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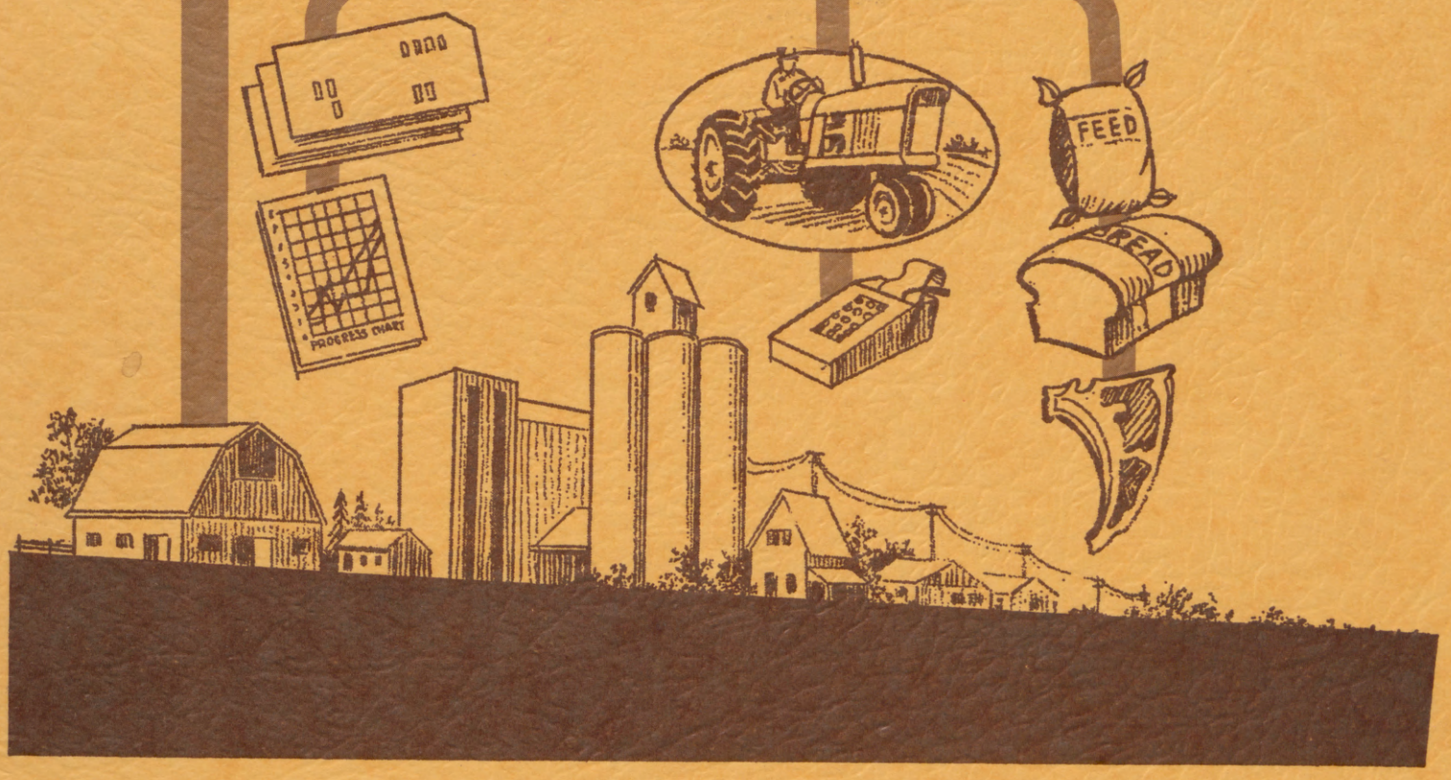

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Effects of Contract Rail Rates on Level of Grain Bids at Country Elevators

by

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Abstract

An econometric model was used to compare grain bids at contracting and non-contracting elevators, before and after the Staggers Act became law. Passage of the Act was associated with a decrease in basis of 20 cents/bushel. Implied rail rates from contracting elevators were 12 cents below those without contracts.

