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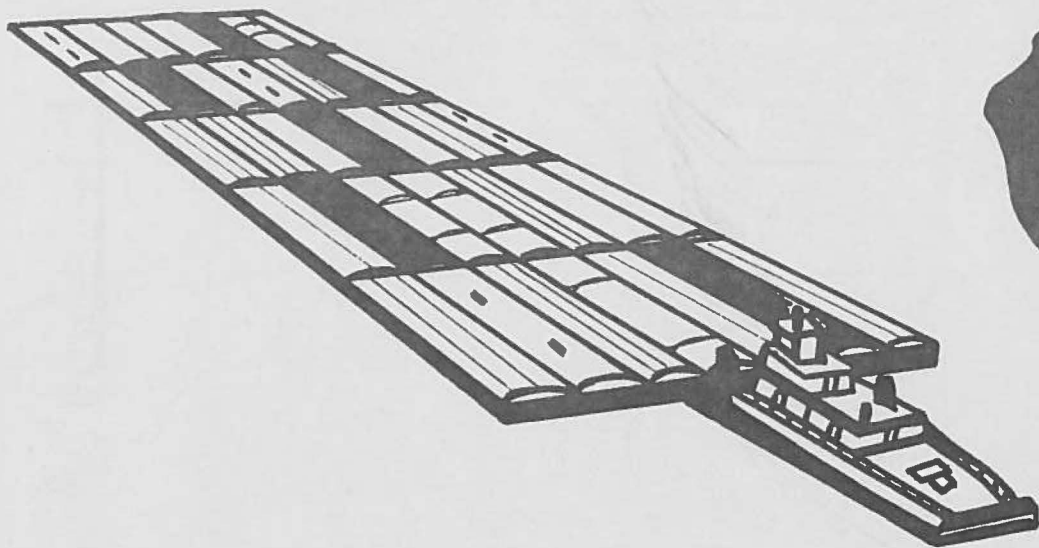
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STRUCTURE OF THE UNITED STATES GRAIN BARGING INDUSTRY  
ON THE MISSISSIPPI RIVER SYSTEM



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Structure of the United States Grain Barging Industry  
on the Mississippi River System

Abstract

This paper presents previously unpublished descriptive structural data for the grain barging industry. Structural parameters are examined to compare the structure of the industry to the purely competitive model. Fewer than 25 firms provide regular line haul grain barging service on the Mississippi River System. Lack of product differentiation and relatively low barriers to entry have helped maintain the competitive nature of the industry. However, shifts in barge ownership to grain firms and market concentration based on the number of grain barges owned by each firm indicate a trend away from the purely competitive model, which could affect analyses of various waterway user charge schemes.



STRUCTURE OF THE UNITED STATES GRAIN BARGING INDUSTRY  
ON THE MISSISSIPPI RIVER SYSTEM

Prior to the development of overland modes of commercial transportation most freight carriage within the United States took place by water. Even though rail, motor truck, and pipeline now carry the major portion of intercity freight traffic in the United States, water transportation has not been entirely replaced. In 1975, inland waterway carriage amounted to 243 billion ton miles or slightly more than 10 percent of total intercity freight. Grain, petroleum products, coal and chemicals consistently comprise about 75 percent of total commodity movements on the Mississippi River System. Inland water transportation is particularly important for the movement of grain destined for export. Nearly half of the grain exported from the United States in 1975 arrived at export terminals via barge (Woolverton, p. 8).

Inland water transportation has recently come under close scrutiny by the Executive Branch of the Federal Government and by legislative committees of Congress. This scrutiny has therefore also activated special interest groups. Even though triggered by such local controversies as reconstruction of the Mississippi River Lock and Dam 26, the major underlying issue has been inter-modal equity. Representatives of other carriers, primarily rail, have argued that water rights-of-way are provided to inland waterway users at an advantageously low cost.

They feel the users of inland waterways should bear a substantial part or all of the cost of improving and maintaining publicly provided waterways. The primary point of contention has been the incidence of various proposed user charges. But definitive research has been hampered by lack of information specific to the subdivisions of the barging industry.

Because structure has a direct bearing on incidence, the purpose of this paper is to present and analyze structural data for the grain barging industry. The data, previously unavailable, were collected in the research phase of the author's dissertation. The original data collection effort was undertaken to test the usual assumption that the grain barging industry is purely competitive.

