MARKET FUNCTIONS, SCALE ECONOMIES, REVENUE
REQUIREMENTS AND THE PLIGHT OF THE NORTHEAST
LIVESTOCK AUCTION INDUSTRY

by

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INTRODUCTION AND PURPOSE

Most economists characterize spot markets as performing two basic functions: price discovery and locational services (which may be subdivided into assembly and sorting). The livestock auction industry in total does not differ from this general characterization since its basic function is to bring buyers and sellers to the place where the animals are being marketed. Thus whether the principal species and class handled in a particular market is feeder pigs or cull beef cows the functions performed at this level of generality are the same. The marketing procedures used are also highly uniform, consisting principally of unloading, sorting, presentation to buyers and re-loading, along with the necessary record keeping. As a result there is a tendency to view this industry as homogenous with some unit cost differences due principally to variation in size.

Important differences nevertheless do exist among markets in the mix or balance between the assembly and price discovery functions. Let us consider two extremes. In major producing areas feeders and feed stock producers often bring to market readiness a semi-load or more of animals sorted by size, sex and grade. To the extent that these lots are sold through auction markets the market serves primairly as a facilitator of price discovery.

The opposite is the sale of culled dairy cows for slaughter. With year-round freshening these animals come to the market a few at a time from individual farms as they dry up, do not conceive, fail to respond to medication, sheer a teat, or for other reasons. The result is a constant trickle of cows from a large number of farms covering a range of quality grades from

standard to cutter and possibly even condemnations. Auctions serving dairy-
ing areas must therefore provide a substantial assembly function to concen-
trate a sufficient number of animals to attract buyers. Sorting may be con-
sidered as the secondary function in terms of importance due, on the supply
side, to the range of quality grades and condition of the stock within grades,
and on the demand side to the specialization of many packers on a few grades
to meet requirements of their major customers. Pricing may then be considered
as the tertiary function.

Costs of the sale function may be expected to vary with the class of
animal sold. Fed and feeder animals, which are generally sold commingled,
have a lower handling cost per unit than the slaughter dairy cows and calves,
which are typically handled individually. Other classes of animals, such as
cull beef cows, would be expected to have an intermediate cost level since
the seasonal sales of these animals and consistency in age and condition would
permit pooling of small lots (Yager and Greene).

The purpose of this paper is to test the hypothesis that auction market
costs exceed allowable fees for markets in dairy states. Permissible fees
are regulated by the Packers and Stockyards Administration (P&SA) of the U.S.
Department of Agriculture in much the same fashion as are public utility fees
(Stoddard). If this hypothesis is not rejected it raises questions about the
long term viability of livestock auctions in dairying states. Local auction
markets are important to dairymen as a convenient outlet for quickly disposing
of unwanted stock. The situation has become more acute in the last few years
because per head commission fees, which yield lower total revenues than per-
cent or valuation fees (Stoddard, p. 63), have been mandated (Federal Register).

The results of this study support the hypothesis that the costs of oper-
ating auctions in dairy states exceeds permissible service derived revenue for

several size categories of markets. The inequality of costs and permissible revenue, known as revenue requirements, is due to the relative costliness of dairy auctions compared to the national average. Thus the future of some of the markets in the principal dairy states in the Northeast and elsewhere is in doubt. The impact of the closing of some of these markets would be substantial since many dairymen rely on auctions as an outlet for their surplus animals. In a recent survey 72% of sampled New York State dairymen were found to use auction markets (Agway, 1978) as opposed to 1976 national sales at only 8% of fed steers through these markets (P&SA, 1977).

In addition, the existing allowable fee structure discourages market growth beyond a relatively small size of 40,000 livestock marketing units.[1] This size market lacks economies of size savings of 17% or $.34 per marketing unit over the most efficient size. The net effect of the current regulator situation is to disadvantage dairymen compared to other livestock producers through both the likely loss of outlets and the costs of encouraging inefficient, small markets. These conclusions indicate the need to modify present regulatory practices as they apply to livestock auction markets in dairying states.

The analysis is based on 1976 data from 1,562 annual reports from individual markets filed as required by law with the P&SA. The data include costs filed by individual markets using a standardized accounting system, revenue requirements by market determined by the P&SA and numbers of animals consigned by principal class and species. Markets are identified by state.

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[1] This term is defined below.

COSTS AND REVENUE REQUIREMENTS

Determining a Standardized Marketing Unit

In order to estimate unit costs it is necessary to convert the range of species and classes to a standardized unit referred to as a livestock marketing unit (LMU). Using the methodology accepted by the P&SA, the units are standardized by regressing the total sales for each market by class (cattle, calves, hogs, sheep, and goats and horses) on the total revenue requirement[2] for that market (Stoddard, pp. 25-27). With one cattle as the basic unit the relative units are calculated as a ratio of the coefficients. In this fashion the standard unit from pooled national data is 1 cattle, 1 calf, 3 hogs, 4 sheep and/or goats and 1 horse (Table 1).