EFFECTS OF CONTRACT RAIL RATES
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The Problem

Among the more important and perhaps the most controversial of the provisions of the Staggers Rail Act of 1980 [Public Law 96-448] is that providing for the right of shippers and carriers to enter into secret contracts specifying rates and other terms of trade. Railroad management has been highly supportive of the Act and the freedom afforded by the contract provision to make rate adjustments to meet changing supply and demand conditions. Some shippers unable to negotiate such contracts have contended that their contracting competitors are thereby afforded an unfair advantage [USDA, 1984]. Research aimed at measuring the alleged rate advantage enjoyed by contract shippers has been hampered by the confidentiality of contract terms. Thus, while it is apparent that contracting has become a widely used substitute for traditional published tariffs [Association of American Railroads], little is known about the extent of the resulting departure from those published rates.

The present paper describes methodology designed to skirt the data problem and recounts briefly the results of an empirical application. The purpose of the application is to estimate the rate effects of contracting and the implied implications for grain producers. A short, preliminary review of some recent empirical studies provides methodological and theoretical background.

Previous Studies

Fuller, Makus and Taylor used a cost-minimizing spatial model to assess the likelihood of real increases in post-Staggers rail rates for export-grain movements from the principal corn, soybean, and wheat producing regions in the U.S. The authors concluded that rates in these regions were already as high as competi-

tive forces would permit, making significant increases unlikely in the near future.

Wilson focused on the northern Plains in a study of wheat shipments from North Dakota, using a derived-demand model to estimate factor-share equations and to derive elasticities. The results, in contrast to those of Fuller, Makus and Taylor, indicated that the demand for rail service was price-inelastic, suggesting that a freer regulatory environment might prompt railroads to raise their rates.

These and other recent investigations, several of which are discussed by Wilson [pp. 3-6], fail to provide conclusive insights into the expected revenue effects of railroad rate changes. Oriented as they generally have been toward providing a macro view of the responsiveness of traffic to rates, studies to date fail for the most part to distinguish among potentially differing responses of different shippers in differing circumstances. Moreover, previous research has sought ex-ante answers to the effects of Staggers. Now, however, the passage of time provides opportunities for ex-post assessments. But while carriers and shippers have had ample time to react to provisions of the Act, their actions are veiled by the effects of one of these provisions--the confidentiality of contract terms.

A method is needed for estimating this missing information. A method of analysis is needed which permits the identification of effects arising from access to contract rates and from other variables expected to have been impacted by passage of the Act. A study by Davis and Hill provides a basis for meeting both needs. The study employed regression procedures in an analysis of the competitive environment surrounding purchases of grain by country elevators in Illinois.

Based on the Illinois study, a subsequent study by Boynton, Forster and Lang, and a preliminary assessment of market conditions in Nebraska, it was hypothesized

that elevator bids for grain are primarily a function of: 1) price received for the commodity, 2) availability and cost of transportation, 3) operating costs, 4) local supply and demand conditions and, 5) market power. Davis and Hill observe that prices in a perfect market should differ among locations by no more than the cost of transportation, and among time periods by no more than the cost of storage. Within these limits, changes in costs, including transportation rates, should be reflected in elevator bids [Davis and Hill, p. 135].

The present study endeavors to isolate rail rates from other components of elevator bids and to measure the effects contracting has had on the rate component of bids. At the same time, however, it is clear that elevators having transportation or other cost advantages may not necessarily pass those savings on to producers in the form of higher prices; bids need be no higher than dictated by competitive forces, no higher than required to attract the most profitable volume of business. Any analysis of the effects of transportation cost changes on bids must therefore account for effects of competitive conditions as well as other factors.

The Models

Econometric procedures are used in the present study which focuses on the effects of transportation-related changes on elevator bid prices for corn and soybeans. By controlling for various factors, other than the 1980 Act, which are expected to influence bids, the remaining values of the bid variable reflect the effects of the Staggers Act alone. Specifically, the hypothesis is tested that the Staggers Act has had a different effect on bids by elevators which contract with railroads than on those which do not. Because their end uses and patterns of marketing are substantially different, the bids for corn and soybeans are analyzed separately; their respective models are specified as follows:

Corn Model

$$BIDS = (\alpha + \beta_1 STAGGERS + \beta_2 CONTRACT + \beta_3 STAGGERS*CONTRACT) + \beta_4 FUTURES + \beta_5 COMPETITION + \beta_6 TURNOVER + \beta_7 SUPPLY/DEMAND + \beta_8 \%RAIL + \beta_9 \%BARGE \quad (1)$$