#### Evidence of Moderate Departure from Perfect Competition

The grain barging industry is a separate and unique part of inland waterway transportation. The uniqueness stems from the regulatory exemption of grain barge shipments, the specialized nature of the barge firms serving the grain trade, and the type of rate determination procedure used in the industry. In most studies the assumption has been that the grain barging industry is purely competitive. Authors of transportation textbooks such as Pegrum, Locklin, and Kneafsey, treat the inland water transportation industry as being very competitive compared with other modes; most authors would agree with Pegrum in concluding that "...costs are mostly variable, and the industry is therefore highly competitive" (Pegrum, p. 180).

Preliminary discussions by the author with barge firm managers indicated that recent structural changes in the grain barging industry may have affected the competitive nature of the industry. Periodic overbuilding of the grain barge fleet, a shift to the use of long term contracts for barge services, and entry into the grain barge industry by grain shippers were some of the specific occurrences cited.

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The major concern in industry structural analysis is with performance. In perfect competition, performance issues directly from industry structure. If imperfect competition exists within an industry, individual firms are faced with conduct options. Instead of a one-way causal relationship, industry structure and performance are reciprocally related and subject to modification by firm behavior.

In accordance with the structure, conduct, and performance technique of analysis, important structural variables bearing on the competitive nature of the grain barging industry are seller concentration, product differentiation, barriers to entry, and vertical integration. That structural variables such as these can have a potentially significant effect on the decision-making latitude of firm managers is now widely accepted in market structure literature.

Data for this structural study of grain barging came from the U.S. Army Corps of Engineers and personal interviews with managers of barge firms and grain shippers. The data not only bear on the structural issue that was paramount, but



constitute a (partial) information base that was previously unavailable. The data are generally descriptive of the grain barging industry and pinpoint changes in structure that have occurred in the past few years.

#### Seller Concentration

According to Corps of Engineers data for 1975, approximately 1,850 firms owning over 20,000 barges provide waterborne transportation services on inland waterways. Of the 1,850 firms only 956 operate on the Mississippi River System and not all of these tow grain barges. Some direct their operations toward movement of a specific non-grain commodity such as coal or petroleum. Many firms specialize in a supportive operation such as switching, fleetling, mid-stream refueling, or dredging. Although any firm owning a large towboat could push grain tows, personal interviews by the author with industry personnel suggest that regular line haul carriers of grain on the Mississippi River System number no more than 25.

The size of firms in an industry can be expressed in terms such as number of employees or sales. Neither of these statistics is readily available for individual firms in the grain barging industry. On the other hand, it is common in the barge industry to rank firms by number of barges owned.

Industry sources provided a list of thirty-five firms owning covered barges used in the grain trade. Twenty-five of these own line haul towboats. Ten, mostly grain shippers, do

not. Corps of Engineers data indicate that between 1970 and 1977 the total count of grain barges nearly doubled (see Table 1). Barges were added rather rapidly during the early 1970s, when grain exports to the U.S.S.R. and other countries increased so fast. Fewer barges have been added annually since 1974.

Conforming to the customary analytical format of showing the number and size distribution of firms in the industry and the concentration ratio (Caves, p. 8), Table 2 presents the size distribution of firms owning grain barges on January 1, 1977. Although several firms own relatively large numbers of barges, well over half the firms could be described as middle-sized, owning 100 to 300 barges. Only one-fourth of the firms own less than 99 barges each.

Converted to 4-firm, 8-firm, and 20-firm concentration ratios, the data show only moderately high concentration at the 4-firm level but fairly high concentration at the 20-firm level. The ratios for 1977 indicate declining 4-firm concentration. The data for the two years are as follows:

	<u>Total Number of Companies</u>	Percentage of <u>Total Number of Barges Owned By:</u>		
		<u>Largest 4</u>	<u>Largest 8</u>	<u>Largest 20</u>
January 1, 1977	35	28.6	45.6	82.6
January 1, 1972	31	44.5	57.7	72.3

Based on degree of concentration, as of 1977 the grain barging industry was a type II oligopoly and nearly met the criteria for classification as type I oligopoly, in which the

Table 1 Covered Barges Available to the U.S. Grain Trade  
on the Mississippi River System, 1970-1977.

Year	Number of Barges	Percent Change from Previous Year
1970	4074	
1971	4329	6.3
1972	4762	10.0
1973	5464	14.6
1974	6121	12.0
1975	6452	5.4
1976	6819	5.7
1977	7344	5.7

Source: Enumeration obtained from Transportation Lines on the Mississippi River System published annually by the U.S. Army Corps of Engineers.

Table 2 Ownership Size Distribution for Covered Barges,  
among Grain Barging Firms Operating on the  
Mississippi River System, January 1, 1977.

