COOPERATIVES AS A SOURCE OF COUNTERVAILING MARKET POWER IN THE CALIFORNIA LAMB MARKET

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INTRODUCTION

Over the last 30 years, U.S. sheep and lamb production has declined significantly. In 1960 there were 21 million lambs in the U.S. In contrast, in 1990 there were only 7.8 million. In the same period, wool production has decreased by over 100 million pounds per year, and the total number of stock sheep has declined dramatically.

Past research efforts aimed at explaining the decline of the U.S. sheep and lamb industry have focused on several factors, the most important of which are:

i) declining per capita consumption of lamb
ii) increased foreign competition in lamb, mutton and wool
iii) substitution of synthetic fiber for wool
iv) relatively long periods of time where prices were below the cost of production

While each of these factors has probably contributed to the significant decline in sheep/lamb and wool production, they do not explain the changing structure and subsequent changes in the conduct and performance of the sheep and lamb industry. Sharp declines in lamb and wool production, together with significant changes in the structure of the industry have resulted in increased concentration of the lamb slaughter industry. This, in turn, has contributed to unstable market conditions, and an inaccurate and noncompetitive pricing structure. California is the second largest producer of sheep and lamb in the U.S., but since 1987, only one slaughter plant remains to service the entire California market. Low producer prices and high wholesale/retail prices strongly suggest the dominance of a regional or spatial monopsony in slaughtering.

This study documents the factors that have led to a change in the structure of the California sheep and lamb industry, and examines the implications of the change in that structure. Finally, some alternative structural changes are examined to determine the feasibility of establishing countervailing market forces in the lamb market.

Part I of this report examines the changing struc-

ture of the lamb market in the U.S. and in California. In Part II, the implications of the changing structure are examined and in Part III, some alternative structural changes are considered.

STRUCTURE OF THE LAMB MARKET

The major participants in the U.S. lamb marketing chain consists of producers, feeders, slaughterers, breakers, and retailers. The following diagram illustrates the flow of lamb from the farm gate to the consumer with an estimate of the relative volumes of lamb flowing through each of the marketing channels.
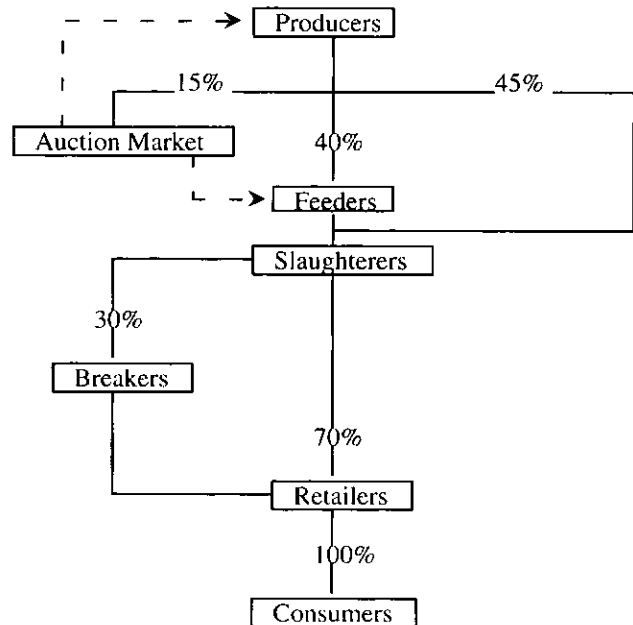
a) Production and Marketing

Production of Lamb
Production of lamb in the U.S. is characterized by decreasing volume; increased input costs (labor costs in particular); pressure on the availability of range land (due to inroads made by recreation facilities, highways, irrigation, and urban encroachment); concentra-

tion of production into fewer but larger flocks; and movement toward consolidation into geographic areas specializing in lamb production and handling. About 80 percent of the U.S. lamb supply is produced in seventeen western states. All these factors have contributed to institutional changes and adjustment throughout the lamb marketing channels in the last 30 years.

The trend in production methods is toward larger ranch and farm flocks in fenced-range pastures, and away from the concept of the industry being tightly tied to unfenced range operations. In addition, many slaughter plant operators now directly or indirectly feed from 20 percent to as much as 60 percent of their lamb requirements.

As with most other areas in the U.S., California has experienced sharp declines in both lamb and wool production. Since 1980 the lamb crop has declined from 1.1 million to 590 thousand in 1989, a 46 percent reduction. During the same time period wool has declined from 11 million pounds to 7.1 million pounds. Even with these sharp declines in production, California ranks second in the U.S. in lamb and mutton production and third in wool production.[1]

Live Marketing

In the past 20 years; the marketing of live lambs through terminal markets has given way to decentralized marketing through direct sales to slaughtering plants. The trend is toward more direct sales to slaughtering plants and less selling through auction markets in the traditional manner.

Fewer slaughter plants, more widely dispersed, has brought about the evolution of new assembly agencies. Lamb pools have been formed which are cooperative efforts amongst smaller producers to facilitate assembly and transportation.

California producers try to sell in the early spring months before heavy movement from other areas begins, and after most of the old-crop fed lambs have reached the market. When this happens, premium prices are obtained for their early spring lambs. Growers in other areas are learning how to produce and market an earlier spring lamb, however, and can compete with California where weather conditions for lambing and feed are favorable.

Lamb feeding

There has recently been increased activity by slaughterers in lamb feeding (Table 1). The number of sheep and lambs fed by slaughterers in 1990 was

approximately 600 thousand.

