An Empirical Study of Competition in the Price Discovery Process for Slaughter Lambs

Clement E. Ward

Buyer competition in the price discovery process for slaughter lambs at an Oklahoma teleauction was studied. Number of buyers positively influenced both absolute and relative sale prices but did not significantly affect buyer gross margins. Buyer market shares also affected prices paid and buyer gross margins. Thus, competition among buyers was found to be important in the price discovery process.

Morgenstern argued in the early 1970s that economic theory had contributed little toward understanding the price formation process. A decade later, R. Ward placed the pricing process among the priority topics on the research agenda for agricultural marketing economists. One element of the pricing process is the importance and impact of competition (as measured by the number, size, location, and efficiency of buyers) on price level. Paul noted that industrial organization economists deal with price performance at a relatively aggregative level. Relatively little empirical evidence exists regarding the importance of buyer competition on prices received by sellers at the firm level. Menkhaus, *et al.* suggest data limitations rather than lack of interest preclude economists from empirically studying structural impacts on prices for agricultural commodities.

This article reports results of an empirical analysis of the importance and impact of competition among buyers in the price discovery process for slaughter lambs. It is intended to contribute toward a theory of price discovery and a better understanding of competition at the microeconomic level.

Conceptual Framework and Hypotheses

Thomsen and Foote define price discovery as the process of buyers and sellers arriving at a transaction price for a specific quantity and quality of a commodity at a specific time and place. Their description of the process consists of two phases. Phase one involves buyers and sellers evaluating supply and demand conditions and determining the general level of prices around which specific transaction prices fluctuate.

At any point in time, neither buyers nor sellers know exactly the shape and location of supply and demand curves for a given commodity for some future period. However, buyer and seller estimates of demand and supply schedules are assumed to be normally distributed around the true schedules. Then, prices corresponding to the extreme points of intersection of the estimated schedules represent a band of potential prices within

Clement E. Ward is Professor and Extension Marketing Economist in the Department of Agricultural Economics at Oklahoma State University.

The author acknowledges useful comments on an earlier version of this article by James Plaxico, Dan Tilley, and Journal reviewers.

Western Journal of Agricultural Economics, 9(1): 135–144

which specific transaction prices fluctuate. The price band width depends on a number of factors, e.g., geographic market area, how far forward price estimates are made, accuracy of grading or describing the commodity, and availability of information to buyers and sellers, among others.

Phase two of the price discovery process involves buyers and sellers determining the value and price of a specific sale lot of the commodity traded. Buyers estimate the value to them of the sale lot, then discover the sale price via some pricing mechanism, such as private negotiation or auction (Tomek).

Interviews with lambpackers indicated that the price discovery process for slaughter lambs is similar to the process for slaughter cattle (Ward, 1979). Buyers begin with a basic economic identity, that profit equals total revenue minus total costs. For lambpackers that equation can be expressed as

$$\pi = [(\text{WLP} \times \text{CWT}) + \text{PPL}] - [(\text{LPL} \times \text{LWT}) + \text{SLC}] \quad (1)$$

where π is profit, WLP is the wholesale lamb carcass price, CWT is the lamb carcass weight, PPL is the pelt price for No. 1 grade pelts, LPL is the slaughter lamb price, LWT is the live lamb weight, and SLC is slaughter and related costs (i.e., cooler shrink and transportation, among others). Lamb buyers rearrange equation (1) and solve for LPL,

$$\text{LPL} = \frac{[(\text{WLP} \times \text{CWT}) + \text{PPL}] - [\text{SLC} + \pi]}{\text{LWT}}. \quad (2)$$

Packers estimate their total returns from sale of the carcass, pelt, and byproducts; subtract their estimated slaughter and related costs and a profit target; and convert net returns to a live weight basis to estimate their break-even price, given assumptions made in their estimates. This process parallels phase one of the price discovery process. Carcass and pelt prices parallel the general price level for each respective commodity. Packers implicitly or explicitly estimate ranges of expected prices as well as costs and profits in order to develop a band or range of prices within which live lamb prices will likely fluctuate during the trading period.

