportation service (D_t) is the vertical distance between these two functions:

$$D_t = D_d^w - S_f^w \rightarrow D_t = D_t(P^w, P_{t-1}^w, \bar{D}, \bar{S}, \epsilon_{df}), \tag{3}$$

where ϵ_{df} is the combined error term from equations (1) and (2). The supply of grain transportation service (S_t) is a function of the price of transportation service (P_t) and also is affected by a number of exogenous shifters ($\bar{Z}$):

$$S_t = S_t(P_t, \bar{Z}, \epsilon_{st}). \tag{4}$$

Equating the demand for and supply of transportation service and solving for P_t results in the following reduced-form equation:

$$P_t = P_t(P^w, P_{t-1}^w, \bar{D}, \bar{S}, \bar{Z}, \epsilon_p). \tag{5}$$

Clearly a number of forces impact on the region's average railroad rate level, thus the need to control for their influences when isolating the effect of the implemented disclosure policy on study region rates. In the short run one would expect determinants of the variables on the right-hand side of the reduced-form equation to be predetermined so that ordinary least squares, applied to a linearized version of the equation, would provide unbiased estimates (at least over ranges of historical data).

The adopted procedure involves estimating a regression equation with railroad rate as the dependent variable. Because railroad rates are for individual hauls, there is a need to include shipment characteristics (distance, etc.) and competition as independent variables as well as: (*a*) controls for the above-noted demand and supply schedules; (*b*) a time trend, season, and region/state dummies; and (*c*) a 0-1 disclosure policy variable and associated interaction terms to identify any change in rate level that results from initiation of the contract disclosure policy. The region/state dummies attempt to control for cross-region rate determinants not formally incorporated into the model, while season dummies are included to capture any seasonal variation in rates. The time-trend variable captures the trend in rates after controlling for changing demands, supplies, and shipment characteristics, and when interacted with the 0-1 policy variable, yields a term whose coefficient measures rate trend after initiation of the disclosure policy in January 1987. Historic grain flow studies show the study region's rail industry has little intermodal competition, thus a competition variable is not included.

The following logarithmic form for the regression equation was specified:

$$\begin{aligned}\ln(RTM) = {} & a_0 + a_1\ln(HRDM) + a_2\ln(HRS) + a_3\ln(RS) \\ & + a_4\ln(RC) + a_5\ln(RU) + a_6\ln(MILE) \\ & + a_7\ln(SHSZ) + a_8\ln(TON) + a_9(Q_1) \\ & + a_{10}(Q_2) + a_{11}(Q_3) + a_{12}(KN) \\ & + a_{13}(TX) + a_{14}(TR) + a_{15}(DP) \\ & + a_{16}(TRDP) + a_{17}(KNTRDP) \\ & + a_{18}(TXTRDP) + U.\end{aligned}$$

The rate or price measure, *RTM* (revenue per ton-mile), is obtained from the ICC's Public Use Waybill Files for 1983–88 (MacDonald 1987).[4] Waybill files are a stratified random sample of all nonproprietary wheat traffic in Kansas, Oklahoma, and Texas and include 15,586 observations (ICC 1983–88). Associated with each rate are the short-line miles of haul (*MILE*), number of cars in the sampled shipment (*SHSZ*), average number of tons per car in the sampled shipment (*TON*), region/state where the haul originated (*KN, OK, TX*),

[4] MacDonald (1987) compared tariff and Waybill rate files to determine whether Waybill files included contract rates. He concluded that Waybill files do include contract rates since they are substantially below the published tariff for identical hauls.