Table 1. Federally inspected slaughter, and lamb feeding by slaughter packers in the U.S.

| Year | Federally inspected slaughter | Packer feeding[1] | | |
		Feeding Packers	Number	Percent of slaughter
	(1,000 hd.)	(No.)	(1,000 hd.)	(pct.)
1981	5388	5	228	4.2
1982	5820	5	103	1.8
1983	5933	4	334	5.6
1984	6035	8	600	5.0
1985	5578	7	493	8.8
1986	5154	4	506	9.8
1987	4771	3	562	11.8

[1] Includes lambs and sheep fed by or for meat packers and transferred from the feedlot for slaughter during the reporting year. Separate feeding activities by owners, officers, employees of meat packers, or affiliates are not included.

Source: Report of packers filed with the Packers and Stockyards Administration USDA, 1988.

The number of major slaughterers feeding sheep and lambs has remained about constant, and the number of other smaller firms has declined from 22 in 1960 to only 5 in 1989.2 Naturally, this reflects increased activity by those feeding sheep and lambs. This trend illustrates the increased concentration of feeding by large slaughterers.

Lamb feeding is conducted in many ways, ranging from largely confined concentrate feeding to pasturing on a wide range of grasses, forages, and crop residues. For this reason, it is difficult to generalize with respect to these operations. It can generally be said, however, that lamb feeding is to finish those lambs that have not reached the desired finish or weight for slaughter while with the ewe flock. While it is estimated that about 45 percent of the lamb crop goes straight to slaughter off grass, and 35 percent to feedlots, this will vary widely among both regions and seasons, depending upon weather conditions and the supply of forages and other feeds available.

Lamb feeding is largely seasonal within a specific geographical area. It is also one of the ways in which lamb marketings for slaughter are more evenly distributed through the season or year. However, as most lambs are marketed within 60 to 90 days after they are placed on feed, there is limited flexibility in the timing of marketing of fed lambs.

Idaho, Utah, and Oregon are important suppliers of fed lambs for the California market. In addition, a large volume of lambs is fed out on irrigated pasture in the Imperial and Sacramento Valleys of California. The

number of lambs on feed in California on January 1, 1989 has exceeded 180,000 head in most of the last five years. A large portion of the lambs placed in California feedlots are shipped in from out of state. In 1988 inshipments amounted to 231,000 head which represents 31 percent of all the lambs marketed in the state. Traditionally California has been and remains a net importer of lamb from neighboring states (Table 2).

Table 2. Sheep and lamb inventory and disposition, California, 1984 - 1988 (in 000's)

Year	Lamb Crop	Inshipments	Marketings[1]	Number slaughtered under Federal Inspection
1984	720	191	737	1402
1985	690	165	629	1173
1986	630	198	685	877
1987	625	403	843	883
1988	590	231	745	785

[1] Includes custom slaughter for use on farms, but excludes interfarm sales within the state.

Source: "California Livestock Statistics", CASS, 1990.

Slaughtering

In the last 50 years the number of plants slaughtering sheep and lamb in the U.S. has decreased significantly from a peak of 248 in 1951 to 129 in 1987 (Table 3). Of these 129 plants there are only 8 major lamb slaughtering companies.

In 1989, 2 firms slaughtered 55 percent of the total Federally inspected sheep and lamb output.[3] The foregoing statistics indicate a high degree of concentration of sheep and lamb slaughtering into relatively fewer, large plants. There are now only 8 plants of significant volume (over 1,000 head per week) slaughtering sheep and lambs in the United States.

Table 3. Slaughtering establishments, number operating under federal inspection and number slaughtering sheep and lambs, U.S., 1977-1987

Year	Total	Slaughtering Sheep and Lambs	Slaughtering as percent of total
1977	1682	189	11.24
1978	1701	182	10.70
1979	1687	190	11.26
1980	1627	195	11.99
1981	1542	187	12.13
1982	1688	187	11.08
1983	1652	184	11.14
1984	1666	168	10.08
1985	1608	157	9.76
1986	1544	164	10.62
1987	1483	129	8.70

Source: "Livestock Slaughter", NASS, USDA, 1988.

Annual volume of sheep and lamb slaughter has decreased by more than 80 percent in the past 30 years. Total slaughter, including farm and commercial slaughter, reached a peak of 27 million in 1943. By 1987 the annual slaughter dropped to 5.3 million head.[4]

The practice of farm slaughtering is disappearing. In fact, laws in various states restrict or prohibit it. Furthermore, the percent of sheep and lamb slaughtered under federal inspection is now about 97% of all U.S. slaughter (Table 4).[5]

The relatively large sheep and lamb slaughtering plants handle from 500,000 to 800,000 head per year. These plants use automated equipment, including a continuously or intermittently moving rail. The rate of slaughter capacity with these facilities generally ranges from 250 to 350 animals per hour. There is considerable variation in the number handled per man on the kill floor, even in plants with comparable facilities and volumes.

Plants with small volumes of sheep and lamb are usually multi-species slaughter facilities. Frequently, they do not have adequate facilities to handle sheep and lamb slaughter, therefore they practice inefficient methods with a great deal of labor input in the process. Some small volume plants range from only 100 to 2,500 head per year.

Firms have found it advantageous to construct plants designed to handle one particular species of livestock. Although this undoubtedly allows for maximum efficiency in slaughtering, it also restricts the product line the plant may produce. However, most large firms have various plants, each of which has an output of specific products, and by pooling these products they can assemble a complete meat product line.

A second major trend, mentioned by nearly every packer, is toward the central cutting operation. Centralized cutting (fabricating or breaking) is the major innovation in the meat industry over the last 30 years. It is estimated that some 65 to as much as 85 percent of the carcasses are cut into either wholesale or retail cuts at the slaughter plant. Central cutting of meats for distribution in fresh form is rapidly replacing the distribution of whole carcasses.

The development of larger, more efficient plants and central cutting reduce costs of lamb handling and improves product uniformity and quality. However, the concentration of lamb handling into fewer hands and the integration of marketing functions such as direct buying from producers and wholesaling to retailers into these same few hands has potential risks as well as

benefits. The concentration of power into the hands of relatively few slaughterers has lessened competition amongst slaughterers, reduced producers' marketing options and thus diminishing producers' bargaining power. This has left producers in a nearly critical situation with respect to obtaining accurate and competitively established price for their lambs.