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Number of Barges	Number of Firms
0 - 19	1
20 - 49	5
50 - 99	3
100 - 199	10
200 - 299	9
300 - 399	4
400 - 499	1
500 - 599	1
600 - 699	1
TOTAL	<u>35</u>

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largest eight firms are responsible for at least 50 percent of industry output and the largest twenty firms at least 75 percent (Caves, p. 11).

#### Product Differentiation

Product differentiation exists when a buyer can form a preference for the product of a particular firm within an industry based on real or imagined differences in the firm's product compared with similar products of other firms. As a single criterion the physical characteristics of barges allow no product differentiation. All dry covered cargo barges used in the grain trade are built to the same physical specifications.

However, the product of a grain barging firm is more than the physical features of a barge. The product is the total package of services involved in moving a cargo of grain from origin to destination. This includes the barge space, towing, switching, fleeting, and other features such as cargo insurance, demurrage penalties, and terms of payment. In spite of possible variations which occasionally occur, contracts for barge services have been standardized in line with the terms specified in Bulk Grain Tariff No. 7, which the Waterways Freight Bureau filed with the Interstate Commerce Commission on behalf of grain barging firms. Even though the Tariff has officially been cancelled, carriers still generally adhere to its terms.

In trying to differentiate their particular package of services, some barge firms have built reputations for consistently providing reliable service. A barge firm that establishes

a good reputation with shippers is able to reduce the substitutability with services of a firm having a poor record. Even so, there is little basis for concluding that the degree of product differentiation would allow one firm to charge a substantially higher price for its services than other barge firms.

### Barriers to Entry

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Product differentiation is commonly cited as a barrier to entry. Product differentiation allows established firms some flexibility in administering prices based on product features that are difficult for competitors to duplicate.

Even though only slight product differentiation exists in the grain barging industry, longstanding favorable relationships with customers may enable a firm to charge slightly higher prices than existing or potential competitors. At very least, the firm may be granted first chance at the opportunity to supply all or a part of a customer's future needs. Little evidence was found to indicate that individual firms providing grain barging services can consistently charge higher prices than competitors, but it is common for grain shippers to refer most of their barging business to a preferred carrier. This alone can be an advantage for an established firm relative to an actual or potential new one.

Economics of size can become a formidable barrier to entry in those industries in which it is possible for a firm to reach a very large size in terms of the total market before

achieving a low per unit production cost. A potential entrant has limited alternatives when faced with such a situation. If a firm enters at such a scale that it too can achieve a low per unit production cost, it may create an over supply situation, reducing price and profits for itself and all other firms in the industry. As a second alternative, the new entrant may enter the industry at a rather small size to avoid disturbing the market, but then would have a cost disadvantage relative to the largest firms in the industry and would be vulnerable to price cutting, oligopolistic behavior on the part of the established firms. Of course, another alternative, which can be costly but avoids both of these difficulties, is for an entrant to acquire a going concern which has achieved optimal size and cost parity with other firms in the industry.

Charles Howe examined the economies stemming from increased firm size in inland water transportation. He concludes ". . . firms can increase their technical efficiency as the size of their operations increase and by being provided with a deeper and less congested waterway" (p. 42). Desalvo and Case separately refined and extended Howe's work (Shabman, p. 36). Their findings tended to support Howe's. Even so, the evidence suggests that economies of firm size are rather modest and do not represent a major barrier to entry.

Regulatory barriers to entry are virtually non-existent for the grain barging industry. Because grain is one of the dry, bulk commodities exempt from Interstate Commerce Commission (I.C.C.) regulation, potential entrants do not need I.C.C. approval for entry. However, once it is a part of the industry,

a firm must conduct its grain barging operation in such a manner that commodities shipped satisfy I.C.C. conditions for exemption as set forth in the Interstate Commerce Act of 1940.

Barriers to entry presented little problem during the period 1972 to 1977 as evidenced by the entry of five firms. One of the firms entering was a water carrier which transported no grain prior to the period examined. Four of the new entrants were grain companies which purchased barges. Although its action did nothing to change the number of firms in the grain barging industry, a large grain company acquired an existing barge firm during the period 1972 to 1977. One firm left the industry during the period.

#### Vertical Integration

Where number, size, degree of product differentiation, and conditions of entry explain horizontal relationships in an industry, the degree of vertical integration as a structural variable describes vertical relationships. Vertical integration occurs when an established firm acquires control over successive stages in the production-marketing sequence.

Vertical coordination in the grain barging industry has tended to shift from market exchange and negotiated contracts to direct ownership. The expansion in number of barges in the early 1970s was due in large part to grain company purchases of barges. Grain firms increased their ownership share of the total number of grain barges from 25 percent in 1972 to 40 percent in 1977 (Woolverton, p. 61). Several grain companies



have acquired barge firms.

