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Structure, Conduct, and Performance Changes in the U.S. Agricultural Commodity Trucking Industry

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Introduction

Logistics is planning, implementing, and controlling the efficient and effective flow and storage of goods, services, and related information from the point of origin to the point of consumption—meeting customer requirements (Coyle, Bardi, and Langley, 1992). Logistics concerns two major activities: storage and transportation. Inputs, commodities, and products must be in or on the storage and transportation facilities before they reach the ultimate consumer or end user (Allen, Reeves, and Thomas, 1998).

The storage activity is centered on the number, size, design, type, and location of storage areas or warehouses. This activity also includes appropriate order sizes, reorder points, stocking locations, and other inventory matters (Coyle, Bardi, and Langley, 1992). The activity's primary function is to add time utility to agricultural inputs, commodities, or food products. Economic value is added to the good or service by having it at a demand point at a specific time.

Transportation activity is the movement of various agricultural inputs, commodities, and products from the point of origin to the point of demand. The primary function of transportation is to add place utility to agricultural and food products, which is accomplished by moving the products from production surplus areas to points where excessive demand exists. Moving of agricultural and food products requires the selection and use of a transportation mode or modes, based on criteria ultimately determined by an agribusiness firm's consumers or end users (Coyle, Bardi, and Langley, 1992).

Logistics is concerned with the cost of maintaining, operating, and improving transportation and storage facilities so that consumers can

be served at reasonable prices. Although storage and transportation are important activities in efficient and effective operation of the logistics system, this paper is limited to the transportation activity, in general, and, specifically, to one modal component of that activity—the agricultural commodity trucking industry. For purposes of this paper, the agricultural commodity trucking industry is defined as “those carriers that haul agricultural commodities for compensation.”

Objectives, Methods, and Data Sources

The general objective of this study is to evaluate the structure, conduct, and performance of the trucking firms that haul agricultural commodities in the United States as a group and by regions for the years 1992 (base) and 1996. The industrial organization (IO) model was selected to evaluate the industry. IO is a field of study within economics in which the primary focus is the organization and performance of markets and industries. The emphasis of the industrial organization model is understanding the behavior of groups of firms that act as competitors or interact as suppliers and customers (Hays, 1986). The components of the industrial organization model are structure, conduct, and performance. According to the model, the way in which firms are organized in a market (structure) tells a great deal about how they make decisions (conduct); this, in turn, changes the level of efficiency and fairness in the market (performance) (Seperich et al., 1994).

Market Structure

Market structure refers to the characteristics of the organization of a market or industry, and those characteristics seem to exercise a strategic influence on the nature of competition and pricing within the market. Competition may exist among sellers, among buyers, and between buyers and sellers. The most common aspects or dimensions of market structure are seller concentration, product differentiation, barriers to entry and exit (Lan-

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tican, 1983), buyer concentration, the number of firms or plants in a market, and the distribution of firms and plants by size (Hays, 1986).

Market Conduct

Market conduct or business behavior includes price policies, product policies, and other firm-level policies aimed at coercing market rivals. Knowing the market structure of a specific industry makes it easier to predict a firm's behavior. For instance, whether an industry has only one firm or many firms, the individual seller reacts only to general economic conditions, not to the challenge of some rivals in business. This is not the case in oligopoly since there is a mutual interdependence among sellers. The individual seller in an oligopolistic market directly reacts to the changes made by its rivals (Lantican, 1983).

Market Performance

Market performance is the appraisal of the deviation between the economic results of an industry's market conduct or behavior and the best possible contribution that the market could make to achieve socioeconomic goals. Several performance measures have emerged because of the broad definition of socioeconomic goals. Economic dimensions include efficiency (pricing and productive), equity, progressiveness, and responsiveness while social measures include environmental and product safety concerns. Other measures include sales promotion costs, characteristics of the product, and the responsiveness of firms to societal needs (Lantican, 1983).

