Assessing the Impacts of Closing the River Gulf Grain Company on Local Producers of Corn and Soybeans

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Abstract

Hotelling's classic model of spatial competition is used to estimate the impacts on price of the closure of one of three grain buyers on the Mississippi River in the vicinity of Scott County, Iowa. The customers of the buyer who is closing (River Gulf Grain Company) in Davenport, Iowa, are assumed to deliver their grain to a buyer in either Buffalo, Iowa, to the south or to a buyer in Clinton, Iowa, to the north. Calibration of Hotelling's framework to this situation leads to an estimated decline in grain bids of 1.5¢ per bushel for the buyer located in Clinton and by 2.5¢ per bushel for the buyer located in Buffalo. These estimates are based on an incremental transportation cost of 0.15¢ per mile between the seller's farm and the buyer. This price decline would reduce gross receipts of the farmers who currently deliver to Davenport by approximately $264,000 per year. The effect of lower price bids on gross receipts of all area farmers would be approximately $745,000 per year. Transportation costs would increase by an estimated $75,000 for those farmers who would have to haul their grain farther because of the closure. Cost savings to other farmers would total approximately $60,000. These are farmers who chose to haul their grain to Davenport even though one of the alternative buyers was closer. The total impact on local economic activity from the closure of the River Gulf Grain Company would be higher than this amount because of the direct and indirect consequences of a loss of 19 jobs, some increased damage to roads from increased miles traveled, and increased waiting times at grain-buying facilities.

Keywords: grain transportation, local monopsony.

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Introduction

Much of the corn and soybeans produced in the vicinity of Scott County, Iowa, is delivered to one of three sites on the Mississippi River. These grain-buying sites are located in Buffalo, Davenport, and Clinton, Iowa. The City of Davenport has told one of these companies, River Gulf Grain Company, that its lease on riverfront property will not be renewed.

The impact of a reduction in the number of local buyers of grain has received little attention in the literature. More attention has been paid to increased concentration of grain buyers on a national scale. For example, when Cargill agreed to acquire Continental Grain in 1998, Hayenga and Wisner (2002) and USDA-ERS (1999) estimated the impact by measuring the change of concentration ratios nationally and regionally, but they did not estimate how decreased competition would affect prices or quantities.

If transportation costs are low relative to the market prices, then one would expect very little impact from reduced local competition because sellers would simply ship their product to the next nearest buyer at no significant increased cost. However, transporting grain is costly relative to market prices. To ship 1,000 bushels of grain an additional 10 miles would cost a producer between \$10 and \$20, or between 1¢ and 2¢ per bushel. In addition, because shipping grain is costly, the remaining local buyers in the area enjoy increased local market power. They can lower their bids marginally without losing all their customers because even at the lower price, many of their customers would still find that the next best alternative price net of transportation costs would still be lower than the now-lower local price.[1] The extent to which the bid price can be lowered is limited, however. If local bid prices fall by too much, then local sellers will simply ship their grain farther away. And if one local buyer decides to lower price significantly, then the remaining local sellers would simply shift their business to the other local buyer(s).

Our objective in this study is to estimate the impacts on local corn and soybean grain prices and transportation costs from the closing of the River Gulf Grain Company. Currently local sellers have three main alternative buyers of grain: River Gulf Grain, a buyer in Buffalo, Iowa, and a buyer in Clinton, Iowa. To estimate the impact of the closing of River Gulf we adapt a modeling approach first developed by Hotelling (1929). We use the approach to calculate the equilibrium bid price with three buyers and compare it to the equilibrium price with two buyers. The degree of price decline is limited by a "residual buyer" located in Muscatine (south of Buffalo).[2] The direct impact of increased shipping costs from the current River Gulf customers having to ship their grain to alternative buyers is also estimated.

Not estimated in this study are other local impacts that would result from the closing. Such impacts would include the loss of economic activity associated with the loss of 19 jobs at River Gulf Grain, possible increased road deterioration from grain-hauling trucks, and increased waiting times by farmers to offload their grain at the remaining facilities.

The Model

The model we construct to estimate the impacts of the closing of River Gulf Grain is an extension of Hotelling's (1929) analysis of spatial competition. Suppose that the Mississippi River can be approximated by a straight line, with grain buyers being located at different points on the line. There are currently four grain buyers in the area (Muscatine, Buffalo, Davenport, and Clinton) that we consider. For notational convenience, Muscatine, Buffalo, Davenport, and Clinton will be assigned numbers from 0 to 3, respectively. Muscatine is located at $D = 0$, and Clinton is located at the other end of the line. Figure 1 shows a diagram of the buyers' locations.