Soybean Model

$$BIDS = (\mu + \delta_1 STAGGERS + \delta_2 CONTRACT + \delta_3 STAGGERS*CONTRACT) + \delta_4 FUTURES + \delta_5 DENSITY/COMPETITION + \delta_6 TURNOVER + \delta_7 TRUCK + \delta_8 \%RAIL + \delta_9 \%BARGE \quad (2)$$

The hypothesized effects of the above variables are as follows:

STAGGERS is a variable designed to capture impacts of the Staggers Act. It is a dummy variable assigned the value 0 for years before Staggers and 1 for years after the Staggers Act became effective. Since the basic purpose of the present research is to test the widely divergent views regarding the implications of this variable for transport rates, no hypothesis is offered concerning its expected effect. Care is needed to distinguish between effects of the Staggers Act and effects of other time-correlated events coincident with Staggers. Choice and modeling of the remaining variables is critical in this respect.

CONTRACT is a firm-type designation, applied to each year, both pre-and post-Staggers, and is designed to reflect, in its interaction form (STAGGERS*CONTRACT), transportation cost advantages stemming from the contracting provisions of the Staggers Act. It is hypothesized that contract rates, calling as they apparently normally do, for minimum lot sizes and total volumes, are lower than tariff rates. By itself, CONTRACT may reflect elevator operating costs if those factors which affect the ability of elevators to obtain contract rates, such as loadout capacity, affect their operating costs.

FUTURES, the Chicago Board of Trade price of the nearest month's futures contract, represents market price, the base by which the prices received by

elevators are normally calculated. This variable is included to control for the effects of world-wide supply and demand variables.

COMPETITION is a value, assigned to each elevator in each crop year, reflecting the intensity of competition the elevator faces for corn or soybean purchases in its own local trade area. The more intense the competition, the higher the competition index number. The values range from 1, where the elevator manager reported no significant competition in the local trade area, to 6.5, where an elevator with no rail facilities faces competition from one or more train-load shippers using contract rates.

TURNOVER, an elevator's yearly sales volume of each commodity divided by its total storage capacity, is a reflection of elevator operating costs. Differences in bids may reflect differences in operating costs, at least to the extent that elevators have a degree of monopsony power [Davis and Hill, p. 136]. The lower an elevator's turnover of a commodity, the higher its anticipated average costs and, if it has sufficient monopsony power, the lower its expected bids.

SUPPLY/DEMAND (corn analysis only) is a ratio of the density of the local supply of corn and corn-equivalents of other feed grains to the density of local livestock demand for feed grains. Transportation costs impart some degree of monopsony power to elevators vis-a-vis nearby producers. The greater the local supply relative to demand, the greater a local elevator's insulation from outside market forces and the lower its expected bids for corn. The SUPPLY and DEMAND portions of the variable are each a weighted average of the production and usage values from each surrounding county (divided by the land area of each county in acres), including the county in which the elevator is located. Densities in counties closer to the elevator are given proportionally more weight.

DENSITY/COMPETITION (soybean analysis only) is a ratio variable used as a gauge of the supply of soybeans relative to the intensity of elevator competition for that supply. Because the use of raw soybeans by feeders is assumed to be minimal, a measure of local demand as unprocessed feed is not included in the soybean model. The DENSITY part of the variable is (like the SUPPLY component of the SUPPLY/DEMAND variable for corn) a weighted measure of the bushels produced in each surrounding county (divided by the land area of the county), including the county in which the elevator is located. Bushels produced closer to the elevator are given proportionally more weight than those produced farther away. The COMPETITION part of the variable is defined above.

%RAIL and %BARGE are the decimal fractions of each elevator's outshipments which move by rail and barge, respectively. The variables are designed to reflect modal differences in transportation costs among elevators. To the extent that these variables reflect specific commodity destinations, they may also affect prices received by elevators.

TRUCK is the cost of trucking soybeans to the nearest processing plant. Bids for soybeans are expected to be inversely related to this variable since processing plants are a primary market for Nebraska soybeans. TRUCK may provide a proxy for local demand for soybeans, lower trucking costs suggesting a relatively greater demand pull from local processing markets.