The Packers and Stockyards Act requires all firms marketing livestock, regardless of their size, to file annual reports with the Packers & Stockyards Administration (P&SA). Additionally any firm slaughtering livestock which purchases more than $500,000 worth of livestock annually is required to file annual reports with P&SA. According to P&SA, of the 786,000 head of sheep and lambs marketed in California in 1990, 763,900 head (97.2 percent) were sold through nonpublic markets directly to the slaughtering plant. The remaining 22,100 (2.8 percent) were sold through public auction markets.

Currently there is only one slaughter plant operating in California. The plant is centrally located within the state in Dixon, California. This firm operates three plants: the largest is located in California with 800,000 head annual capacity; a plant in Washington with 350,000 head annual capacity; and a third plant in New Mexico with less than 150,000 head annual capacity. The firm operating the California plant processes approximately 25 percent of all the sheep and lambs marketed in the U.S. In terms of volume on a national level, it ranks second to a firm headquartered in Colorado which processes approximately 30 percent of the total U.S. market. Combined, these two firms control 55 percent of the total U.S. production.[6]

Prior to 1988, there were two slaughter plants operating in California. The second plant was operated for more than twenty years before it was acquired by a Colorado slaughterer in a 1985 buy-out. It was operated for 2 years and then was closed down by this Colorado slaughterer in 1987, and dismantled shortly afterward.

Breaker-Jobber-Wholesaler

Breakers, jobbers, and wholesalers provide the service of "breaking" the whole carcasses into either wholesale or retail cuts depending upon the orders from their customers. In total they handle about 20 percent of the total lamb volume in the U.S. The remainder is traded directly from slaughterers to retailers. It is this relatively small market that the USDA monitors to establish reported wholesale carcass price. The pricing system used by slaughterers to determine live weight prices is based on the relatively thin wholesale carcass market.

Breakers, jobbers, and wholesalers in the business of supplying lamb to hotel, restaurant and institutional trade with specialty cuts are experiencing little or no growth. Other breakers, jobbers and wholesalers who supply only retail outlets are going out of business, and those remaining express deep pessimism concerning the future of their business because of the absolute

Table 4. Number of sheep and lambs slaughtered and number slaughtered under federal inspection

Year	Total Commercial sheep and lambs slaughter	Number of Lambs Slaughtered Under Federal inspection	Lambs under Federal Inspection as percent of Total Commercial	Number of sheep Slaughtered Under Federal inspection	Sheep under Federal Inspection as percent of Total commercial
	(1,000 hd.)	(1,000 hd.)		(1,000 hd.)	
1974	8847	7987	90.28	569	7.12
1975	7835	6993	89.25	558	7.98
1976	6714	6058	90.24	416	6.87
1977	6356	5643	88.79	489	8.67
1978	5369	4810	89.59	359	7.46
1979	5017	4499	89.67	334	7.42
1980	5579	4970	89.08	393	7.91
1981	6008	5388	89.68	401	7.44
1982	6449	4820	90.25	454	7.80
1983	6619	5933	89.63	479	8.07
1984	6759	6035	89.29	513	8.50
1985	6165	5578	90.48	399	7.15
1986	5635	5154	91.46	310	6.01
1987	5200	4771	91.76	271	5.68
1988	6025	5585	92.70	220	3.94
1989	5300	4812	90.79	191	3.97

Source: "Livestock Slaughter", NASS, USDA, 1990.

advantages slaughterers have in terms of lower costs and greater quality assurance.

Distribution

Most lamb is distributed to the retail store in boxed wholesale cuts and then it is broken into retail cuts by the store meat cutter. The typical store receives two or three lamb carcasses in boxed form in one delivery- once weekly- then sometimes buys some lamb as a fill-in order if store inventory runs out. The latter purchase may be from the store's own warehouse or a local packer. It may be in carcass form or in block-ready primal cuts. In high lamb consuming areas a retail food store may sell the equivalent of as many as 50 lamb carcasses in boxed form per week.

On the other hand, it is estimated that only about half of all retail food stores handle lamb, and that most of the stores that do handle lamb tend to do so periodically. The distribution system for lamb is concentrated primarily in the higher lamb consumption areas on the East and West Coasts. Most other areas of the nation lack an adequate lamb marketing system. In most chains, lamb represents approximately two to five percent of total meat volume.

b) Pricing

Naturally, many factors affect sheep and lamb prices. These factors influence either the supply of lambs coming to market or the demand for a given animal or product. While the demand for lamb may be viewed as relatively constant (inelastic), there are factors in slaughtering, processing and distribution which may influence short-run demands. For example, national holidays associated with the consumption of other meat products may influence lamb marketing for short periods of time.

Certainly in the overall demand for lamb, such things as level of consumer incomes, ethnic background and religious preferences all play an important part. The reduction in immigration from many eastern and traditional lamb eating nations will, in the long run, have significant impact on the demand for lamb in certain market areas. Likewise, the price level of competing products influences the price of lamb.

It is, however, the more highly variable short-run supply fluctuation that causes current market prices for sheep and lambs to fluctuate to the greatest extent. This also results in prices not necessarily being related to the costs of production in the short-run. It is only in the

longer run that prices are expected to average at a level sufficient to return a profit necessary to keep producers in operation.

Cyclical and Seasonal Price Variations

Because of changing conditions, both physical and economic, sheep and lamb prices tend to vary both cyclically (over several years) and seasonally (within the year).(Figure 1)

Figure 1. Monthly price swings, simple avg. prices for choice slaughter lambs at Dixon 1986-1990.