Assume that grain is uniformly available across the landscape. This means that we can map the reality of grain availability in two dimensions onto the one-dimensional line. That is, we model grain availability as being uniformly available along the line. The density of grain is normalized to one; that is, there is one unit of grain available per unit of

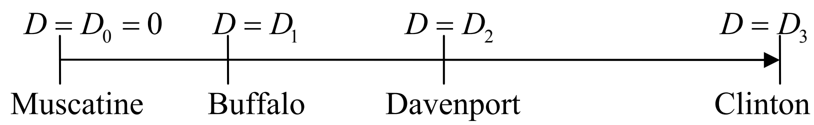

FIGURE 1. Location of grain buyers on the Mississippi River in eastern Iowa

distance.[3] Sellers incur transportation costs t per unit of grain per unit of distance to market their production. This implies that the price received by sellers net of transportation costs per unit of grain decreases linearly with the distance from the buyer. As noted before, it is precisely this transportation cost that gives buyers their market power. We also assume that the downstream market for grain is perfectly competitive. That is, grain buyers cannot influence the price they receive when they resell grain delivered from farmers. Thus, each unit (bushel) of grain has a value of P for all buyers. This does not mean, however, that all buyers will offer the same price.

Buyers choose their offer prices (p_i, $i = 0,...,3$) simultaneously and independently. Each buyer competes directly only with its immediate neighbors. Given this information, the supply function for each buyer with linear transportation costs can be derived. We assume that that the prices offered by any pair of contiguous firms is not so different (relative to transportation costs) to drive the supply of the low-price firm to zero. This is a reasonable assumption, because all firms are currently buying grain, indicating that some sellers are supplying them.[4] We further assume that the reservation price of sellers (given by their next best alternative) and the costs of hauling grain are not so low relative to the prices offered that some potential sellers in the market choose not to ship their grain to any of the buyers.[5]

Sellers compare the net (of transportation cost) prices offered by the two nearest buyers in order to decide who to sell to. For example, a seller located at point $z_{i,i+1}$ in the interval ($i, i+1$, $i = 0,1,2$) compares $p_i - t(z_{i,i+1} - D_i)$ against $p_{i+1} - t(D_{i+1} - z_{i,i+1})$. By assumption there is a seller $\hat{z}_{i,i+1}$ located in every interval ($i, i+1$, $i = 0,1,2$) that is indifferent between the two contiguous buyers. To make the seller indifferent, the following must be true: $p_i - t(\hat{z}_{i,i+1} - D_i) = p_{i+1} - t(D_{i+1} - \hat{z}_{i,i+1})$.

Thus, $\hat{z}_{i.i+1} - D_i = \dfrac{p_i - p_{i+1} + t(D_{i+1} - D_i)}{2t}$ and $D_{i+1} - \hat{z}_{i.i+1} = \dfrac{p_{i+1} - p_i + t(D_{i+1} - D_i)}{2t}$ units of grain from the interval (D_i, D_{i+1}) are supplied to buyers i and $i+1$, respectively. The resulting supply functions are as follows:

$$S_0(p_0, p_1) = \frac{p_0 - p_1 + t(D_1 - D_0)}{2t} \text{ for } i = 0, \tag{1}$$

$$S_i(p_{i-1,} p_i, p_{i+1}) = \frac{p_i - p_{i-1} + t(D_i - D_{i-1})}{2t} + \frac{p_i - p_{i+1} + t(D_{i+1} - D_i)}{2t} \text{ for } i = 1, 2, \tag{2}$$

$$S_3(p_2, p_3) = \frac{p_3 - p_2 + t(D_3 - D_2)}{2t} \text{ for } i = 3. \tag{3}$$

Notice that all buyers will obtain a positive amount of grain only if $|p_{i+1} - p_i| < t(D_{i+1} - D_i)$, $i = 0,1,2$.[6] Because all buyers are currently operating (receiving grain), attention will be restricted in the optimization to the continuous portions of the supply curves, sidestepping issues of non-existence of solutions.[7]