The justification for using structure, conduct, and performance as models for this study is ease of application in defining and analyzing an industry. Researchers can determine, from this analytical framework, the physical dimension of an industry, the operational characteristics, and how well, in a normative sense, an industry operates. The interactions of these components reflect how a change in one component possibly causes adjustment in another (Hays, 1986). Several studies (Hays, 1986; Erba, Pratt, and Wasserman, 1993; Erba and Pratt, 1994; Donghwan, 1994; Lee, Baumel, and Harris, 1987; Quesada, 1995; Lantican, 1983; Southern, 1982) have used the structure, conduct, and performance models to evaluate an industry or market.

The structure, conduct, and performance of the agricultural trucking industry can play important roles in the marketing channels that provide food and fiber products and services to customers; therefore, it is important for managers and owners of agribusiness firms to assess the agricultural commodity carriers that serve them (Allen, Reeves, and Thomas, 1998).

Due to a lack of data, the agricultural commodity haulers were not evaluated using the standard concepts of conduct and performance; rather, the firms were evaluated using the variables found in Table 1. Data used to accomplish the objective of this study were obtained from Quesada, Allen, and Reeves (1998), and the Transportation Technical Services (TTS) *Blue Book of Trucking Companies* for the years 1992 and 1996. The TTS publication lists information from annual reports for motor carriers. These data contain information on the income statement, balance sheet, labor, units of equipment, and output data. Although the TTS publication does not represent industry totals (partly because small carriers are not required to report to governmental agencies and other carriers may have missed the publication deadline), the data can be considered a good estimator of industry figures.

The summary data of TTS for the different industry segments did not necessarily account for all of the individual firms included in each segment due to incomplete individual firm data. To separate the figures of the agricultural commodity segment from an overall category designated "Other Specialized Carriers," gross freight revenues and the number of carriers for the agricultural commodity segments were obtained by adding the individual-firm data. For the remaining industry segments, data were directly taken from the TTS *Blue Book of Trucking Companies*.

To make comparisons between 1992 and 1996, the agricultural commodity segment was divided into three geographical regions: West, Midwest, and South. Due to the small number of firms reported for the northeast region, the firms in that region were pooled with those of the Midwest and are classified under the latter for the purposes of this analysis.

Results and Discussion

Discussion of the agricultural commodity trucking industry in the United States is divided into two sections. The first section presents a dis-

Table 1. Structure, Conduct, and Performance Variables for the Analysis.

| Structure Variables | Underlying Variables from TTS |
|--|---|
| Number of firms | Actual number of firms with usable data |
| Firm size | Total operating revenues divided by number of firms |
| Concentration ratio | Sum of four top firms' operating revenues divided by total operating revenues for agricultural commodity segment |
| Conduct Variables | Underlying Variables from TTS |
| Revenue per ton-mile | Total operating revenues in agricultural commodity segment divided by total ton-miles in agricultural commodity segment |
| Number of drivers and helpers, and trucks, tractors, and trailers owned (ownership of equipment) | Actual number of each item with usable data |
| Load per vehicle | Ton-miles-highway service divided by total highway miles operated |
| Current ratio | Current assets in agricultural commodity carrier segment divided by current liabilities in agricultural commodity carrier segment |
| Performance Variables | Underlying Variables from TTS |
| Return on transportation investment | Net carrier operating income divided by net carrier operating property plus working capital times 100 |
| Operating expenses per ton-mile | Total operating expenses in agricultural commodity segment divided by total ton-miles in agricultural commodity segment |
| Length of haul | Total ton-miles divided by total tons |

tribution of the whole trucking industry by the number of carriers and the amount of revenues between 1992 and 1996, by industry segment. This section provides an understanding of the changes in the trucking industry, by segments. Information on the changes in the structure, conduct, and performance of the agricultural commodity transportation sector is provided in the second section for the years 1992 and 1996.

The U. S. Trucking Industry, 1992 and 1996

Trucking firms, by segments, are presented in Table 2. The segments are classified into general—and specialized—freight carriers. General

freight carriers are separated into truckload and less-than-truckload groups. A truckload carrier handles large shipments of commodities that are generally picked up from a single shipper and delivered to a single destination. A less-than-truckload carrier picks up many small shipments that are consolidated at terminals for transportation over the highway. At destination points, the shipments are distributed to different customers. Significant cost differences exist between the two types of operations, primarily due to the labor intensity of less-than-truckload operations. Specialized carriers tend to be truckload operations although there are many exceptions (TTS, 1992, 1996).