MONTHLY PRICE SWINGS
Average Prices for Choice Lamb,Dixon CA
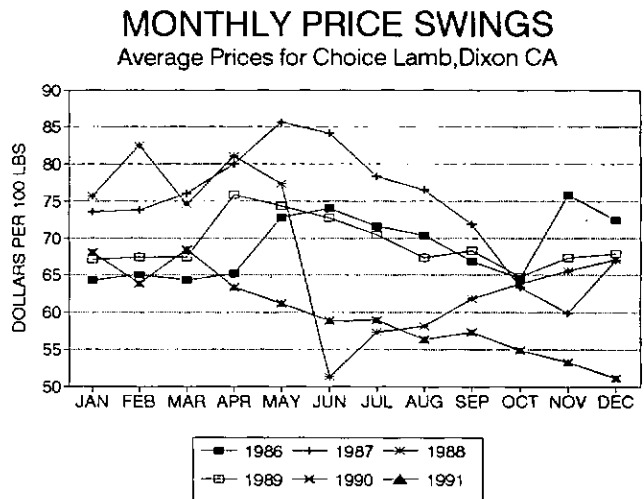
Source: California Ag. Statistics, California Livestock Service.

Cyclical variations in lamb prices are the result of the combined decisions of large numbers of sheep producers in reaction to either variations in profitability of the sheep enterprise or the availability or lack of adequate rangeland for feeding.

An interesting aspect of cyclical price variations is that when sheep and lamb production is sufficiently profitable to induce increased production, then breeding stock to make these increases must come from either: 1) a reduction of the present rate of ewe slaughter, or 2) a holding back of ewe lambs to build breeding flocks. In either case (or, as is usually the case, a combination of both these developments), sheep and lamb slaughter supplies are reduced and even higher prices occur in the short-run. Conversely, when prices are sufficiently low to cause producers to sell off breeding stock, this further adds to sheep and lamb supplies and even lower prices result in the ensuing period. This explains the rather severe cyclical fluctuations in price that occur over time in the industry

5

(Whipple and Menkhaus, 1989).

These countercyclical swings in production and prices have contributed to significant income instability in the industry, creating increased risk and uncertainty for producers.

Transportation Costs

As might be expected, the greatest factor determining sustained price differences among markets is their relative distance from and consequent transportation cost to the ultimate consumption areas. For example, the average price difference between St. Paul and Chicago would be expected to approximately equal the transportation cost from Chicago to St. Paul, as both ship largely to the east coast market.

The cost of transporting sheep and lambs live averages somewhat higher than the cost of transporting either hogs or cattle on a per hundredweight basis. This is primarily due to problems of handling, loading to capacity and other risks such as death loss.

Grade and Weight Price Differences

Price differences among grades for sheep and lambs exist only to the extent that they can be justified by differentiating markets with respect to demands for different products. They may exist in either real or imaginary terms, depending upon the ability and willingness of the purchaser to differentiate between the various grades with respect to price.

Generally, the weight of an animal or its carcass is the greatest determinant of its value. However, because of differences in composition, as reflected in both live and carcass grades, animals of the same or nearly the same weight may be of considerably different value.

Historically, price differences among weight groups of either live animals or carcasses have been on buyers' estimates of their potential value. However variations in the supply of lambs of different weights throughout the year make price differences subject to wide fluctuations and difficult to understand and explain. Quality and yield grades and their associated implications for the pricing of lamb are discussed later in this report.

Wool and Other By-Product Credits

When lambs or ewes are priced live, it is assumed the carcass, as well as other by-products contained in and on the animal, are figured into the price. However, as it becomes more common to price animals on a carcass basis, it is increasingly important to have some estimate of the value of the by-products. While it is at present relatively simple to obtain carcass prices, it is extremely difficult to obtain values for many of the by-products.

The most valuable single by-product from sheep or lamb is of course, the wool, fleece or pelt. The value of this will depend upon whether the animal has recently been shorn or is carrying a full fleece. Wool prices, therefore, have considerable bearing on the value of these by-products. Since wool prices vary seasonally, it is important to have a relatively recent estimate of the value of wool when estimating values for sheep and lambs (Figure 2).

Figure 2. Wool, monthly prices received by farmers, 1989 - 1990

MONTHLY WOOL PRICES
Received by producers, 1989-1990
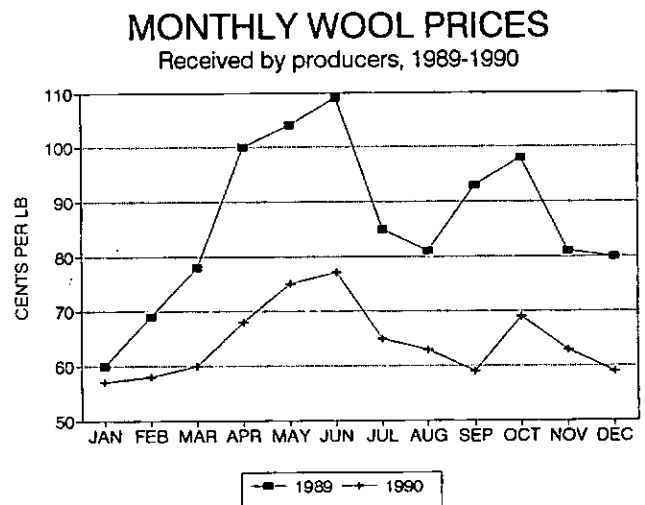
Source: "Livestock & Meat Statistics," ERS, USDA, 1990.

Pelt prices are somewhat more difficult to obtain, but are generally reported weekly in major industry trade publications. Price ranges for the major classifications of pelts at Chicago ranged from $1.08 - $2.50 in 1990.