Data

Weekly (Thursday) corn bids were obtained from 20 Nebraska country elevators for the period September 1978 through August 1984; soybean bids were obtained from 14 of the 20 elevators. Weekly (every Thursday) futures settlements were obtained from the Chicago Board of Trade. Effects of week-to-week fluctuations were

reduced by averaging weekly bids and futures prices into yearly prices, with a year specified as the period September 1 through August 31.

Local supply and demand densities were estimated from USDA data [Nebraska Agricultural Statistics]. Trucking costs were compiled by Mr. Glenn Hess, Department of Agricultural Economics at the University of Nebraska-Lincoln, from various engineering studies.

Data describing individual elevator operating characteristics, such as grain destination, modes of transport and rail facilities were collected by personal interview with elevator managers and grain merchandisers. Sample elevators were selected on the basis of their representativeness of a range of the diverse operating environments found in Nebraska. Distinguishing factors included: 1) use of contract rates; 2) geographic location with associated market orientation; 3) barge availability; 4) access to multiple-car shipping opportunities; and 5) the specific railroad serving the elevator.

Their location in the northern Plains, a region often characterized as "captive" to the railroads [USDA, 1980], makes Nebraska elevators a particularly good focus for the study. Effects of the Staggers Act are likely to be more sharply drawn and thus more observable in Nebraska than in "less captive" states.

Procedures

Since the data sets were pooled from both cross-section and time-series observations, the null hypothesis of no difference between the intercepts of the cross-sections was tested in an analysis of covariance model [Dielman, pp. 254-5; Pindyck and Rubinfeld, pp. 114-5]. The null hypothesis was not rejected at the 90-percent level of significance in either the corn or soybean model, indicating that the assumption of equal intercepts for the cross-sections was appropriate.

A test using Variance Inflation Factors [Judge et. al., 1980, pp. 461-2; Semprevio and Capps, p. 3] and a test proposed by Belsley, Kuh, and Welsch [pp. 85-191] indicated moderate collinearity problems in both models associated with the variable FUTURES.[1] Since these tests indicate almost no collinearity when BASIS (FUTURES - BIDS) is used as the dependent variable, this specification is used in the final models. In effect, this restricts the coefficient on FUTURES to equal 1.[2] With this specification higher bids correspond to smaller basis values.

The null hypothesis of homoskedasticity was tested using a multiplicative test [Judge et. al., pp. 141-2]. The test indicated a problem with heteroskedasticity in the corn model associated with the variables FUTURES, SUPPLY/DEMAND, and TURNOVER, but no significant heteroskedasticity in the soybean model. Generalized Least Squares [Kmenta, pp. 250-4; Judge et. al., 1982, pp. 291-2] was used to correct for the problem in the corn model.

Results

Results of the study confirmed the hypothesis that changes in confidential contract rail rates could, given an appropriately specified model, be isolated from publicly-available country elevator basis patterns. Moreover, the findings were broadly consistent with the hypothesis that the Act in general and the contracting provision of the Act in particular had indeed impacted prices paid to farmers. An average decrease in the basis of about 20 cents per bushel for each commodity at sample elevators was attributable to the STAGGERS variable.

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[1]Although the Durbin-Watson statistics are presented in Tables 1 and 2, the small number of time periods (six) in each cross-section limits the applicability of autocorrelation tests.

[2]Results using BIDS as the dependent variable were very similar to those obtained using BASIS; the R^2 values were between 0.95 and 0.98.

The soybean model explained about 65 percent of the variation in BASIS; all but two of the coefficients in the soybean model were significant and had the expected sign. The insignificant coefficient for the TURNOVER variable was not necessarily a surprise; to the extent the variable is a proxy for elevator operating costs, the insignificant t-ratio suggests a lack of monopsony power. Alternatively, TURNOVER may be insignificant because, for elevators which earn substantial revenue from storing grain, the variable may be a poor indicator of capacity utilization.

The interaction term, CONTRACT*STAGGERS, provided a test of the hypothesis that the Staggers Act has had differential effects on elevators which contract and on those which do not. The positive, significant coefficient on the term indicates that basis values of contracting elevators decreased an average of 12 cents per bushel more following Staggers than did those of non-contracting elevators. The insignificant coefficient on CONTRACT indicates that there was no significant difference, after controlling for other variables, between basis of contracting and non-contracting elevators before Staggers.