Table 2. Identification of Carriers by Industry Segment.

General Freight

| | |
|--------|--------------------------------------|
| GF-LTL | General Freight, Less-than-truckload |
| GF-TL | General Freight, Truckload |
| GF-LOC | General Freight, Local |

Specialized Carriers

| | |
|--------|--|
| SC-HM | Specialized Commodity, Heavy Machinery |
| SC-PP | Specialized Commodity, Petroleum Products |
| SC-RL | Specialized Commodity, Refrigerated Liquid |
| SC-RS | Specialized Commodity, Refrigerated Solid |
| SC-DT | Specialized Commodity, Dump Trucking |
| SC-AG | Specialized Commodity, Agricultural Goods |
| SC-MV | Specialized Commodity, Motor Vehicles |
| SC-AT | Specialized Commodity, Armored Truck |
| SC-BM | Specialized Commodity, Building Materials |
| SC-FA | Specialized Commodity, Film and Associated |
| SC-FP | Specialized Commodity, Forest Products |
| SC-MO | Specialized Commodity, Mine Ores (not Coal) |
| SC-SD | Specialized Commodity, Retail Store Delivery |
| SC-DP | Specialized Commodity, Dangerous/Hazardous |
| SC-NEC | Specialized Commodity, Not Elsewhere Listed |
| HHG | Household Goods Carriers |

The distribution of truck transportation firms in the United States is presented in Table 3 by industry segment, changes in the number of carriers, and gross freight revenues. Changes in absolute values and percentages have been calculated to help assess the importance of each industry segment. The results reveal that the number of carriers increased from 1,259 in 1992 to 1,449 in 1996, a 15 percent increase (Table 3). The largest increase in carrier numbers occurred in the truckload general-freight segment. The group's numbers increased from 283 in 1992 to 569 in 1996, an increase of almost 102 percent. This result suggests that, in general, competition has increased in this segment.

Results from the less-than-truckload segment indicate that competition declined. Less-than-truckload general-freight carriers represented the largest decline in operating freight revenues from 1992 to 1996. The sector's operating revenues declined from almost \$30.5 billion in 1992 to \$16.2 billion in 1996. The truckload general-freight carriers' operating revenues increased from \$8.5 billion in 1992 to \$14.4 billion in 1996, an increase of 69.2 percent. This result suggests that firms in this segment obtained more revenues from hauling general freight than did other segments of the industry.

The Agricultural Commodity Sector

Changes in the structure, conduct, and performance of the agricultural commodity sector from 1992 to 1996, using the variables selected for this analysis, are summarized in Table 4. Discussions of the results of the variables for this analysis are divided into three subsections: market structure, market conduct, and market performance.

Market Structure

The market structure of the agricultural commodity trucking industry is measured by the following variables: number of firms, average firm size, and concentration ratios. The data for those variables are presented in Tables 5-7.

Number of Firms. The number of carriers in the agricultural commodity hauling segment increased from 53 firms in 1992 to 60 in 1996, an increase of 13 percent (Table 5). Based on this variable, this result may suggest that competition increased in the agricultural commodity segment

of the U.S. trucking industry. On a regional basis, the largest increase in firm numbers occurred in the Midwest. The number of firms increased from 19 in 1992 to 34 in 1996, or by almost 79 percent. The South had the largest percentage decline of firms from 1992 to 1996. These results suggest that the relative competitiveness of the Midwest increased while it declined in the South.

Firm Size. Size of firm for this study was measured by dividing gross freight operating revenues by the number of firms. Large gross freight revenues generally lower cost as a percentage of gross freight revenues or sales. Under the assumption of perfect competition in an industry, if economies of size are found, there should be a positive relationship between firm size and financial performance. This result is due to a decreasing long-run average total cost curve. Larger firms may also enjoy selling efficiencies, further expanding their advantages; therefore, firms with larger volumes of sales are expected to financially outperform those with smaller sales volumes (Burbrink and Boynton, 1981).