Shrinkage and Losses

Relatively little research data are available concerning the amount of shrinkage which lambs suffer while being either held in pens off feed and water or being transported live. However, as with other classes of livestock, this undoubtedly varies widely depending upon the type of animal, feeding program, and conditions under which they are handled. However, most livestock shrinkage occurs during the roundup, loading and first few miles hauled. Prices are generally reported on direct sales or sales from the farm, ranch or feedlot with a three or four percent pencil shrink.[7]

Farm - Wholesale - Retail Price Spreads

The pattern during the past several years has been an increase in price per pound for lamb at the retail level, while the net farm value has not increased as rapidly. As a result, the farm-retail price spread for an equivalent amount of lamb product has tended to increase significantly in recent years (Figure 3).

Figure 3. Lamb prices: farm price, wholesale price, and avg. retail price, U.S., 1977 - 1989

LAMB PRICES: FARM, WHOLESALE, RETAIL
Average Prices, U.S. 1977-1990
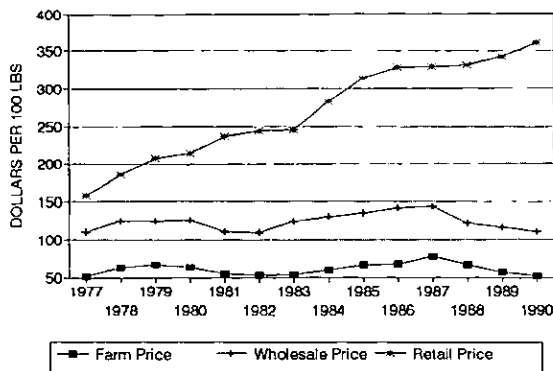
Source: "Livestock & Meat Statistics," ERS, USDA, 1990.

Average farm prices, average wholesale carcass prices and average retail prices from 1977 to 1990 are shown in Table 5 below.

Table 5. Avg. farm, wholesale carcass, and retail prices lamb, U.S., 1977 - 1990

Year	Farm price	Wholesale carlot carcass price	Retail price
1977	51.30	110.40	157.88
1978	62.80	123.40	185.57
1979	66.70	123.60	207.58
1980	63.60	125.54	213.55
1981	54.90	110.78	237.04
1982	53.10	108.50	244.15
1983	53.90	123.83	245.58
1984	60.10	130.62	282.42
1985	66.67	13523	313.49
1986	67.31	140.63	327.91
1987	77.60	143.40	329.00
1988	67.00	122.20	331.00
1989	58.00	116.41	342.00
1990	52.00	110.23	361.00

Source: Livestock and Meat Statistics, USDA, & Ag. Marketing Service, Livestock News Division, USDA.

To formally measure the relationships between farm prices and wholesale carcass prices and retail prices, correlation coefficients,[8] between each of these prices are calculated and presented in the following table.

Correlation Coefficient Table

Farm	Price	Wholesale carcass price	Retail price
Farm Price	1		
Wholesale carcass price	.8507	1	
Retail price	.2967	.3254	1

The relationship between farm and retail prices is very weak (r = 0.2967). Since retail margins tend to be fixed, variations in the farm price are mainly a result of changes in the quantity of marketings. However, as expected, the correlation between wholesale and farm prices is relatively high (r = 0.85079). This is easily explained since the slaughter industry bases farm prices directly from wholesale carcass prices. The relationship between wholesale carcass prices and retail prices is relatively weak (r = 0.3254), but somewhat stronger than the relationship between farm and retail prices.

Since both wholesale and retail unit margins tend to be relatively fixed, variations in farm price are largely due to variations in lamb supplies. Low periods in lamb production and processing are generally accompanied by increasing live stock and wholesale carcass prices. Since farm prices respond more rapidly to changes in sales than to wholesale prices, wholesale margins are squeezed during this period. Similarly, increased marketings and seasonal declines in farm and wholesale prices are usually accompanied by increases in wholesale margins. Generally speaking farm prices are independent of retail prices and closely related to wholesale carcass price.

Quality and Yield Grades

There is considerable evidence that the past and present methods of market price determination and reporting have failed to accurately reflect consumer demands and value differences among sheep and lambs. Evidence of this problem rests in the current pricing system based on grading standards for lamb.

Livestock and meat grades are a means of identifying animals, carcasses or cuts based on man-made standards by which groupings can be made, hopefully on an economic basis. Yet such sorting is not a simple task, because of the infinite variety of biological forms. The degree to which an animal varies from a precon-

ceived standard is generally an imprecise evaluation. In spite of these problems, livestock and meat grading have served useful purposes in marketing.

For sheep and lambs, the grades or standards may be considered as dealing with either quality or quantity factors. Quality factors relate to the eating characteristics of the meat, while quantity or carcass yield grades describe the volume or total proportion of trimmed boneless retail cuts. A common fault in the industry is to apply a quality designation to animals where a quantity or other physical characteristic is being supplied. For example, low quality may be used to describe lambs with poor pelts or dirty fleeces while meat quality of lambs may be of choice or prime grade.

In the production of lambs there are differences in both quality and quantity (yield) grades among lambs within the same breeding or feeding program. It is however, a challenge to both breeders and feeders to produce the greatest percentage of high value, market preferred lambs as economically as possible. The immediate returns for such effort may not, in all cases, be commensurate with added expenses. However, it is likely that the producer of superior market lambs will be compensated in the long run; i.e., increased demand for lamb may result from improved production practices.

i) Quality Grading

Quality grades for lamb (prime, choice, good, utility, cull) were designed to identify differences in meat palatability (tenderness, juiciness, flavor, etc.) and cooking characteristics, as well as differences in shape or conformation. The estimators of lamb carcass quality include the quantities of fat between the ribs and over the flank and the firmness of the flesh, all in relation to the physiological maturity of the animal. The attributes are presumed to be related to amount of marbling and palatability. However, evidence is lacking to show that the lamb quality grades predict palatability. Quality indicators apparently are not well correlated with marbling deposits and/or marbling is not closely correlated with palatability in lamb.[9]