Phase two consists of determining the value of a specific sale lot of lambs given its location, lot size, sex, and estimated grade, weight, and yield of lambs, among other factors. Then a sale price is discovered via some pricing mechanism. Actual sale price depends on many factors, among them are the number and quality of lambs for sale, supply and demand conditions of individual buyers and sellers, and competition among buyers.

Both microeconomic and industrial organization theory suggest that increased buyer competition has a positive effect on sale price (Henderson and Quandt; Sherer). The expanding literature on electronic marketing supports that theory. In nearly all cases to date, electronic marketing has had a price enhancing effect for sellers (Henderson and Baldwin; Henderson and Holder; Holder; Russell; Sporleder and Davis; and Ward, 1982b). Often, increased buyer access to the trading session and reduced buyer concentration have accompanied higher prices. Thus, it is unclear how much price enhancement resulted: (1) from buyers being able to better match price with the value of the commodity due to improved description of the sale lot; (2) from an equal distribution of information to buyers about the commodity available for sale and an equal opportunity to bid on sale lots; (3) from reduced buying costs which were then passed back to sellers; or (4) from increased competition among buyers during the trading session. This study focuses on the latter possibility.

A positive relationship between buyer

competition and price means there is a concomitant negative relationship between competition and buyer profits and gross margins. If increased competition leads to higher prices paid by buyers in equations (1) and (2), it increases packer costs and reduces packer profits and gross margins (cet. par.).

Bain hypothesized that with high levels of concentration, the largest buyer can depress prices paid to sellers. Love and Shuffett and Menkhaus *et al.* found results supporting that hypothesis. Aspelin and Engelman; Holder; and Ward (1981) also found that an increased number of buyers had a positive effect on price. However, Ward (1982a, 1983); and Williamson *et al.* found different results when studying market structure impacts on prices and margins in other situations. Their studies found no significant relationship between buyer market shares and prices paid to sellers or packer gross margins. Differences in results may be due to different methodologies, data, or market conditions, among other reasons. Regardless, the effects of buyer competition in the price discovery process are unclear and empirical results have been inconsistent.

In this study, the absolute and relative impact of competition (i.e., number and size of buyers) on prices, and the absolute impact of competition on gross margins were estimated. Hypotheses tested were: (1) that number of buyers positively influenced the selling price of lambs and negatively influenced the gross margins of buyers; and (2) that buyer market shares had no impact on selling prices of lambs and gross margins of buyers.

Data and Procedures

A group of producers organized and operated a slaughter lamb teleauction in Oklahoma from March 1979 until February 1982, when they began marketing lambs via computerized auction. Producers conducted a lamb teleauction sale whenever they could pool at least one semi-trailer truckload of lambs, thus sponsoring 58 sales over the 35-month period.

Teleauction records provided much of the data for this study. Pre-sale data included estimates on the number of lambs for sale, their average weight, grade, and pelt grades, number of lambs discounted (i.e., buck lambs and tailed lambs), and price discounts for lambs varying from the standard or base type of lambs (e.g., for weight, grade, and other factors). Sale data included the number of buyers on the conference telephone, opening bid, bid sequence by bidder, sale price, and buyer. Post-sale data included delivery date and place, actual number and weight of lambs by seller, final live-weight grade of lambs, and actual number and average weight of lambs in the sale lot. Weekly average wholesale prices for choice grade lamb carcasses at New York, No. 1 grade pelt prices at northern, river, and southwestern markets, and choice grade slaughter lamb prices at San Angelo, Texas were obtained from "Livestock-Meat-Wool Market News: Weekly Summary and Statistics," AMS-USDA.

A description of the slaughter lamb pricing process was based on personal interviews with the two largest buyers from the Oklahoma teleauction, and supplemented with published information (Engelman *et al.*; Ward, 1979). The two largest buyers purchased 59.8 percent of all lambs sold by teleauction in Oklahoma from March 1979 to February 1982.

Models were specified and estimated by OLS regression to measure the impact of competition and market structure on prices paid and on buyer's gross margins. Independent variables in equations reported here were selected on the basis of economic theory, hypothesized relationships, theoretically correct coefficient signs, and statistical significance of the coefficients.