Results reveal that the average firm size in the industry, as a whole, declined from almost US\$9 million to US\$8 million in 1996 (Table 6). This result suggests that, as the number of firms in the industry increased, the average firm size declined, indicating an increase in competition and a smaller average firm size in 1996 than what existed in 1992. The West had the largest increase in firm size during the study period. The average firm size increased from US\$6.5 million in 1992 to almost US\$9.8 million in 1996. This result suggests that, as the size of the firm increased, competition in this area decreased, and firms were able to earn higher revenues for their services.

Concentration Ratio. A concentration ratio is the percentage of the market sales or some other measure of size controlled by an absolute number of firms (Adrangi, Gritta, and Chow, 1986). For this study, the four largest firms' ratios were used. Concentration ratio is one of the most popular measures of structural power. It has been suggested by Scherer (1970) that four firm concentration ratios of more than 40 percent indicate oligopoly. A major advantage of these ratios is that they are easily understood and that they have the added advantages of combining firm numbers and serving as a measure of firm size rather than simply considering one or the other. There are disadvantages, however, with using concentration ratios as

Table 3. Truck Transportation Firms by Industry Segment and Changes in Number and Revenues, United States, 1992 and 1996.

| Industry | 1992 | | | 1996 | | | Net Change from 1992 | | | % of Revenue | |
|-------------------------------|-----------------|---------------|-------------------------------------|-----------------|--------------|-------------------------------------|----------------------|---------------------------|------------------------|--------------|----------------------|
| | No. of Carriers | % of Carriers | Gross Freight Revenues ^a | No. of Carriers | % of Revenue | Gross Freight Revenues ^a | No. of Carriers | % ^b of Revenue | Net Change in Revenues | | % of Carrier Numbers |
| LTL general freight | 203 | 16.12 | 30,545,717 | 128 | 58.98 | 16,230,592 | 8.83 | 36.79 | -14,315,125 | -36.95 | -46.86 |
| TL general freight carriers | 283 | 22.48 | 8,489,438 | 569 | 16.39 | 14,362,346 | 39.27 | 32.26 | 5,872,908 | 101.06 | 69.18 |
| Local general freight carrier | 28 | 2.22 | 267,130 | 8 | 0.52 | 86,585 | .55 | .20 | -180,545 | -71.43 | -67.59 |
| Heavy machinery | 43 | 3.42 | 403,809 | 28 | 0.78 | 473,406 | 1.93 | 1.07 | 69,597 | -34.88 | 17.24 |
| Petroleum products | 112 | 8.90 | 2,506,475 | 110 | 4.84 | 2,689,843 | 7.59 | 6.10 | 183,368 | -1.79 | 7.32 |
| Refrigerated products | 91 | 7.23 | 2,190,234 | 119 | 4.23 | 2,478,954 | 8.21 | 5.62 | 288,720 | 30.77 | 13.18 |
| Automobile carriers | 28 | 2.22 | 1,575,733 | 28 | 3.04 | 1,614,765 | 1.93 | 3.66 | 39,032 | 0 | 2.48 |
| Building materials | 66 | 5.24 | 969,058 | 62 | 1.87 | 1,043,682 | 4.28 | 2.37 | 74,624 | -6.06 | 7.70 |
| Agricultural commodities | 53 | 4.21 | 476,252 | 60 | 0.92 | 479,585 | 4.14 | 1.09 | 3,333 | 13.21 | .70 |
| Other specialized carriers | 352 | 27.96 | 4,367,434 | 337 | 8.43 | 4,655,294 | 23.26 | 10.55 | 287,860 | -4.26 | 6.59 |
| Total | 1,259 | 100.00 | 51,791,280 | 1,449 | 100.00 | 44,115,052 | 99.99 | 100.01 | -7,676,228 | 15.09 | -14.82 |

^a Thousand dollars.^b Percents do not total 100 due to rounding errors.