Table 1. Variable Identification, Description, and Descriptive Statistics

Variable Identification	Description	Mean	Maximum	Minimum	Standard Deviation
RTM	Revenue per ton-mile, 1983–88 $/ton-mile	0.0382	3.3227	0.00001	0.0773
HRDM	Monthly hard red winter wheat exports, 1983–88, 1,000 bu.	51,589.9	113,266.0	19,129.0	22,857.1
HRS	Annual hard winter wheat production and carryover, 1983–86, 1,000,000 bu.	1,909.06	2,027.0	1,447.0	86.1
RS	Capacity of rail grain fleet, 1983–88, 1,000,000 bu.	816.95	823.5	809.30	5.19
RC	Quarterly index of railroad materials, fuel and labor costs (1977 = 100)	193.27	208.4	176.1	8.19
RU	Ratio of rail grain traffic by quarter to rail grain fleet capacity (*RS*)	1.4	1.81	1.07	0.22
MILE	Short-line miles associated with Waybill sample rail data	380.63	3,200.0	5.00	315.99
SHSZ	Number of railroad cars associated with Waybill sample shipment	17.35	230.0	1.00	30.51
TON	Average tons per car associated with Waybill sample rail data	97.28	113.0	3.85	14.11
Q_1, Q_2, Q_3	Seasonal dummy variables for first, second, and third quarters				
TR	A yearly time trend, 0 = 1983, 1 = 1984, 2 = 1985, 3 = 1986, 4 = 1987, 5 = 1988				
KN	0-1 variable, Kansas origins				
TX	0-1 variable, Texas origins				
DP	0-1 variable, contract disclosure 1983–86 = 0, 1987–88 = 1				
TRDP	0-1 variable, interaction between *TR* and *DP*				
KNTRDP	0-1 variable, interaction between *KN*, *TR*, and *DP*				
TXTRDP	0-1 variable, interaction between *TX*, *TR*, and *DP*				

and the day, month, and year of shipment (table 1). It is hypothesized that the miles of haul (*MILE*), shipment size (*SHSZ*), and tons per car (*TON*) variables are negatively related to revenue per ton-mile (*RTM*).[5]

The demand for hard red winter wheat (*HRDM*), supply of hard red winter wheat (*HRS*), and supply of rail transportation service (*RS*) are included to control for their effect on rate (table 1). The wheat demand and supply variables are expected to be positively related to rate (*RTM*), while rail supply would be negatively related to *RTM*. Monthly hard red winter wheat exports are included as a proxy for wheat demand (*HRDM*) [U.S. Department of Agriculture (USDA), *Grain and Feed Market News*]. Changes in the demand for rail transportation service are primarily associated with changing export demands since domestic demands are relatively constant over time, thus the choice of the export variable. Annual hard red winter wheat production and carryover represent the wheat supply variable (*HRS*) in the specified model (USDA, *Wheat Situation and Outlook*).

The capacity of the railroad industry's grain fleet is published annually in *The Grain Book* (AAR 1988e) and is taken as a measure of railroad supply (*RS*), while the AAR's monthly index of railroad costs (*RC*) serves as a supply shifter (AAR, *Railroad Cost Indexes*).[6] Because a large portion of railroad costs are fixed, the utilization of grain carrying capacity may have a favorable impact on costs and rates. To capture this potential effect, a ratio variable (*RU*) is calculated which includes rail-trans-

[5] Costs of switching, classification, and documentation as well as some line haul costs do not increase proportionately with mileage. As a result, costs and rates per mile are expected to decline with distance.

[6] The rail cost variable (*RC*) is highly correlated with per-mile motor carrier costs. Thus, it also may be viewed as a measure of truck competition.

ported grain shipments per month as the numerator and grain carrying capacity of the rail fleet as the denominator. It is hypothesized that railroad supply (*RS*), railroad cost (*RC*), and utilization of railroad capacity (*RU*) variables will influence rates negatively. To capture any seasonal variation in rates, quarterly dummies (Q_1, Q_2, Q_3) are incorporated in the specified model.

The annual trend variable (*TR*) will provide information on study-region railroad rate trends after controlling for the above-identified exogenous variables. Earlier studies show study-region rates trend downward over the 1981 through 1986 period, thus a negative sign is expected on this variable.[7] To measure the impact of contract disclosure, a 0-1 disclosure policy variable is included. All observations in the 1983–86 period are assigned a zero and those in 1987 and 1988 are assigned a one. In January 1987 contract disclosure was initiated. Of course, the use of a dummy variable to capture the effects of the change in policy requires that one recognize that other unidentified "causal" factors which are coincident with the policy change are candidates for affecting the observed result on rates (Campbell and Stanley). The authors know of no such variables. An interaction term (*TRDP*) between *TR* and *DP* measures the rate trend in the post-disclosure period. If the estimated coefficient on *TRDP* is positive and larger than the anticipated negative coefficient on *TR*, the study-region rate trend will have been reversed. The unique effect of contract disclosure on rate trends in each state within the study region is measured by interacting the state dummies (*KN, TX*) with the *TRDP* variable to yield the *KNTRDP* and *TXTRDP* variables.