Slaughter lamb prices trended downward over the 1979–82 period so a vari-

able was included to remove the trend variation (TRD) in prices. Zero-one dummy variables were added to account for the seasonality found in slaughter lamb prices (Usman and Gee).[1]

Variables that normally affect the price for a specific sale lot of lambs in the second phase of the price discovery process include number of lambs per sale lot, estimated weight of the sale lot, and estimated weight of lambs sold, among others. Teleauction sales were in semi-trailer truckload lots. Forty-six of the 58 sales were single-truckload lots, 11 were two-truckload lots, and one was a three-truckload lot. Lamb weights, grade, and condition varied among sale lots but the pooling process reduced such variation and increased quality consistency compared to single-owner lots. Consequently, variables for such factors as lot size, lot weight, and average sale weight were not significant and were omitted from models reported here.

Buyer competition was hypothesized to be important in the second phase of the price discovery process, especially during the teleauction (i.e., when lambs were auctioned to buyers over a conference telephone call). Elements of competition hypothesized to be important were the number, size, and location of buyers.

Bain defined a very highly concentrated oligopoly market structure as one in which the four largest firms account for 75 percent or more of market sales. The four largest lamb buyers in the U.S. accounted for 56.4 percent of sheep and lambs slaughtered in 1978 (Packers and Stockyards Program). The closest buyer to the Oklahoma teleauction was approximately 365 miles from the teleauction assembly site and the farthest buyer was about 920 miles away. Buyers were located in Texas, Colorado, South Dakota, Minnesota, Illinois, and Michigan. The four largest buyers purchased 83.3 percent of all lambs sold by teleauction. Thus, the buyer market structure is estimated to be a very highly concentrated oligopsony, according to Bain's classification scheme.

[1] Factor demand theory and equation (2) suggest that slaughter and related costs should be incorporated in the model but data were not available.

Models Specified

Three models were specified and estimated.

Model A

Model A was specified to determine: (1) the absolute price impact from the number of packers bidding at each teleauction; and (2) whether or not packer market shares affected prices paid for lambs. Model A incorporated variables hypothesized to be important in both phases of the price discovery process. Model A was

$$LPL = f(WLP, PPL, TRD, DQ_i, LB_i, BUY) \quad (3)$$

where LPL is the slaughter lamb price at each teleauction ($/cwt.), WLP is the weekly average New York price for choice grade 50–55 pound lamb carcasses ($/cwt.) the week of the teleauction, PPL is the northern, river, and southwestern price for No. 1 grade pelts ($/pelt) the week of the teleauction, TRD is a trend variable, DQ_i is a zero-one dummy variable for seasonality (e.g., January, February, March was DQ_1), LB_1 is a zero-one dummy variable for the i^{th} buyer (i.e., one per teleauction), and BUY is the number of packers bidding on each sale lot of lambs.

The pricing process followed by packers suggests that wholesale lamb carcass prices and pelt prices are of primary importance in estimating revenue from lamb and byproducts sales. This parallels Thomsen and Foote's first phase of the price discovery process. Thus, wholesale carcass prices (WLP) and pelt prices (PPL) were included in the model and were expected to be positively related to slaughter lamb prices.[2]

[2] Nominal prices were used in the analysis.

Industrial organization theory suggests the largest buyer in such a market structure can depress prices paid to sellers (Bain). It was hypothesized that larger buyers paid less for lambs than their smaller competitors. Zero-one dummy variables for packers (LB_i) were included to determine whether there was a significant difference between prices paid by larger or smaller packers, as measured by market shares of total teleauction sales.[3] Prices paid by packers could be higher or lower depending on when purchases were made (i.e., during high or low price periods), thus providing further rationale for including time related variables (i.e., TRD and DQ_i).

Number of buyers was also hypothesized to be an important element of competition. Thus, the number of packers bidding on each sale lot (i.e., at each teleauction) (BUY) was included in the model and was expected to be positively related to sale price.

Model B

Model B was specified to determine: (1) the absolute impact of the number of packers bidding at each teleauction on buyer gross margins; and (2) whether or not packer market shares affected buyer gross margins.