Table 4. Summary of Structure, Conduct, and Performance Variables for the Analysis^a

| Structure Variable | Regions | | | | United States |
|-------------------------------------|---------|---------|-------|---------------|---------------|
| | West | Midwest | South | United States | |
| Number of firms | - | + | - | + | |
| Firm size | + | - | - | - | |
| Concentration ratio | + | - | + | - | |
| Revenue per ton-mile | - | - | + | - | |
| Number of drivers and helpers | + | - | - | - | |
| Ownership of equipment | | | | | |
| Number of trucks | + | - | - | + | |
| Number of tractors | - | - | + | - | |
| Number of trailers | + | - | - | + | |
| Load per vehicle | + | + | - | + | |
| Current ratio | - | + | + | + | |
| Return on transportation investment | + | + | + | + | |
| Operating expenses per ton-mile | 0 | - | + | + | |
| Length of haul | + | + | + | + | |

^a Plus or minus sign represents net changes in values of variables from 1992 (positive=increase; negative=decrease; zero=no change).

Table 5. Changes in the Number of Agricultural Commodity Haulers from 1992 to 1996.

| Region | 1992 | 1996 | Net Change from 1992 | Percentage Change from 1992 |
|---------------|------|------|-------------------------|--------------------------------|
| West | 18 | 14 | -4 | -22.20 |
| Midwest | 19 | 34 | 15 | 78.95 |
| South | 16 | 12 | -4 | -25.00 |
| United States | 53 | 60 | 7 | 13.21 |

Table 6. Changes in Average Firm Sizes for Agricultural Commodity Haulers from 1992 to 1996.

| Region | 1992 | 1996 | Net Change from 1992 | Percentage Change from 1992 |
|---------------|-------------------|-------------------|-------------------------|--------------------------------|
| | Mean ^a | Mean ^a | | |
| West | 6,507 | 9,791 | 3,284 | 50.47 |
| Midwest | 10,300 | 6,797 | -3,503 | -34.03 |
| South | 10,216 | 9,283 | -933 | -9.13 |
| United States | 8,986 | 7,993 | -993 | -11.05 |

^aThousand dollars.**Table 7. Changes in the Four Top Firms' Concentration Ratios for the Agricultural Commodity Haulers from 1992 to 1996.**

| Region | 1992 | 1996 | Net Change from 1992 | Percentage Change from 1992 |
|---------------|-------|-------|-------------------------|--------------------------------|
| | % | % | | |
| West | 54.75 | 60.05 | 5.30 | 9.68 |
| Midwest | 48.05 | 21.77 | -26.28 | -54.69 |
| South | 53.19 | 55.76 | 2.57 | 4.83 |
| United States | 25.08 | 18.22 | -6.86 | -27.35 |

the only measure of market power. First, only a certain number of firms (four or eight), rather than all the firms, are considered; this may result in distorted and ambiguous conclusions. Second, the concentration ratios for a certain group of firms do not measure the firm's power within the group (Adrangi, Gritta, and Chow, 1986).

As might be expected, the concentration ratio increased in the West and South, reflecting the possibility of less competition among firms in those regions (Table 7). This result implies that

the firms in those regions consist of a few large firms—with the possibility of a large degree of market power—and a number of smaller firms.

Market Conduct

Industry conduct consists of the industry's policies toward its product market and toward the actions of its rivals in the market. The agricultural commodity trucking industry conduct is measured by certain variables: revenue per ton-mile; number

of drivers and helpers; tractors, trucks, and trailers owned; current ratio; and average load per vehicle dispatched (Tables 8–14).

Revenue Per Ton-Mile. Revenue per ton-mile is one way to look at prices on the basis of a combination of weight and distance. Revenue per ton-mile is calculated by dividing revenues by total ton-miles. Results reveal that average revenue per ton-mile decreased for the industry as a whole from 1992 to 1996 (Table 8). These results imply that firms in the industry received lower prices as the number of tons moved per mile declined.

The South had the largest increase in revenues per ton-mile from 1992 to 1996. That region's revenue per ton-mile increased from 10 cents in 1992 to 12 cents in 1996. Results reveal that firms in the South received higher revenues per ton-mile from 1992 to 1996 when compared to the industry as a whole and by regions.