Results and Implications

The coefficients and associated *t*-statistics for the estimated regression equation are shown in table 2. The adjusted R^2 is .7148 and the Durbin-Watson statistic indicates no serial correlation. All continuous variables are significant at the .01 level except *HRS* and *RS*. Distance of haul (*MILE*) is negative, large, and highly significant with a *t*-ratio of −125.0. Since the estimated coefficients on all continuous variables are elasticities, increasing miles of haul (*MILE*) by 1% lowers the ton-mile rate by .63%. The number of cars in a shipment (*SHSZ*) and mean tons per car in a shipment (*TON*) also have important impacts on rates, with estimated elasticities of −.18 and −.12, respectively. Monthly exports of hard red winter wheat (*HRDM*) are positive and significant but relatively small. A 1% increase in monthly wheat exports leads to only an estimated .06% increase in rates. Railroad costs (*RC*) also have a positive and significant effect on rates. Neither the wheat (*HRS*) nor railroad (*RS*) supply variables are significant.

The coefficient on the trend variable (*TR*) is negative and highly significant indicating that rates trend downward in the study region between 1983 and 1986. After controlling for the identified exogenous variables, rates decreased about 5% per year or 20% during 1983–86. This closely parallels the findings of Babcock

Table 2. Estimated Regression Coefficients for Plains Rail Rate Equation[a]

Variable	Coefficient	*t*-Ratio
Constant	−18.5091	−1.150
*HRDM**	0.0581	4.588
HRS	0.0551	0.412
RS	1.6559	0.720
*RC**	1.4767	4.507
*RU**	−0.4251	−7.132
*MILE**	−0.6269	−125.041
*SHSZ**	−0.1842	−57.677
*TON**	−0.1183	−5.987
Q_1	−0.0076	−0.405
Q_2*	0.0427	2.956
Q_3*	0.0755	5.514
*TR**	−0.0551	−6.806
KN	−0.0140	−1.046
*TX**	−0.1936	11.905
*DP**	−0.8073	−9.597
*TRDP**	0.1668	9.308
*KNTRDP**	−0.01627	−4.102
*TXTRDP**	−0.01655	3.471
Adj. R^2 = .7148		
N = 15,586		
Durbin-Watson = 1.85		

[a] All continuous variables are in natural logarithms.
* Statistically significant at the .01 level.
Note: For explanation of variables, see table 1.

[7] We are referring to the trend of rail rates in the Great Plains. Presumably, there also may be underlying trends in either the farm level supply or the total demand for grain from the region which would affect rail rates through their impact on the demand for transportation services. However, our perusal of wheat data for the 1983–88 period revealed no discernable trends in either U.S. or worldwide wheat prices or wheat quantities produced, consumed, or traded. If there is any trend in the supply of transportation service, we would expect it to be in the direction of excess capacity, furthering the decline in rail rates.

et al.; Chow; and Fuller et al. who measured about a 33% rate decline in the study region during 1981–86. Further, rail rate trends in the post-disclosure era (*TRDP*) are positive and highly significant as are the interaction terms which measure rate trends peculiar to any state in the study region. Based on these coefficients the annual upward trend in rail rates in Kansas, Oklahoma, and Texas was about 10%, 11.8%, and 13.7% per year, respectively.[8] Thus, the downward trend in study-region rates has been reversed and the reversal is coincident with the initiated disclosure policy.[9] This observation comes after controlling for the identified exogenous forces which generally were found to have the expected impact on rates.