Buyers' profits are given by

$$\pi_0(p_0, p_1) = (p - p_0)\left(\frac{p_0 - p_1 + t(D_1 - D_0)}{2t}\right) \text{ for } i = 0, \tag{4}$$

$$\pi_i(p_{i-1}, p_i, p_{i+1}) = (p - p_i)\left(\frac{p_i - p_{i-1} + t(D_i - D_{i-1})}{2t} + \frac{p_i - p_{i+1} + t(D_{i+1} - D_i)}{2t}\right) \tag{5}$$

for $i = 1, 2$,

$$\pi_i(p_2, p_3) = (p - p_3)\left(\frac{p_3 - p_2 + t(D_3 - D_2)}{2t}\right) \text{ for } i = 3. \tag{6}$$

Each buyer strives to maximize his own profits by choosing an offer price, given the prices offered by his rivals. First-order conditions for this problem are

$$\frac{\partial \pi_0(p_0, p_1)}{\partial p_0} = -2p_0 + p_1 + p - t(D_1 - D_0) = 0 \text{ for } i = 0, \tag{7}$$

$$\frac{\partial \pi_i(p_{i-1}, p_i, p_{i+1})}{\partial p_i} = -4p_i + p_{i-1} + p_{i+1} + 2p - t(D_{i+1} - D_{i-1}) = 0 \text{ for } i = 1, 2, \tag{8}$$

$$\frac{\partial \pi_3(p_2, p_3)}{\partial p_3} = -2p_3 + p_2 + p - t(D_3 - D_2) = 0 \text{ for } i = 3 \tag{9}$$

and the second-order conditions are satisfied. Rearranging the system of equations given by (7) – (9), the best response functions (on the restricted interval considered) are

$$p_0 = \frac{p_1 + p - t(D_1 - D_0)}{2} \text{ for } i = 0, \tag{10}$$

$$p_i = \frac{p_{i-1} + p_{i+1} + 2p - t(D_{i+1} - D_{i-1})}{4} \text{ for } i = 1, 2, \tag{11}$$

$$p_3 = \frac{p_2 + p - t(D_3 - D_2)}{2} \text{ for } i = 3. \tag{12}$$

A non-cooperative price equilibrium for this model is the set of prices p_i^*, $i = 0, 1, 2, 3$ such that, given the price of its competitors, no seller can benefit from unilateral deviations. The equilibrium is found by solving the system of equations previously presented. This is a non-singular linear system with four equations and four unknowns. It can be shown to have the following solutions:

$$p_0^* = p - \frac{t}{15}\left(D_3 + 2D_2 + 8D_1 - 11D_0\right) \tag{13}$$

$$p_1^* = p - \frac{t}{15}\left(2D_3 + 4D_2 + D_1 - 7D_0\right) \tag{14}$$

$$p_2^* = p - \frac{t}{15}\left(7D_3 - D_2 - 4D_1 - 2D_0\right) \tag{15}$$

$$p_3^* = p - \frac{t}{15}\left(11D_3 - 8D_2 - 2D_1 - D_0\right) \tag{16}$$

To evaluate the change in the equilibrium price if Davenport is closed, the previous exercise is repeated, removing point number two from the analysis. In equilibrium, the prices offered by the three remaining ports are

$$p_0^{**} = p - \frac{t}{4}\left(D_3 + 2D_1 - 3D_0\right) \tag{17}$$

$$p_1^{**} = p - \frac{t}{2}\left(D_3 - D_0\right) \tag{18}$$

$$p_2^{**} = p - \frac{t}{4}\left(3D_3 - 2D_1 - D_0\right) \tag{19}$$

Letting Muscatine be on the extreme of the line ($D_0 = 0$), Buffalo, Davenport, and Clinton are located at $D_1 = 18.95$, $D_2 = 29.5$, and $D_3 = 70.3$ miles (according to www.mapquest.com) from Muscatine, respectively.

With this information at hand, the price declines at the remaining three ports resulting from closing Davenport can be computed as $p_0^{**} - p_0^*$, $p_1^{**} - p_1^*$ and $p_3^{**} - p_3^*$. Table 1 presents the predicted price changes in cents per bushel for corn for different per bushel per mile costs of transportation (*t*).