Drivers and Helpers. Number of employees is one of the indicators of a firm's conduct in a market. The number of drivers and helpers was used to represent the number of employees in the industry. Results from the analysis reveal that the average number of drivers and helpers declined from 63.1 in 1992 to 54.2 in 1996 (Table 9); this may suggest that firms in the industry as a whole decreased the number of drivers and helpers to reduce operating expenses to improve productivity and profitability. Contrary to the results for the other regions, firms in the West increased the number of drivers and helpers from 37.1 in 1992 to 65.6 in 1996.

Ownership of Equipment. Investment in transportation equipment is generally seen as an indicator that firms are providing the necessary tools for their employees, enabling them to do a better job of serving customers. To represent decisions to invest in transportation equipment, three variables were used: trucks, trailers, and tractors owned.

The average number of trucks, tractors, and trailers owned by firms in the agricultural commodity sector from 1992 to 1996 is shown in Tables 10–12. Results show that carriers increased the ownership of trucks and trailers from 1992 to 1996 (Tables 10 and 12). The average number of trucks owned increased from 15 in 1992 to almost 18 in 1996.

Firms in the West owned more trucks and trailers in 1996 than in 1992. The ownership of trucks and trailers increased from almost 14 and 121 to 27 and 279, respectively, from 1992 to

1996. These results suggest that firms interested in marketing trucks and trailers for hauling agricultural commodities would find this region a viable market for their goods and services.

The South increased its ownership of tractors from 1992 to 1996 while the other regions did not (Table 11). The South increased ownership of tractors from 39 in 1992 to 56 in 1996. This result indicates that firms in the South invested more in tractors than did the other regions and the United States as a whole.

Load Per Vehicle. The average load per vehicle is an index of the use of productive capacity, derived by dividing ton-miles-highway service by total highway miles operated. The index indicates the number of tons transported by each unit dispatched. Results reveal that the average amount of tons transported by each dispatched vehicle increased from 16.5 tons in 1992 to 60.2 tons in 1996 for the United States as a whole (Table 13). The results also indicate that the West and Midwest had higher tons per dispatched vehicle in 1996 than in 1992. Firms in the Midwest might have gained cost efficiencies by substituting larger loads for the declining number of drivers and helpers, and trailers. The West's firms may have increased the use of productive capacity by complementing larger loads with the increase in the number of drivers and helpers, and trucks and trailers. The average increase in tons per vehicle in those areas also could have been affected by the change in traffic composition.

Current Ratio. Except for the West, the current ratios increased from 1992 to 1996 (Table 14). Increases in the regions and in the United States indicate that firms were in a better position to meet current financial obligations in 1996 than in 1992. This result may suggest that the firms have excess funds available and perhaps should consider investing those surplus funds. The result could also mean that carriers owned most of their equipment in the latter year.

Market Performance

The agricultural commodity trucking industry performance is a measure of the efficiency of that industry and is measured by the following variables: return on transportation investment; operating expenses per ton-mile; and the average haul or the average length of haul (Tables 15–17).

Table 8. Changes in Average Revenue per Ton-Mile from 1992 to 1996.

| Region | 1992 | 1996 | Net Change from 1992 | Percentage Change from 1992 |
|---------------|-------------------|-------------------|-------------------------|--------------------------------|
| | Mean ^a | Mean ^a | | |
| West | .12 | .11 | -.01 | -8.33 |
| Midwest | .1 | .08 | -.02 | -20 |
| South | .1 | .12 | .02 | 20 |
| United States | .1 | .09 | -.01 | -10 |

^aDollars.**Table 9. Changes in the Average Number of Drivers and Helpers from 1992 to 1996.**

| Region | 1992 | 1996 | Net Change from 1992 | Percentage Change from 1992 |
|---------------|-------------------|-------------------|-------------------------|--------------------------------|
| | Mean ^a | Mean ^a | | |
| West | 37.1 | 65.58 | 28.48 | 76.77 |
| Midwest | 69.3 | 43.73 | -25.57 | -36.90 |
| South | 85.1 | 66.36 | -18.74 | -22.02 |
| United States | 63.1 | 54.16 | -8.94 | -14.17 |