It was hypothesized that competition would have a positive impact on sale price and a simultaneous negative impact on gross margins of packers purchasing lambs. Gross margins were estimated by

$$GRM = [(WLP \times YLD) + PPL] -](LPL + TRC)] \quad (4)$$

where GRM is the gross margin for each buyer of teleauctioned lambs ($/hd.), WLP, PPL, and LPL are the same as defined earlier, YLD is the dressing percentage, assumed to be 50 percent for all sale lots, and TRC is an estimate of freight costs ($/cwt.) from the assembly site to the slaughter plant.[4] Thus, the first bracketed expression is an estimate of returns from lamb carcass and pelt sales and the second bracketed expression is an estimate of costs of lambs plus transportation. Gross margins must cover slaughter costs (including cooler shrink and other in-plant costs), transportation costs from the plant to retailer, and a profit. Then, Model B was

$$GRM = f(TRD, DQ_i, LB_i, (BUY) \quad (5)$$

where all variables are the same as defined earlier.

Estimation results for Model B were expected to nearly mirror results for Model A. However, transportation costs from assembly site to packing plant were incorporated into Model B. Thus, Model B incorporated number, size, and location of buyers.

Packers purchasing lambs at different times (e.g., during low or high price periods) may have higher or lower gross margins. Thus, time variables were included to remove any variation due to trend (TRD) and seasonality (DQ_i) in gross margins.

It was hypothesized that the largest packer in an oligopsonistic market structure would have a competitive edge over smaller buyers in terms of gross margins. If larger buyers paid less for lambs, they would have higher gross margins to cover slaughter costs and earn a profit than smaller buyers (cet. par.). Thus, dummy variables for each packer (LB_i) were included to determine whether there was a significant difference in gross margins among larger and smaller buyers.

[3] Using market shares limits interpretation of results because market shares measure the relative size of buyers in the market studied but do not measure their absolute size. Market shares may be as much a function of buyer location relative to the teleauction location than buyer size and efficiency.

[4] Freight cost estimates were based on a 45,000 pound truckload of lambs, @ $1.80 per hundredweight rate per loaded mile, times the number of miles from assembly site to packing plant.

Competition in the form of number of buyers (BUY) was hypothesized to negatively affect gross margins of buyers.

Model C

Model C was specified to determine the relative price impact from the number of packers bidding at each teleauction. Price differences were computed between teleauction prices and weekly average slaughter lamb prices at San Angelo, Texas for the same week as the teleauction, by

$$PDIF = LPL - SAP \quad (6)$$

where PDIF is the price difference ($/cwt.), LPL was defined earlier, and SAP is the weekly average choice grade slaughter lamb price at San Angelo ($/cwt.). Model C was

$$PDIF = f(TRC, BUY) \quad (7)$$

where all variables were defined earlier.

Price differences between the teleauction and San Angelo market averaged $.37 per hundredweight in favor of the teleauction. The mean was not statistically significantly different from zero at the $\alpha = .10$ level. However, price differences ranged from −$10.75 to +$6.75 per hundredweight, and differences were from −$4.88 to +$5.62 per hundredweight 95 percent of the time. Model C was specified to determine whether buyer competition explained the variation in price differences.

Estimated transportation costs between assembly site and packing plant (TRC) were hypothesized to explain a significant portion of the variation in price differences. It was also hypothesized that buyer competition (BUY) would positively affect the price difference.

TABLE 1. Estimation Results of Alternative Model Specifications.[a]