The range of transportation costs in Table 1 was obtained from two sources. Baumel, McVey, and Gervais (1996) estimated that the variable cost per mile for a farmer-owned truck to haul a load of 970 bushels of corn was \$0.669, or 887 bushels of corn. This cost estimate was based on mid-1990s fuel, labor, and repair costs, which together account for approximately 77 percent of total variable costs. The price of fuel, as measured by the New York Mercantile Exchange December futures contract in 2003, was approximately 50 percent higher than the same futures price in 1995. Average inflation rates for labor and repair over this period imply a cost of approximately \$0.008 for corn and \$0.009 for soybeans for one-way miles. For a round trip, the costs are \$0.0016 and \$0.0018. Using a different method, Trimac Consulting Services (1999) estimated for Transport Canada that the variable cost per mile for hauling grain varied from \$0.0016 to \$0.0019 per bushel when converted into U.S. dollars using an exchange rate of Can\$0.75 to U.S.\$1.00.

As expected, the price impact of closing a buying facility is sensitive to transportation costs. Over this range, a doubling of transportation costs doubles the decline in bids. It is difficult to obtain a precise estimate of transportation costs because it varies so

TABLE 1. Predicted change in bid prices (cents per bushel) for alternative transportation costs

	***t* = \$0.001**	***t* = \$0.0015**	***t* = \$0.002**
Muscatine	-0.8	-1.2	-1.7
Buffalo	-1.7	-2.5	-3.3
Clinton	-1.0	-1.5	-2.0

widely among producers. The estimates used in Table 1 are based on the assumption that grain is hauled only one way, so that if a farmer needs to travel an extra 10 miles to deliver grain, the actual distance traveled is 20 miles. These costs do not account for the cost of any additional waiting times.

Table 1 shows that the price drop will be larger in Buffalo than in the other two ports. Davenport is just about 10 miles from Buffalo, and about 40 miles from Clinton. The competition between Davenport and Buffalo therefore is expected to be more intense than is the competition between Davenport and Clinton because of their geographical proximity. In the model presented here, Muscatine does not feel the pressure of Davenport's competition directly. Its adjustment is predicted to be milder than that of the direct competitors. The predicted price declines vary directly with transportation costs. If incremental shipping costs are 0.15¢ per bushel per mile, then price bids are estimated to decline by 1.2¢ in Muscatine, by 2.5¢ in Buffalo, and by 1.5¢ per bushel in Clinton.

The results of the model indicate that Davenport is currently covering almost 26 miles of the line. In 2002 it purchased about 12 million bushels of corn and 4.1 million bushels of soybeans. This would indicate that if the grain is uniformly distributed over the line as assumed in the model, then the density of corn is roughly 462,000 bushels per mile, and that 158,000 bushels of soybeans can be mapped to a mile of the line. According to the model, upon the exit of Davenport, Buffalo and Clinton will share the "space" left open. Buffalo will capture 80.7 percent of Davenport's area of influence, whereas Clinton will capture 19.3 percent. Despite the fact that we predict Buffalo would lower its price more than would Clinton, it will increase the area covered by a larger amount than would Clinton. This is again attributable to the geographical location of Davenport, which is relatively close to Buffalo. These increases in areas are represented by increases in the length of the line covered and are shown in Table 2. Note that the sum of the lengths covered before and after do not add up to the same quantity. Table 2 does not present the length covered by Muscatine, which makes up the difference.

The financial impact for the area initially covered by Davenport relative to the status quo is obtained by comparing the price paid by Davenport multiplied by its quantity purchased and the prices that the same amount of grain would receive after the closing in

TABLE 2. Length of the line covered by each buyer

	With River Gulf Grain		Without River Gulf Grain	
	Length covered (mi)	Proportion of Supply	Length covered (mi)	Proportion of Supply
Buffalo	18.5	26.3%	35.2	50.0%
Davenport	25.8	36.7%	-	-
Clinton	16.6	23.7%	21.6	30.8%

Buffalo and Clinton, weighted by the amounts absorbed by each of them. Let $p_2^* Q_2^*$ be the gross receipts obtained by the current sellers who deliver to Davenport. If Davenport is closed, Q_2^* will be shared between Buffalo (80.7 percent) and Clinton (19.3 percent). This implies that the gross receipts for the current Davenport sellers after River Gulf closes are $\left(0.807 p_1^{**} + 0.193 p_3^{**}\right) Q_2^*$. The direct financial impact of closing Davenport is the difference between those two quantities. These estimates are reported in Table 3.