^aNumber of employees working throughout the year.**Table 10. Changes in the Average Number of Trucks Owned from 1992 to 1996.**

| Region | 1992 | 1996 | Net Change from 1992 | Percentage Change from 1992 |
|---------------|-------------------|-------------------|-------------------------|--------------------------------|
| | Mean ^a | Mean ^a | | |
| West | 13.6 | 27.14 | 13.54 | 99.56 |
| Midwest | 12.0 | 10.50 | -1.50 | -12.50 |
| South | 21.4 | 15.25 | -6.15 | -28.74 |
| United States | 15.4 | 17.60 | 2.20 | 14.29 |

^aNumber of pieces of equipment.**Table 11. Changes in the Average Number of Tractors Owned from 1992 to 1996.**

| Region | 1992 | 1996 | Net Change from 1992 | Percentage Change from 1992 |
|---------------|-------------------|-------------------|-------------------------|--------------------------------|
| | Mean ^a | Mean ^a | | |
| West | 34.4 | 19.50 | -14.90 | -43.31 |
| Midwest | 64.4 | 35.23 | -29.17 | -45.20 |
| South | 39.2 | 56.00 | 16.80 | 42.85 |
| United States | 56.1 | 36.12 | -19.98 | -35.61 |

^aNumber of pieces of equipment.

Table 12. Changes in the Average Number of Trailers Owned from 1992 to 1996.

| Region | 1992 | 1996 | Net Change from 1992 | Percentage Change from 1992 |
|---------------|-------------------|-------------------|-------------------------|--------------------------------|
| | Mean ^a | Mean ^a | | |
| West | 121.3 | 279.00 | 157.70 | 130.01 |
| Midwest | 148.7 | 103.03 | -45.67 | -30.71 |
| South | 120.6 | 105.18 | -15.42 | -12.79 |
| United States | 131.5 | 141.16 | 9.66 | 7.35 |

^aNumber of pieces of equipment.

Table 13. Changes in the Average Load per Vehicle from 1992 to 1996.

| Region | 1992 | 1996 | Net Change from 1992 | Percentage Change from 1992 |
|---------------|-------------------|-------------------|-------------------------|--------------------------------|
| | Mean ^a | Mean ^a | | |
| West | 17.57 | 208.81 | 191.24 | 1,088.45 |
| Midwest | 17.00 | 19.50 | 2.50 | 14.71 |
| South | 15.00 | 11.80 | -3.20 | -21.33 |
| United States | 16.50 | 60.16 | 43.66 | 264.61 |

^aTons.

Table 14. Changes in the Average Current Ratio from 1992 to 1996.

| Region | 1992 | 1996 | Net Change from 1992 | Percentage Change from 1992 |
|---------------|------|------|-------------------------|--------------------------------|
| | West | 3.8 | | |
| Midwest | 1.8 | 2.11 | .31 | 17.22 |
| South | 3.4 | 6.20 | 2.8 | 82.35 |
| United States | 3.0 | 3.06 | .06 | 2.00 |

Table 15. Changes in the Average Return on Transportation Investment from 1992 to 1996.

| Region | 1992 | 1996 | Net Change from 1992 | Percentage Change from 1992 |
|---------------|-------------------|-------------------|-------------------------|--------------------------------|
| | Mean ^a | Mean ^a | | |
| West | 10.89 | 16.35 | 5.46 | 50.13 |
| Midwest | 11.30 | 20.29 | 8.99 | 79.56 |
| South | -21.80 | -8.22 | 13.58 | -62.29 |
| United States | .80 | 13.46 | 12.66 | 1,582.50 |

^aPercent.

Table 16. Changes in the Average Operating Expenses per Ton-Mile from 1992 to 1996.

| Region | 1992 | 1996 | Net Change from 1992 | Percentage Change from 1992 |
|---------------|-------------------|-------------------|-------------------------|--------------------------------|
| | Mean ^a | Mean ^a | | |
| West | .15 | .15 | 0 | 0 |
| Midwest | .10 | .09 | -.01 | -10 |
| South | .10 | .12 | .02 | 20 |
| United States | .10 | .11 | .01 | 10 |

^aDollars.**Table 17. Changes in the Average Length of Haul from 1992 to 1996.**

| Region | 1992 | 1996 | Net Change from 1992 | Percentage Change from 1992 |
|---------------|-------------------|-------------------|-------------------------|--------------------------------|
| | Mean ^a | Mean ^a | | |
| West | 342.44 | 637.40 | 294.96 | 86.13 |
| Midwest | 496.30 | 722.67 | 226.37 | 45.61 |
| South | 678.00 | 681.90 | 3.90 | .58 |
| United States | 505.00 | 699.33 | 194.33 | 38.48 |

^aMiles.