Vertical integration by grain firms into barge ownership or barge line operation has occurred for several reasons. In the early 1970s sharply increased grain exports coupled with a relatively fixed supply of grain barges caused barge rates to increase without an accompanying rapid increase in barge space (see Table 3). Purchasing barges or a barge firm assured a grain shipper of the means to transport grain to export and inland water terminals. In the mid-1970s, as the size of the barge fleet grew, stabilization of grain export volume caused barge rates to fall drastically. Integration into barging by grain firms during a time of widely fluctuating barge prices tended to reduce the uncertainty of merchandising profits by internalizing barging costs.

Diversified grain companies that also trade in commodities other than grain have an additional incentive to integrate into the grain barging industry. Non-grain commodities such as fertilizer make convenient backhauls for export grain barge shipments since they tend to move from South to North, the reverse of the downriver grain movement. By coordinating commodity movements internally, a diversified firm can achieve a high degree of barge equipment utilization, thus lowering per ton transportation cost.

A firm owning a substantial number of barges may find itself at times with insufficient quantities of commodities to ship to keep its barge fleet fully utilized. This could make barge ownership a costly proposition. Fortunately, for

Table 3 New Orleans Grain Export Volume, Number of Covered Barges Available on the Mississippi River System and Rates to Barge Grain on the Mississippi River System, 1970-1977, by Year.

Year	Grain Export Volume <sup>a</sup>	Number of Covered Barges <sup>b</sup>	Rates to Barge Grain <sup>c</sup>
	(millions of bushels)		
1970	684.5	4074	91.75
1971	713.8	4329	90.75
1972	957.2	4762	101.9
1973	1103.0	5464	134.3
1974	1138.9	6121	107.2
1975	1165.5	6452	90.3
1976	1649.8	6819	100.5
1977	1395.4	7344	118.6

SOURCES: U.S., Department of Agriculture, Agricultural Marketing Service, Grain Market News, 1970-1977; Enumeration obtained from Transportation Lines on the Mississippi River System published annually by the U.S. Army Corps of Engineers; Compiled from historical rates obtained from barge firms and grain shippers by the author.

<sup>a</sup>Volume of grain inspected for export at the New Orleans Gulf Port. Includes corn, wheat and soybeans.

<sup>b</sup>Covered, dry cargo barges.

<sup>c</sup>Historical, negotiated barge rates are not reported. In order to preserve firm anonymity, barge rates expressed as a percentage of the now discontinued Tariff No. 7 were aggregated into a composite rate for the Mississippi River System.

Presenting the rate as a yearly average masks the extreme volatility of grain barging rates. For example, in 1975 the average composite rate for May was 51 percent of tariff. By October, the rate had jumped to 208 percent of tariff. That translated into a 25 cents per bushel variation in cost to ship grain from Minneapolis to New Orleans.

firms in this situation, there exists a rather fluid spot market for barges. A firm may sell or buy the entire package of origin to destination services by negotiating with other firms. Some firms find trading in the barge spot market to be quite profitable and formulate trading strategies for barge space as if it were any other commodity.

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#### Summary and Concluding Remarks

This paper has presented updated descriptive structural data for the grain barging industry. The grain barging industry is one of relatively few firms. Concentration ratios based on the number of grain barges owned by each firm indicate that market concentration in the industry has declined slightly in the past five years but still is high enough to classify the industry as oligopolistic rather than purely competitive. On the other hand, lack of product differentiation and relatively low barriers to entry have helped maintain the competitive nature of the grain barging industry.

A significant finding was the trend toward vertical integration. Some of the recent industry entrants have been grain shippers which leased and purchased grain barges or acquired grain barging firms. They apparently did so in an attempt to gain greater vertical control of their operations.

The findings tend to refute the usual assumption that the grain barging industry is purely competitive. Investigation verified the casual observations of barge firm managers that recent industry structural changes have occurred in the industry.

This led to a conclusion that changes in structural characteristics push the barge industry away from the perfectly competitive model. If current trends continue, firm managers may be able to exercise certain conduct options which will cause industry performance to be questioned.

The findings of this research constitute an analytical base useful for public and private decision making. This report presents structural data previously unavailable. Perhaps of greatest importance is the conclusion that the grain barging industry can no longer be represented by the perfectly competitive model. The impacts of various user charge schemes on cost of service, quantity of services offered, intermodal competition, relative modal advantages among regions, and other distributional burdens must be examined in a different light.

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