In contrast, only the intercept and two coefficients, STAGGERS and SUPPLY/DEMAND, were significant at the 5-percent level in the corn model, and the model explained only about 45 percent of the variation in BASIS. The negative sign on SUPPLY/DEMAND was opposite of what was expected. One explanation may be that elevators in areas with a high density of local supply relative to demand were unit-train shippers whose primary market was export ports, enabling them to bid higher prices for corn. There was no significant difference between basis of contracting and non-contracting elevators, either before or after Staggers.

The contrast in results between the two commodities apparently results from differences in their marketing patterns and in the resulting competitive environments. Whereas local processors buy a large proportion of Nebraska soybean

production, export elevators and out-of-state feeders are primary markets for corn. As a result, excess capacity in the export industry in recent years may have affected bids for corn more than it has bids for soybeans, as elevators sought to accomodate expanded merchandising capacities to diminished marketings of corn. Moreover, the relatively greater number of local elevators bidding for corn may lead to more intense competitive pressures in corn markets. Elevators may have set their bids more in response to competitors' bids than to their own costs of operation, resulting in few significant explanatory variables.

Barge and rail rates in general fell in 1981, probably due to excess capacity in the industry (see Hauser), at least partially explaining the large significant coefficient on STAGGERS. Also contributing was excess capacity in the grain merchandising industry. The important result of this study, however, is the difference between basis values of contracting elevators and non-contracting elevators. While the evidence is not conclusive, the results suggest that elevators contracting corn shipments benefitted from Staggers to about the same extent as did those contracting soybeans; at least part of their advantage has been reflected in smaller basis values. At the same time, competing elevators without benefit of contracts have apparently been forced to increase their bids, accepting lower rents in an effort to compete with the higher bids of the contractors. Recent increases in the rate of elevator bankruptcies lend further credence to such a characterization.

Conclusions

Results of the study support the feasibility of applying well-established econometric procedures to the measurement and analysis of an apparently unmeasurable transportation variable--confidential railroad contract rates. Results of empirical tests of the model provide insights into the effects of the Staggers

Rail Act of 1980 on shippers of corn and soybeans, two important agricultural commodities marketed under rather different conditions.

Analysis of elevator basis patterns suggests that elevators using the contracting mode made legal by the 1980 law have realized major rate savings relative to elevators not shipping under such contracts.

Procedures employed in the study provide a more disaggregated view of the effects of the Act than did previous analyses which employed, by necessity, ex-ante approaches. Thus, the present study was able to focus specifically on effects of the contracting mode as well as more generally on effects of the Act as a whole.

Results of statistical tests provide confidence that the modeling is generally realistic and that, with a minimum of adaptation, it could be applied to other commodities, other geographic areas and other periods of time. Such applications, particularly extensions in the time dimension, would provide a critical test of the model's validity and valuable additional information about the implications of the Staggers Act.

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Table 1

Results of GLS estimation of soybean model

R^2 = 0.68 Adjusted R^2 = 0.64 DW = 1.90

VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	T-RATIO (ASYMPT.) df=67
STAGGERS	-0.203	0.028	-7.15**
CONTRACT	0.016	0.051	0.32
STAGGERS* CONTRACT	-0.123	0.051	-2.39**
DENSITY/ COMPETITION	0.092	0.228	4.03**
TURNOVER	0.012	0.030	0.41
TRUCK	1.070	0.241	4.45**
%RAIL	-0.001	0.0004	-3.83**
%BARGE	-0.003	0.001	-2.61**
CONSTANT	0.443	0.059	7.50**

Table 2

Results of GLS estimation of corn model

R^2 = 0.49 Adjusted R^2 = 0.45 DW = 2.44

VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	T-RATIO (ASYMPT.) df=99
STAGGERS	-0.199	0.277	-7.19**
CONTRACT	-0.018	0.036	-0.48
STAGGERS *CONTRACT	-0.024	0.046	-0.51
SUPPLY/ DEMAND	-0.010	0.005	-1.82*
COMPETE	-0.007	0.009	-0.75
TURNOVER	-0.001	0.005	-0.26
%RAIL	0.0001	0.0004	0.26
%BARGE	-0.0009	0.001	-0.65
CONSTANT	0.465	0.048	9.69**

*indicates significance at the 10% level
**indicates significance at the 5% level
Dependent variable = BASIS

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