Dependent Variable	Model A LPL	Model B GRM	Model C PDIF
Intercept	12.369	7.359***	−1.373
	(1.12)	(3.88)	(.86)
WLP	.391***		
	(6.67)		
PPL	.304		
	(.59)		
TRD	−.189***	.055*	
	(2.17)	(1.98)	
DQ_1	−.602	.022	
	(.44)	(.02)	
DQ_3	1.055	−1.495	
	(.84)	(1.18)	
DQ_4	1.891	−2.541*	
	(1.27)	(1.80)	
LB_2	−1.176	1.501	
	(1.01)	(1.29)	
LB_3	1.125	−1.723	
	(.90)	(1.38)	
LB_4	.892	−2.590	
	(.39)	(1.16)	
LB_5	−1.601	−.124	
	(.88)	(.07)	
LB_6	−1.773	−.485	
	(.79)	(.21)	
LB_7	.753	−1.088	
	(.24)	(.35)	
LB_8	4.168*	−4.709*	
	(1.77)	(1.96)	
BUY	1.105**	−.702	.595**
	(2.26)	(1.64)	(2.16)
TRC			−.224
			(.33)
n	56	56	57
R^2	.900	.365	.080
DW	1.715	1.770	2.260

[a] Numbers in parentheses are absolute values of calculated t-statistics; and *** = .01, ** = .05, and * = .10 significant levels.

Empirical Results

Estimation results for all three models are shown in Table 1.

Model A

Wholesale lamb carcass prices (WLP) were positively and significantly related

TABLE 2. Teleauction Purchases by Buyers, 1979–82.

Packer[a]	Number of Lots Purchased	Number of Lambs Purchased	Percent of Total Lambs Purchased
LB_1	23	10,815	35.9
LB_2	12	7,209	23.9
LB_3	11	4,970	16.5
LB_4	3	2,115	7.0
LB_5	4	2,100	7.0
LB_6	2	1,270	4.2
LB_7	1	856	2.8
LB_8	2	780	2.6
Total	58	30,115	99.9[b]

[a] Identified by buyer dummy variable found in Models A and B.
[b] Sum does not equal 100 due to rounding.

to teleauction prices for slaughter lambs as expected, based on derived demand theory and phase one of the price discovery process. Pelt prices (PPL) did not explain a significant amount of the slaughter lamb price variation, despite being a factor in lambpackers' pricing process.

Slaughter lamb prices exhibited a significant downward trend (TRD) over the period studied. The seasonal dummy variables (DQ_i) explained less of the variation in teleauction prices than was expected, though seasonality in prices was accounted for in part by the wholesale lamb carcass price variable.

Buyer dummy variables in Table 1 (LB_i) are listed in descending order of the number of lambs purchased from the teleauction. Buyer purchases are shown in Table 2. The largest buyer (i.e., measured in terms of the share of teleauction lambs purchased) paid significantly lower prices ($4.17/cwt.) than did the smallest buyer (LB_8). Other packers did not pay significantly different prices than the largest buyer.

Number of buyers bidding on each teleauction sale lot (BUY) was positively and significantly related to slaughter lamb prices. Thus, competition (i.e., measured in terms of the number of buyers actively bidding) significantly affected teleauction prices. Number of potential bidders per teleauction ranged from 7 to 10 (i.e., number of buyers on each conference telephone call), while active bidders ranged from 2 to 7, averaging 3.79. As the number of buyers increased, so did the teleauction price. Each additional buyer increased sale price by $1.10 per hundredweight.

Model B

Coefficient signs for Model B were opposite those in Model A in most cases, as expected. Gross margins trended significantly upward over the study period (TRD) and packer gross margins were significantly lower in the fourth quarter (DQ_4) than the second quarter.

The largest buyer's gross margins from teleauction purchases were significantly higher ($4.71/hd.) than gross margins of the smallest buyer (LB_8). Gross margins of the largest buyer relative to the remaining buyers were not significantly different.

Number of buyers bidding (BUY) was not significant. Thus, increased buyer competition had no significant affect on buyer gross margins. The explanatory power of Model B was relatively low. One explanation among others may be that buyers' slaughter and related costs were not incorporated in the model.

Model C

Model C was estimated to determine whether or not buyer competition affected teleauction prices relative to prices at a reference market. Number of buyers (BUY) positively and significantly affected the teleauction-San Angelo price difference. As the number of packers that bid increased, the price difference widened in favor of the teleauction. Transportation costs did not explain a significant portion of the price difference

variation. Estimation results of Model C are relatively weak due to the low explanatory power of the model.