The direct financial impact for the region as a whole can be estimated by comparing total gross receipts for the region before and after the change. Differences in gross receipts are calculated by multiplying the predicted change in bid price (weighted average) by the total supply. This last quantity is inferred from the amount of corn and soybeans that are currently being shipped to Davenport. Table 4 presents the results.

TABLE 3. Predicted change in price and total receipts for sellers of corn and soybeans that currently deliver to Davenport

	t = \$0.001	t = \$0.0015	t = \$0.002
Difference in gross receipts (cents per bushel)	-1.093	-1.639	-2.185
Difference in gross receipts for corn	-\$131,160	-\$196,680	-\$262,200
Difference in gross receipts for soybeans	-\$44,813	-\$67,199	-\$87,585
Total difference	-\$175,973	-\$263,879	-\$349,785

Without more detailed data about current grain deliveries to Clinton and Buffalo, a more precise estimate cannot be made. However, note that the Table 4 estimates assume that approximately 32 million bushels of corn and 11 million bushels of soybeans are affected by the lower bids. Scott County alone produced an average of 18 million bushels of corn and 4.2 million bushels of soybeans from 2000 to 2002. Thus, the Table 4 estimates seem reasonable because the area affected by lower bid prices consists of more than just Scott County. Clinton is located in Clinton County, which produced 30.6 million bushels of corn and 6.2 million bushels of soybeans in 2002; and Muscatine is located in Muscatine County, which produced 15 million bushels of corn and 3.6 million bushels of soybeans in 2002.

It might seem that we are underestimating the amount of production that would receive a lower price because the actual amount of grain produced in the region is much larger than that delivered to the three buyers. However, the number of affected bushels must be related to the aggregate amount of grain being delivered to Davenport. In 2002, about 12 million bushels of corn were delivered to Davenport. Our model predicts that 32 million bushels of corn will receive a lower price, which is a factor of 2.67 bushels affected for each bushel that was delivered to Davenport. The next task is to estimate the direct increase in costs that will be incurred by the current sellers to Davenport because of increased hauling distances.

TABLE 4. Predicted change in price and gross receipts for corn and soybean sellers in the area under study

	t = \$0.001	t = \$0.0015	t = \$0.002
Difference in gross receipts (cents per bushel)	-1.138	-1.706	-2.275
Difference in gross receipts for corn	-\$369,489	-\$554,234	-\$738,978
Difference in gross receipts for soybeans	-\$126,362	-\$189,543	-\$252,724
Total difference	-\$495,851	-\$743,777	-\$991,702

Increased Transportation Costs

To estimate the effect of closing the Davenport buyer on the change in total transportation costs that must be incurred to transport grain to the neighboring buyers in Buffalo and Clinton, we collected data on the geographical location and concentration of Davenport's current suppliers. The increased transportation costs are estimated by simply multiplying the average change in hauling distance by the number of bushels delivered by the cost per bushel per unit of distance.

The change in distance is estimated by assuming that each customer ships grain from the geographic center of that customer's zip code region. Then the distance to each potential shipping point was calculated by entering the zip code and the address of all the potential shipping locations (using mapquest.com). For simplicity, it is further assumed that each of River Gulf's customers in 2002 would choose to ship to the closest alternative buying point.

The available data indicate that 3,323 customers delivered grain to River Gulf Grain in 2002. Given that quantities of corn and soybeans are distributed uniformly among these customers, each customer is assumed to deliver 3,611 bushels of corn and 1,203 bushels of soybeans. Multiplying the amount of each product (corn or soybeans) that each customer delivers by the extra number of miles that need to be driven, an estimate for the additional miles per bushel is obtained. Applying miles-per-bushel transportation rates to this previous figure results in the additional costs, shown in Table 5.

TABLE 5. Additional transportation costs for the customers trading with Davenport

	t = \$0.001	t = \$0.0015	t = \$0.002
Increased costs for corn	$7,506	$11,260	$15,013
Increased costs for soybeans	$2,565	$3,847	$5,129
Total additional transportation costs	$10,071	$15,107	$20,142

The reason why these cost estimates are small is that this method of calculating the change in distance results in a reduction in shipping costs for 61 percent of River Gulf's customers. That is, Davenport is farther away for these customers than is the next closest buyer. These customers must have had some other reason for shipping grain to River Gulf than simply shipping distance.