Return on Transportation Investment. Results reveal that the average return on transportation investment in the agricultural commodity segment increased from 1992 to 1996 (Table 15). The results show that return on transportation investment for firms in the United States increased from .8 percent in 1992 to 13.46 percent in 1996. This result suggests that the industry was operating at a higher level of profitability in 1996 than in 1992. The West, Midwest, and South regions' returns on transportation investment increased from 10.89, 11.3, -21.8, respectively, in 1992, to 16.35, 20.29, and -8.22 percent, respectively, in 1996. The largest absolute improvement occurred in the southern region.

Operating Expenses Per Ton-Mile. Operating expenses per ton-mile slightly increased for the United States from 10 cents in 1992 to 11 cents in 1996 (Table 16). These results indicate that operating expenses per ton-mile did not increase much to adversely affect firms operating in this industry. The operating expenses per ton-mile in the Midwest declined from 10 cents in 1992 to 9 cents in

1996. This result reveals that firms in the region were able to reduce the cost of providing transportation services to their customers.

Length of Haul. The ability of trucking firms to carry agricultural commodities to long-distance markets has an impact on the competitive activity of firms. In addition, the ability of truckers to carry products to distant markets can help suppliers and truckers find good markets.

The average length of haul was calculated by dividing total ton-miles by total tons. This number shows how far the unit travels (one way) each time it is dispatched. Results show that the average length of haul for agricultural commodity haulers in the United States and by regions increased from 1992 to 1996 (Table 17). These results suggest that firms increased their hauling distances to reach markets. These results could also mean that firms needed to go farther to satisfy their customers, thus increasing competition in markets that were farther away in 1996 than in 1992. Also, as noted (Table 8), the revenue per ton-mile decreased; therefore, to get higher

prices for each ton moved, firms had to be willing and able to move goods farther away from their base locations.

Summary and Conclusions

The general objective of this study is to analyze changes in the structure, conduct, and performance of the trucking firms that haul agricultural commodities in the United States, as a whole and by regions for the years 1992 and 1996. The IO model was used to accomplish the objective of this study. According to the model, the way in which firms are organized in a market (structure) tells a great deal about how the firms make decisions (conduct)—which, in turn, changes the level of efficiency and fairness present in the market (performance). Data used to accomplish the objective of this study were obtained from secondary sources. The following is a list of the variables used to represent structure, conduct, and performance of the agricultural commodity industry: Number of firms, average firm size, and the concentration ratio were used to evaluate structure; conduct variables included revenue per ton-mile, number of drivers and helpers, number of tractors, trailers, and trucks owned, current ratio, and average tons per vehicle dispatched; and performance variables included return on transportation investment, operating expenses per ton-mile, and average length of haul.

Results from this study show that the number of firms hauling agricultural commodities as a group increased about 13 percent from 1992 to 1996. This result may suggest that competition has increased in the agricultural commodity segment of the U.S. trucking segment. On a regional basis, the largest increase in firm numbers occurred in the Midwest. The number of firms increased from 19 in 1992 to 34 in 1996, almost a 79 percent increase.

Concentration ratios increased in the West and South, reflecting the possibility of less competition among firms in those regions. However, the concentration ratio decreased in the Midwest, reflecting an increase in competition in this region from 1992 to 1996. Except for the West, the current ratios increased in the Midwest, South, and in the United States as a whole from 1992 to 1996. Increases in those regions and in the United States as a whole indicates that firms were in better positions to meet financial obligations in 1996 than

they were in 1992. This result may suggest that the firms have available excess funds, which they perhaps should consider investing.

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