Implications and Conclusions

The primary objective of this study was to measure the importance of buyer competition in the second phase of the price discovery process. One part of that analysis was to determine whether number of buyers affected teleauction prices. Results confirmed that competition among buyers (as measured by the number of buyers bidding at each teleauction) positively and significantly affected slaughter lamb sale prices. As the number of bidders increased, so did sale price.

Results failed to confirm that as buyer competition increased, buyer gross margins declined. This relationship between number of buyers and gross margins was expected to mirror the relationship between number of buyers and prices paid for lambs. Specification error due to data unavailability may explain why estimation results did not support hypothesized results.

Price differences between teleauction and San Angelo prices were found to widen in favor of the teleauction with increased buyer competition. Thus, the number of buyers influenced the absolute level of prices paid by packers as well as relative prices, compared to a reference market. However, poor explanatory power of the model weakens reliance placed on results of the relationship between number of buyers and price differences.

A second part of the analysis was to determine whether size of buyers (as measured by market shares) affected prices paid by packers and buyer gross margins. The four largest buyers of teleauctioned lambs bought 83.3 percent of total lambs sold, more than the 75 percent four-firm market share level over which Bain referred to the market structure as being very highly oligopsonistic. Results indicated that market shares affected prices paid by packers and buyer gross margins in just one instance. The largest buyer (in terms of market share of teleauction purchases) paid significantly lower prices than the smallest buyer. However, results may reflect poor purchases by the smallest packer rather than implying that the largest firm used market power to depress prices.

Buyer gross margins differed little, despite the expected importance of buyer location. The two closest buyers to the teleauction assembly site were the two largest buyers. One paid the lowest average prices and the two had the highest gross margins. The lone packer paying significantly higher prices and having significantly lower margins was located farthest from the teleauction. Thus, price and gross margin differences were in part dependent on buyer location as well as market share of purchases, as theoretically expected by location theory (Capozza and Van Order). However, other factors are important. Some packers may simply buy more skillfully. For example, two packers were located about 920 miles from the assembly site. One packer paid significantly higher prices and had significantly lower gross margins than the largest buyer, while no significant differences were observed for the other packer.

In summary, the hypothesis that number of buyers positively influences the absolute and relative selling price could not be rejected, but the hypothesis that number of buyers negatively affects buyer gross margins was rejected. Also, the hypothesis that buyer market shares had no impact on either selling price or gross margins was rejected. Thus, buyer competition is important in the price discovery process. Number, size, and location of buyers affected prices paid for lambs and buyer gross margins.

The observed positive relationship between prices paid and number of buyers supports previous work (Aspelin and Engelman; Holder; Love and Shuffett; Ward,

1981, 1983) and parallels expectations based on both industrial organization and microeconomic theory. The observed relationship between market shares and prices supports research by Menkhaus *et al.* and results suggested by industrial organization theory, but differs from results observed by Ward (1982a). Results on the relationship between buyer market shares and gross margins support industrial organization and microeconomic theory but differs from the study of Williamson *et al.*

Buyer competition appears to be important in discovering transaction prices based on results reported here. However, further research is needed to evaluate and identify appropriate methodologies, data aggregation levels, and data or information needs for studying the relationships between market structure and performance (e.g., such criteria as price level, gross margins, and profits). Absolute size differences of buyers may be a more appropriate explanatory variable than relative size (as measured by market shares), which incorporates buyer location to some extent. Also, this study did not address whether or not larger buyers influenced the absolute level of prices paid and gross margins earned by all buyers, rather than simply relative prices and gross margins compared to smaller competitors.

References

Aspelin, A. and G. Engelman. "Packer Feeding of Cattle—Its Volume and Significance." C&CM USDA, MRR 776, 1966.

Bain, J. S. *Industrial Organization*. John Wiley & Sons, New York, 1959.

Capozza, D. R. and R. Van Order. "A Generalized Model of Spatial Competition." *American Economic Review*, 68(1978): 5 896–908.

Engelman, G., E. Stoddard, and J. Maetzold. "The Lamb Industry: An Economic Study of Marketing Structure, Practices, and Problems." P&S USDA, Research Report 2, 1963.