The markets are regionalized by classifying states as principally dairy, beef or pork producing areas depending on the principal sale of species and class of all animals marketed in that state in 1976 (P&SA, 1977). The resulting division of states into these three groups generally fits with the common knowledge of the major livestock product of each state. Dividing the sample into dairy, beef and hog producing states leads to significant changes in estimated LMU's with 1 cattle in a beef producing state used as a basic unit. As expected, one cattle in a dairy state has a LMU value of less than one, indicating that it is more expensive to handle compared to one cattle in a beef

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[2] Revenue requirements are used by the P&SA in determining the need for increased in commission fees at an auction. If a market's commission revenue is below the requirement for that market as determined by the P&SA than an increase in fees will not be contested; if the reverse is true a fee charge may be disallowed. Revenue requirements are estimated by passing through some costs including labor, by allowing a fixed return on investment, and by prescribing returns for management and owner/operator labor. Other costs such as trucking are not considered a part of commission sales and are not included (Stoddard, pp. 27-34).

Table 1

Estimating Livestock Marketing Units Using National and Regional Areas

| Area | Regression (a) | | | | | | | Livestock Marketing Units | | | | |
	Const.	Cattle	Calves	Hogs	Sheep & Goats	Horses	$\overline{R}^2$	Cattle	Calves	Hogs	Sheep & Goats	Horses
National[1]	(c)	1.00	1.11	.32	.27	1.92	(c)	1	1	3	4	1
Beef[2]	404.70	.029 (52.22)	.035 (17.83)	.015 (21.90)	.0079 (10.18)	(b)	.84	1	1	2	4	(b)
Dairy[3]	66.21	.041 (11.55)	.039 (11.87)	.013 (8.53)	.041 (2.24)	(b)	.89	3/4	3/4	2	3/4	(b)
Hogs[4]	125.97	.036 (51.69)	.035 (11.91)	.010 (16.07)	.044 (15.97)	(b)	.92	1	1	3	3/4	(b)

(a) students t-statistic is in parenthesis.

(b) not calculated since horses are insignificant in total numbers.

(c) not available.

[1]Source: Stoddard, p. 27.

[2]The beef producing states used in the study are: AR, CA, FL, ID, IL, IN, KS, LA, MO, ND, NM, NV, OK, OR, SC, SD, TX, UT, WA, WV, and WY.

[3]The dairy producing states used in the study are: CT, MN, NJ, NY, PA, VT, and WI.

[4]The park producing states used in the study are: AL, AZ, CO, DE, GA, IA, KY, MD, MI, MS, MT, ND, NC, OH, TN, and VA.

state. The results are shown in Table 1. All coefficients are significantly different from zero for a two-tailed test at the five percent level.

Methodology and Results

The financial viability of auction markets may be determined by comparing reported costs and revenue requirements. If costs exceed revenue requirements for a market or markets they may be considered to be in a deficit position. Allowable fees are based on the relationship of actual revenue to required revenue, not the relationship between revenue and costs.

Revenue requirements are hypothesized not to be significantly different from costs for all markets and for markets in the beef subsample. The markets in the dairy subsample are hypothesized to have average costs exceeding their revenue requirements because the extra handling required for surplus dairy animals is expected to exceed the national average. The analysis is conducted for all markets and by size divisions established by the P&SA.[3] Size divisions are used to test for size related differences in the revenue requirements cost relationships.

Unit costs and requirements using national LMU's are compared using one way analysis of variance (ANOVA). The hypothesis is tested at the five percent level using a one-tailed F-test under the alternative hypothesis that costs exceed requirements. The results shown in Table 2 support the hypothesis that national markets in total and by size category have costs and requirements not statistically different. The same conclusion can be made for a similar analysis applied to the beef subsample.

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[3] The groupings used are, in 1,000 LMU's: < 5, 5-10, 10-15, 15-20, 20-25, 25-30, 30-40, 40-50, 50-60, 60-70, 70-80, 80-90, 90-100, 100-150, 150-200, > 200.

Table 2

Comparision of Reported Unit Livestock Marketing Costs and Revenue Requirements for the National and Beef and Dairy Samples