Some argue that the upward rate trend in 1987 and 1988 was the result of an increase in the demand for grain transportation service (AAR 1988d). They reinforce their contention by noting average monthly exports of hard red winter wheat increased from 30.5 million bushels in 1986 to 46.5 and 50.6 million bushels in 1987 and 1988, respectively. In spite of the substantial increase in exports, the results of this study do not support their contention. This study found export volume to be highly significant but to have a small direct effect on wheat rates. The elasticity of rates with respect to export volume was about .06, in which case the 53% increase in monthly shipments (1986 versus 1987) would have adjusted rates by less than 4%.[10] The effect of increased export demand is too small to account for the observed increase in rates.

A shift toward multicar shipments in the post-Staggers era is often cited as a partial explanation for the observed rate decline in the 1981–86 period (MacDonald 1989). A reversal of this trend could explain the recent upward rate trend, but, in fact, the average number of cars per shipment (*SHSZ*) in 1987–88 was about 21, the highest recorded during the six-year study period. Thus, the increased shipment size in 1987–88 offers no explanation for the measured trend. Nor does average length of haul (*MILE*), tons per car (*TON*), railroad costs (*RC*), or any other exogenous variable account for the observed trend in rates in 1987–88. Further, railroads should have been able to retain efficiencies associated with planning the deployment of personnel and equipment since major carriers in the study region introduced reservation programs after the reduced use of contracts (AAR 1988a).[11]

The Staggers Act fostered interrail competition through the abolition of rate bureaus and reduced reliance on the posted tariff schedules. The AAR maintains the implemented disclosure policy reduced grain contracting, thus increasing dependence on posted tariffs. This research suggests that contract disclosure and increased use of tariffs facilitated rate coordination and the subsequent upward trend in rates. This was possible in the study region because of ineffective intermodal competition. In those regions where railroads and barges compete for grain traffic (Corn Belt), there is less reason to expect the upward rate trend observed in the Plains.

Summary and Conclusions

Legislation in the fall of 1986 required the ICC to broaden disclosure of terms of contracts between agricultural shippers/receivers and railroads. Rules were issued in January 1987 that forced disclosure of most contract terms. Previously, nearly all terms were confidential. The purpose of this study was to determine whether contract disclosure affected railroad grain rate levels in the South and Central Plains.

A regression equation was estimated which included rail rates as the dependent variable and a variety of independent variables which controlled for shifts in transportation demand and supply, shipment characteristics and shipping region, as well as a 0-1 disclosure variable and interaction terms to measure rate trends in the pre- and post-disclosure periods. Rate data were obtained from the ICC's Public Use

[8] A telephone survey (May 1988) of seven shippers in the panhandle of Texas and western Oklahoma showed export rates increased an average of 17.6% in the first 15 months following initiation of the disclosure policy in January 1987.

[9] This result is based on the presumption that our trend variable (*TR*) only captures trends in railroad rates. If the trend variable should incorporate any other trends that may be included in the structural equations, these results must be reinterpreted (see footnote 7).

[10] Fuller et al. found the elasticity of the export price spread with respect to export volume ranged between .06 and .07 in the study region, an estimate virtually identical with the elasticity of rate with respect to export volume estimated by this study.

[11] Since legislation mandating grain contract disclosure was implemented, the Burlington Northern and Union Pacific introduced forward arrangements and similar specialized reservation programs to facilitate improved scheduling of equipment and personnel. These programs were initiated in early 1988.

Waybill Files for 1983–88. The estimated coefficients showed study-region rates trended downward through 1986, a finding supported by earlier research. However, coincident with the implemented disclosure in January 1987 was a strong and significant upward trend in rates. Based on the estimated coefficients, rates in Kansas, Oklahoma, and Texas increased at an annual rate of about 10%, 11.8%, and 13.7%, respectively. The reversal in rates was measured after controlling for the effect of exogenous forces.

This study suggests that contract disclosure and the increased reliance on posted tariffs facilitated rate coordination by the oligopolistic railroad industry, thereby leading to an increase in rail rates. This finding supports those of Hong and Plott who investigated the effect of rate disclosure on rate levels of the inland barge industry. In addition, this finding supports the argument of grain shippers who contend that contract disclosure discourages interrail competition. The implemented disclosure policy represents a return to shipper rate equalization, a regulatory philosophy of the pre-Staggers era.

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