Table 6 reports the increased shipping costs for only the 39 percent of customers that would have an increased distance to ship their grain. Subtracting the Table 6 estimates from Table 5 estimates shows the savings in shipping costs that would occur for those customers who reside closer to Clinton or Buffalo than to Davenport. The fact that many customers chose to ship their grain to Davenport even though one of the other buyers was closer indicates that River Gulf Grain must have offered some other benefit that overcame the increased travel costs. Two likely reasons are a stronger bid or a shorter waiting time to offload grain. The estimates made in this study do not account for either of these "hidden" benefits that would be affected if River Gulf Grain were to close.

Conclusions

Few estimates exist on the impact of local market power on buyers' bids for grain. The potential closing of River Gulf Grain in Davenport, Iowa, provides an opportunity to apply existing spatial models to the problem of estimating the impacts of reducing the number of grain buyers in a local market from three to two. Hotelling's venerable line model of spatial competition was calibrated to model the impact of a decrease in grain-buying competition on the Mississippi River. The key parameter in the model is the

Table 6. Additional transportation costs for customers that would incur an increase in shipping costs

	***t* = $0.001**	***t* = $0.0015**	***t* = $0.002**
Increased costs for corn	$37,354	$56,031	$74,708
Increased costs for soybeans	$12,763	$19,144	$25,525
Total additional transportation costs	$50,116	$75,175	$100,233

incremental cost of hauling grain. Estimates of this cost range between 0.1¢ to 0.2¢ per bushel per mile. Bids for grain by the remaining buyers in the local region are estimated to drop by between 1¢ and 3¢ per bushel given this range of transportation costs. This price decrease results in a decrease in gross revenue from grain of between $500,000 and $990,000 per year. Additional costs from the departure of River Gulf Grain include additional transportation costs of between $50,000 and $100,000 for those sellers who find that they will have to haul their grain a greater distance.

Endnotes

1. If one buyer lowers his or her bid by a small amount, only those sellers who were indifferent between selling to the one buyer or another buyer will change their decision about where to deliver their grain. This means that each buyer faces an upward sloping grain supply function.

2. We implicitly assume that illegal collusion between buyers does not occur.

3. This is just for notational convenience. Later, the current density for corn and soybeans will be used.

4. This condition also has to be satisfied in equilibrium. A firm facing no supply makes zero profits and hence has an incentive to increase its offer price. (See Tirole 1988).

5. For a discussion of models in which this does not hold, see Martin 2002, and the references therein.

6. When transportation costs are linear, the model is not well-behaved, as this condition is not satisfied in the sense that the supply functions are not continuous (see, e.g., Tirole 1988, or Martin 2002). With only two firms, this condition must be satisfied in equilibrium (D'Aspremont, Gabszewicz, and Thisse 1979). This also rules out the possibility of spatial arbitrage between the buying points.

7. For the two-firms case, D'Aspremont, Gabszewicz, and Thisse (1979) provide necessary and sufficient conditions for the existence of pure-strategy Nash equilibrium in prices. In the problem at hand, the fact that all the buyers under consideration face a positive supply lends support to the restricted focus of the analysis.

References

D'Aspremont, C., Gabszewicz, J. J., and Thisse, J. F. 1979. "On Hotelling's 'Stability in Competition.'" *Econometrica* 47(5): 1145-50.

Baumel, C. P., M.J. McVey, and J-P. Gervais. 1996. "Trend Toward Increased Semi Use Challenges Elevators." *Feedstuffs,* Vol. 68, No. 33, August 5.

Hayenga, M., and R. Wisner. 2002. "Cargill's Acquisition of Continental Grain's Grain Merchandising Business." *Review of Agricultural Economics* 22: 252-66

Hotelling, H. 1929. "Stability in Competition." *Economic Journal* 39: 41-57.

Martin, S. 2002. *Advanced Industrial Economics*, 2nd ed. Oxford: Blackwell Publishers.

Tirole, J. 1988. *The Theory of Industrial Organization*. Cambridge, MA: The MIT Press.

Trimac Consulting Services. 1999. "Trucking Operations/Business Viability and Truck Costing Model for Transportation of Grain." Available at http://www.tc.gc.ca.pol/EN/Report/truckGrainCosting1999/Main.htm (accessed March 2003).

U.S. Department of Agriculture, Economic Research Service (USDA-ERS). 1999. "Cargill's Acquisition of Continental Grain: Anatomy of a Merger." *Agricultural Outlook,* September, pp. 21-24.