LMU[3] (1000's)	All Markets			Beef States[1]			Dairy States[1]		
	N	F	Significant[2]	N	F	Significant[2]	N	F	Significant[2]
<5	105	14.77	No	49	10.66	No	14	3.01	Yes
5-10	188	60.83	No	93	31.98	No	23	16.16	No
10-15	175	91.76	No	85	78.07	No	29	27.04	No
15-20	172	94.56	No	70	30.13	No	17	41.76	No
20-25	134	58.54	No	73	31.40	No	11	13.70	No
25-30	144	57.49	No	61	22.34	No	9	1.94	Yes
30-40	205	79.70	No	108	49.86	No	18	26.83	No
40-50	126	82.22	No	72	49.46	No	10	3.98	Yes
50-60	81	46.65	No	49	41.04	No	N.C.	N.C.	
60-70	55	30.93	No	31	16.61	No	N.C.	N.C.	
70-80	54	21.93	No	30	14.50	No	3	2.66	Yes
80-90	27	12.43	No	16	10.75	No	N.C.	N.C.	
90-100	21	26.38	No	10	21.09	No	N.C.	N.C.	
100-150	51	23.61	No	30	11.63	No	6	48.67	No
150-200	17	103.50	No	10	46.80	No	N.C.	N.C.	
>200	14	19.99	No	9	7.66	No	N.C.	N.C.	
All	1569	399.86	No	796	109.46	No	146	48.99	No

N.C. - not calculated because of insufficient sample size.

[1] For a list of the states in these groups see Table 1

[2] Significance at the five percent level for a one-tailed test

[3] One LMU equals 1 cattle, 1 calf, 3 hogs, 4 sheep and/or goats, or 1 horse

The hypothesis that costs equal requirements cannot be rejected for all dairy state markets but is rejected for the smallest group of dairy auctions, those handling less than 5,000 LMU's annually. This group represents nearly 10 percent of all markets in the dairy states. Additionally, a number of the dairy markets in the larger size categories of 40,000 to 100,000 annual LMU's have costs significantly different from requirements. This number represents nine percent of all dairy state auction markets. Together they represent 12 percent of the markets in the Northeast states and 20 percent of the markets in New York State. The largest testable size category, 100,000 - 150,000 annual LMU's, represents only 5 percent of all markets in the dairy states and 2.5 percent of markets in the Northeast.

Repeating ANOVA analysis using the regionalized LMU's for calculating unit costs and revenue requirements costs and requirements are shown to be significantly different for only one size group of dairy auctions (60,000 - 70,000 regionalized LMU's). This result further suggests that the additional cost requirements of dairy state auctions can be accounted for by taking into consideration the different service requirements of marketing the major live-stock classes.

CONCLUSIONS

The analysis suggests a distinct but unintentional discrimination against livestock auction markets in dairy areas. Present procedures, if continued, can jepordize almost 20 percent of the markets in the principal dairy states. Livestock auctions are particularly important to dairymen since viable alter-natives, such as direct sales, are not generally available. Additionally, current practice provides a disincentive to increase in size or consolidate several smaller markets. The disincentive takes the form of lower (or

negative) unit returns to larger markets than smaller areas. An analysis of size economies of livestock auction markets using a frontier function estimator recently developed by Greene indicates that the average unit costs for markets with 50,000 LMU's is 24 cents or 10 percent lower than markets handling 20,000 LMU's.[4] Thus, regulation which discourages increases in the size of markets will cause exiting of the larger markets and survival of the smaller inefficient ones. For the dairymen the result is inconvenience and higher than necessary costs.

In general terms the descrepency reported here among the three classes of markets-beef, hog and dairy- can be corrected by recognizing that the differences in services rendered entail cost differentials which must be compenstated. The method suggested here is to group the markets by principal class handled and base the necessary revenues on class groupings rather than treating all markets together. Such a suggestion is easier to make than to apply. Specific guidelines for adjusting current policy to rectify the discrimination against dairy auctions exceeds the purpose of this paper. It is nevertheless useful to identify the likely basis of the problem.

Direct labor, the major marketing costs (Kuehn), is passed through so

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[4]The estimator uses grouped data since there are wide variations in reported costs among markets (Wilson and Kuehn) and the estimator is sensitive to outlyers (Schmidt). For 16 pooled observations for 1976 the estimated boundry function is:

$$\log C/Y = 3.57 + .592 \log Y + .014 \log^2 Y$$
$$\quad\quad\quad (17.00) \quad\quad (14.49) \quad\quad\quad (7.35)$$

where

C/Y — average unit cost per LMU (national)
$\quad$ Y — LMU (national)

All coefficients are significant at the 5 percent level. No R^2 is calculated.

that it should not be a distorting factor. Similarly the treatment of returns

on investment is evenhanded and appropriate. Estimated returns to owner man-

agement and labor seems the likely basis for discrepencies in an industry

where owner operation of dairy auctions is common. Present practice scales

returns to owner labor by LMU's (in 1975 the amounts were $.50 per unit for

the first 20,000 LMU's, $.25 per unit for the next 20,000 units and $.05 per

unit for all LMU's handled above 40,000 (Stoddard, p. 29)). For the dairy

auctions it would appear that the return at the low end is insufficient while

the scale declines too rapidly for dairy markets between 40,000 and 100,000

LMU's. To correct the present bias against dairy auctions it is suggested

that regulatory practices be reassesed with particular emphasis on (a) relat-

ing costs and revenue requirements to the principal species and class handled

and (b) reevaluating scale economies of owner management and labor.

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