Henderson, D. R. and E. D. Baldwin. "Marketing Slaughter Hogs by Remote-Access Computerized Auction: Theory and Empirical Results." Organized symposia paper, American Agricultural Economic Association Meetings, July 1981.

Henderson, D. R. and D. L. Holder. "Lessons Learned in Electronic Marketing." *Proceedings, Electronic Marketing Conferences*, Virginia Polytechnic Institute and State University, August 1982.

Henderson, J. M. and R. E. Quandt. *Microeconomic Theory: A Mathematical Approach*. 2nd Edition, McGraw-Hill, New York, 1971.

Holder, D. L. "Benefits of a Sheep and Lamb Teleauction in Virginia and West Virginia." Presented at the Southern Agricultural Economics Association Meetings, February 1979.

Love, H. G. and D. M. Shuffett. "Short-Run Price Effects of a Structural Change in a Terminal Market for Hogs." *Journal of Farm Economics*, 47(1965): 3 803–12.

Menkhaus, D. J., S. St. Clair, and Z. Ahmaddaud. "The Effects of Industry Structure on Price: A Case in the Beef Industry." *Western Journal of Agricultural Economics*, 6(1981): 2 147–53.

Morgenstern, O. "Thirteen Critical Points in Economic Theory." *Journal of Economic Literature*, 10(1972): 3 1163–89.

Packers and Stockyards Program. "Concentration in the Meat Packing Industry—National and Local Procurement Areas." Report presented to the U.S. House Committee on Small Business. AMS USDA, April 1980.

Paul, A. B. "Some Basic Problems of Research into Competition in Agricultural Markets." *American Journal of Agricultural Economics*, 61(1979): 1 170–77.

Russell, J. R., II. "Electronic Marketing: Conceptual, Theoretical, and Empirical Consideration." Unpublished Ph.D. dissertation, Virginia Polytechnic Institute and State University, 1981.

Scherer, F. M. *Industrial Market Structure and Economic Performance*. Rand-McNally, Chicago, 1970.

Sporleder, T. L. and E. E. Davis. "Economic Analysis of a Computer Based Trading System for Feeder and Stocker Cattle." Texas Agricultural Experiment Station Report, (forthcoming) 1984.

Thomsen, F. L. and R. J. Foote. *Agricultural Prices.* 2nd Edition, McGraw-Hill, New York, 1952.

Tomek, W. G. "Alternative Pricing Mechanisms in Agriculture." *Future Frontiers in Agricultural Marketing Research.* Ed. Paul L. Farris, Iowa State Press, Ames, 1983.

United States Department of Agriculture. "Livestock-Meat-Wool Market News: Weekly Summary and Statistics." AMS USDA, various issues.

Usman, M. and C. K. Gee. "Prices and Demand for Lamb in the United States." Colorado Agricultural Experiment Station, Technical Bulletin 231, January 1978.

Ward, C. E. "Slaughter Cattle Pricing and Procurement Practices of Meatpackers." ESCS USDA, AIB 432, December 1979.

Ward, C. E. "Short-Period Pricing Models for Fed Cattle and Impacts of Wholesale Carcass Beef and Live Cattle Futures Market Prices." *Southern Journal of Agricultural Economics,* 13(1981): 1 125–32.

Ward, C. E. "Relationship Between Fed Cattle Market Shares and Prices Paid by Beefpackers in Localized Markets." *Western Journal of Agricultural Economics,* 7(1982a): 1 79–86.

Ward, C. E. "Market Participant and Comparative Price Evaluation of Marketing Feeder Cattle by Video Auction." Department of Agricultural Economics, Oklahoma State University, AE 82108, October 1982b.

Ward, C. E. "Price Impacts of a Structural Change in Pork Processing—A Case Study in Oklahoma." *Current Farm Economics,* 56(1983): 1 3–9.

Ward, R. W. "The Agricultural Marketing Agenda for the Eighties." *Southern Journal of Agricultural Economics,* 14(1982): 1 77–82.

Williamson, J. C., Jr., R. Schneider, E. Stoddard, and C. Swearingen. "Geographic Markets and Prices for Fed Steers and Heifers." P&SA-USDA, Report 82-1, April 1982.