The quality grades have been applied to significant percentages of lambs slaughtered commercially. Yet, of the total graded, an extremely high percentage (over 98%) is within the choice grade or higher. Thus, the application of the present grade standards tends to depend on the qualification of the carcasses for choice or better. The fact that a high proportion of graded lambs fall within the choice or prime grades, plus the fact that external finish is not included in the consider-

ation, suggests that present quality lamb grades do not adequately distinguish meaningful differences in carcass value.

ii) Yield Grading

Yield grades appear to be the useful tools for identifying lamb carcass merit in quantitative terms. The standards reflect the compositional differences which are associated principally with deposition of fat, and which represent the percent of closely trimmed retail cuts a lamb carcass will yield. They are based on research which shows that measure of fatness is superior to the other predictors of retail yield. Thus, the yield grades offer a means by which value differences can be communicated within the industry.

Among the indicators used to predict carcass yield of cuts, the most dependable one is the measure of fat thickness over the center of the ribeye muscle between the 12th and 13th ribs. This measurement is sometimes adjusted to account for unusual quantities of fat over the rump, at the fifth rib and in the body wall. The amount of kidney and pelvic fat is often unrelated to the thickness of fat over the ribeye. Consequently, the percentage of the carcass represented by such fat also makes a valuable contribution to the estimation of retail yield. The conformation grade of the leg is not highly correlated with retail yield, but it is considered to be useful in the overall prediction. This factor is evaluated subjectively and coded (1=low cull, 15=high prime).

The yield grade standards are based on a multiple regression prediction equation: Yield grade = 1.66-(0.05 x leg conformation grade score) + (0.25 x percent kidney and pelvic fat) + (6.66 x adjusted fat thickness over the ribeye, inches). The fractional part of the yield grade is dropped, resulting in yield grades 1 through 5.

The yield grades correspond to the percentage of retail cuts obtained from a carcass:

yield grade 1	47.3% and over
yield grade 2	45.5 to 47.2%
yield grade 3	43.7 to 45.4%
yield grade 4	41.9 to 43.6%
yield grade 5	less than 41.9%

Available research evidence indicates that the yield grades do reflect true differences in retail yield and value. Important differences have been shown in percent bone-in or boneless cuts and retail carcass value, as a result of cutting tests. (Table 6).

The degree of fatness, as measured in the USDA yield grade, serves as a quick assessment of the accept-

ability of the lamb carcass. Since this carcass measurement is strongly indicative of yield grade, it is necessary to measure it with extreme accuracy. Fat thickness in excess of 0.25 of an inch is usually found on carcasses that are of lower quality when they are separated into trimmed retail cuts.

Prices and Grading

Live prices have always been and continue to be largely determined by the wholesale carlot carcass price. This wholesale carcass market determines the value of carcasses based on carcass size (i.e. weight), rather than the percentage of retail cuts from the carcass (i.e. yield). Due to the slaughterers integration into centralized cutting operations, this wholesale carcass market has gradually declined in volume. Currently the wholesale carcass market represents approximately 35% of the total domestic lamb sales.[10]

Due to federal budget cuts, price reporting methods have been changed by USDA. Currently USDA uses the New York carlot price to report the US. wholesale carlot carcass price. The problem is this market represents only 20 percent of the total domestic lamb sales. It is a relatively thin market and there are relatively few trades to be considered a reliable indicator of value. Furthermore slaughterers sort the carcasses, the lowest quality carcasses are sold into this wholesale carcass market.[11] Since it is these lower quality carcasses that make up the wholesale carcass market, in effect the poorest 20% of all the lambs slaughtered are setting the value of all the lambs marketed for slaughter.[12]

Current pricing methods, therefore, fail to value lambs based on their cutability (i.e., yield grade), yet it is the cutability of a lamb that determines, to a large

extent, the actual value of the lamb. The current system fails to reward lean lambs, yet it is lean lamb that consumers prefer. A pricing system based on yield grades would more accurately reflect the value differences between lambs and, therefore, more closely reflect consumer demands.

Implications

As the industry has evolved, the decline in the numbers of producers, and in the number of sheep and lambs has created significant changes in the structure of the industry. A critical examination of the current structure of the lamb and sheep industry reveals several significant changes that have resulted from production instability. These are briefly outlined as follows.

i) Increased backward integration by lamb slaughterers:

In response to the unstable and unreliable supply conditions, slaughtering plants now feed from 20 to 60 percent of their lamb requirements. This has two potentially negative impacts on the producer. First, it reduces the volume of lamb moving through the traditional direct producer-to-slaughter price-determining and reporting channels—thus exacerbating the thin market problem (reported below). Second, lamb feeding by slaughterers competes directly with producers, and allows the slaughter plant to bargain/bid producer prices down.

ii) Decline in the number of slaughter plants:

In the last 40 years, the number of slaughter plants in the U.S. has declined from 248 in 1951 to 129 in 1987. Only 8 major lamb slaughtering companies own these 129 plants. In 1989, the top two companies controlled 55% of the market share in lamb slaughtering.

iii) Higher degree of specialization in lamb slaughtering and increased forward integration:

In the past 20 years, the marketing of live lambs through terminal (auction) markets has given way to decentralized marketing through direct sales to slaughtering plants. With fewer plants, slaughterers have found it increasingly attractive to:

a) increase plant capacity to capture economies of size and scale.

b) increase specialization of sheep species to allow for maximum plant efficiency. This tends to restrict product lines.

c) increase central cutting operations to facilitate

Table 6. Differences between the means of Various Traits for the yield grades.

Between Yield Grades	% Major Bone-in Cuts	% Major Boneless Cuts	% Trim Fat	Retail Carcass Value/cwt.
1 & 2	2.22	1.56	.23	9.74
2 & 3	2.46	1.53	3.38	7.44
3 & 4	3.06	2.00	2.62	15.76
4 & 5	4.26	1.54	3.86	11.74
1 & 4	7.74	5.09	9.23	32.92
1 & 5	10.00	6.63	13.09	44.66

Source: Carpenter, Report to American Sheep Producers Council, 1982.

marketing of wholesale and retail cuts. This has the two-fold effect of by-passing the specialized breaker industry, and facilitating the marketing of lamb to retailers who do not have a cutting facility. This, in turn, has resulted in substantial decline of the specialized breaker industry.

iv) Thin Markets - Inadequate Price Discovery:

Slaughterers base the price they pay producers for lamb on the wholesale carcass market price. However, there appear to be several problems with this method of pricing.

First, the wholesale carcass market price is based solely on carcass size (weight) rather the on the percentage of retail cuts (yield grade). While yield grade pricing has been shown to be highly correlated with actual retail value, there is no evidence that carcass size (weight) reflects retail value.

Second, because slaughterers have forward integrated into centralized cutting operations, this market has declined in volume. Currently this market represents approximately 35% of the total domestic lamb sales.

Third, due to federal budget cuts, prices are reported by USDA *only* for the New York car lot carcass price. But this market represents only 20% of total domestic lamb sales. Finally, slaughterers tend to sell the *lowest* quality lamb into the wholesale carcass market, while the better quality lambs are cut and sold directly to retailers. Thus, the *poorest* 20% of lambs slaughtered are used to reflect the U.S. value for all lamb.

IMPLICATIONS OF CHANGING STRUCTURE IN THE LAMB MARKET

The previous section on the structure of the lamb industry identifies at least 4 significant changes that have occurred as the industry has evolved over the last 30 years.

1. A decline in the number of slaughter plants
2. Increased backward integration by lamb slaughterers
3. A higher degree of specialization in lamb slaughtering and increased forward integration
4. Inadequate price discovery and thin markets

These structural changes coupled with reports of low producer prices and high wholesale/retail prices strongly suggest the dominance of regional monopsonies in lamb slaughtering.

Monopsony (or buyer power), per se, in its pure form is relatively rare in the U.S. economy. Monopsony or buyer power has been observed in certain large retailing firms such as Sears, Safeway and Walgreens, and other industries such as the shoe industry, the automobile industry, refrigeration and air conditioner firms, all of whom dominate the purchase of specialized products as inputs into their own product lines (Scherer, 1980, pp 297-313). Cohen and Cyert (1975, p. 268) use the example of the "company town" which used to be prevalent in coal mining areas as representative of a monopsony, since a single firm was the sole employer of labor in the town.

By far, the most widely recognized forms of monopsony occur in labor markets, and in cases where a bilateral monopoly occurs. In the latter case, some interesting examples occur when a labor union forms a monopoly in response to extensive buyer power to create a countervailing power in the market in which they are able to win large wage and fringe benefits concessions from powerful employer groups.

The theoretical implications of a bilateral monopoly are far from irrelevant in this study. Given the possible existence of a regional monopsony in lamb slaughtering, the establishment of a countervailing producer monopoly in the form of a cooperative bargaining association is a distinctly possible solution to the structural problems currently being experienced in the lamb industry. At this stage however, the focus of the study will be on the existence of a monopsony, leaving the theoretical considerations of bilateral monopoly to a later section of the report.

Monopsony Theory

There are as many different types of market structures in the factor market as there are in product markets. At one extreme is perfect competition, in which many buyers of an input or factor of production purchase from a number of sellers. At the other extreme is a monopsony, a market in which there is only one purchaser of an input or factor.

The crucial feature of any type of factor market imperfection is the dependence of purchase price on the quantity of the factor which is purchased by a single firm. In perfectly competitive markets, input prices are invariant with respect to the quantity bought, and therefore the input supply curve is horizontal. A monopsonist cannot purchase an unlimited amount of

input at a uniform price; the price which the single firm must pay for each quantity purchased is given by the upward sloping supply curve for the input. Therefore, the price which the monopsonist must pay is generally an increasing function of the quantity purchased.

· Neoclassical theory indicates that any firm, regardless of the structure of the market, will maximize profits by purchasing inputs and producing output at a rate for which the marginal revenue (or its equivalent) equals the marginal cost (or its equivalent).[13]

Figure 4. Effects of Monopsony on the Utilization of a Factor
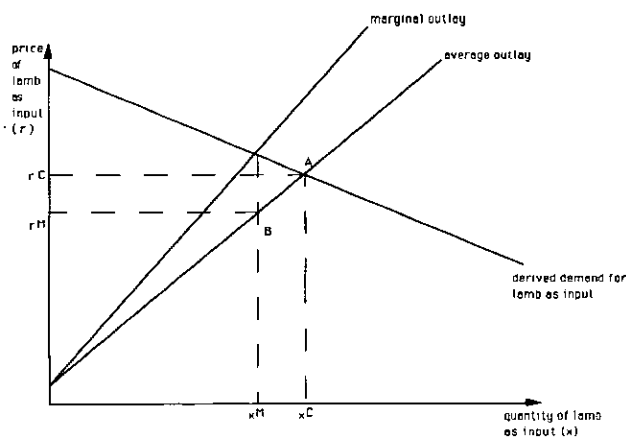
The effects of monopsony on the utilization of lamb as an input is shown in Figure 4. Since the derived demand curve for lamb as an input is downward sloping, the intersection of the derived demand curve with the marginal outlay curve (B) occurs to the left of the intersection of the derived demand curve with the average outlay curve (A).

Thus, the quantity of lamb purchased by the monopsonist, xm, is necessarily less than the quantity of lamb that would be purchased if the lamb market was perfectly competitive (xc). Similarly, the price that a monopsonist will pay for lamb (rm) is less than the price that would be paid if the lamb market was perfectly competitive (rc).

Thus, monopsony reduces the quantity of lamb and depresses the price received by lamb producers compared with perfect competition in the lamb market.

Market Performance

The Marketing Margin

A useful concept often used by economists to check market performance is the marketing margin (Sexton and Iskow, 1988). The margin essentially accounts for all of the costs incurred by the marketing sector in bringing lamb to the consumer.

A mathematical expression to check market performance can be expressed as follows. Denote the marketing margin as M and the retail price for a pound of processed lamb as PRL. Given M and PRL, the competitively established price, PL*, for a pound of lamb on the hoof is:

$$(1) \ P_L^* = (P_{RL} - M) / K$$

where K is a conversion factor indicating the number of pounds of live lamb to produce a pound of retail lamb. The conversion factor, K, will vary depending on the quality or yield grade of each particular lamb.

There are considerable variations among lambs that affect the value of any one particular lamb. Any attempt to estimate a marketing margin must therefore make some simplifying assumptions to complete the analysis.

Although formal cost studies for each of the above marketing functions are nonexistent, cost estimates were collected for each of these functions to obtain an estimate for the competitive marketing margin. Surveys were completed by three of California's leading retailers of lamb. Since there is only one slaughterer in California, surveys were completed by two lamb slaughterers in the U.S., one located in California and the other in Colorado.[14]

The Competitive Slaughterer's Margin
a) Slaughtering

Data are quite limited on economies of size and specialization in meat packing in general, and are practically non-existent on the subject of processing sheep and lamb.

In order to obtain a picture of current cost-to-size conditions facing slaughtering firms, Logan and King studied seven plants with different output capacities in a single area in California. In this analysis, costs were synthesized for plants which slaughtered only cattle, sold their hides green, and did not perform rendering, sausage-making, boning, and breaking operations. The estimated long-run costs of these synthesized cattle slaughtering plants did exhibit economies of size.

Most of the economies of size can be traced to increased efficiency and specialization in labor inputs, with larger size plants more intensive in the usage of identical items of equipment and of sufficient size to warrant use of new equipment items.

It would appear reasonable to assume some economies of size relationships exist in lamb slaughter operations even though no reports could be found of such studies.

Plants specializing in slaughtering and processing sheep and lamb report greater efficiency and lower costs than plants handling several animal species. This is largely because of specialization in labor inputs, intensive use of equipment, and other economies of size and specialization. Specific cost estimates gathered from the slaughterers surveyed for three different size plants are as follows:[15]

Cost of Slaughtering

Plant	Annual Output number of head	Reported per head Lamb Slaughter Cost
A	250,000	$6.50
B	500,000	$4.75
C	800,000	$3.50

b) Fabrication and Packaging

Fabrication of carcasses and prepackaging of meats in fresh form with flexible film-vac packaging for distribution continues to expand in the slaughter industry. To gain efficiency and improve the cost and profit situation, the food industry has turned to centralized fabrication of fresh meats into block-ready and counter-ready cuts.

There also appears to be economies of size associated with the fabrication process as evidenced by the following cost estimates provided by the slaughterers participating in the survey. Included in this fabrication cost estimate is the cost of packaging and cooling.

Cost of Fabrication and Packaging

Plant	Annual Output number of head	Reported per head Lamb Slaughter Cost
A	100,000	N/A
B	200,000	$13.00
C	320,000	$9.25

c) Advertising and Wholesaling Costs

Advertising and wholesaling costs at the slaughterer level vary from year to year. It was estimated that the advertising and wholesale costs average approximately 15 percent of the total cost of fabrication and slaughter. It is duly noted that this estimate is from a slaughterer located in Colorado and thus may not be representative of California. However in 1989, this slaughterer processed approximately 30 percent of the sheep and

lambs in the U.S.

d) Transportation Costs

Transportation costs for wholesale meat will vary depending upon the distance of the slaughtering plant from the retail market. An estimate based on a weighted average of the distance between the processor located in Dixon, California to the major markets in California was calculated, using the relative market shares as weights.

Major market	Market Share	Distance (miles)	Weighted Distance (miles)
Los Angeles	55%	390	214.5
San Francisco	25%	95	23.8
Sacramento	7%	20	1.4
San Diego	12%	510	61.2
Average distance			300.9

From industry quotes, the average cost for transportation in 1990 was $3.25 per loaded mile. Therefore the average cost per load of wholesale lamb ran $977.93 (300.9 miles x $3.25 per loaded mile). To arrive at a cost estimate for the transportation of wholesale meat on a per head basis, some assumptions must be made. The average live weight for lambs marketed in California for 1990 was 118 pounds. Assuming these lambs were classified as yield grade 2, they would yield 37.76 pounds of wholesale boxed meat. Assuming 50,000 lbs were transported per load (the maximum allowed by law), it would cost 74 cents per head to transport wholesale boxed lamb from the slaughterer to the retail markets in California.

e) By-Products

The by-products are in the form of drop cuts, pelts and offal. The sale of the drop cuts depends largely upon the quality of each lamb, however the sale of these cuts were reported to average $3.00 per head. The market for the offal is relatively stable at 50 cents per head. The market for the pelts is more volatile and runs between $1.50 and $3.25 per head depending on the market conditions. For 1990 the pelt price averaged $2.00 per head. Collectively, the value of by-products from a fabricated lamb is estimated at $5.50 per head.

The assembly and transportation costs of live lambs from the farm gate to the slaughter plant are typically paid by the producer, therefore they were excluded from this analysis and P_L^* will represent the perfectly

competitive price the producer should receive delivered at the slaughter plant.

The Competitive Retailer's Margin

California's three leading retailers of lamb were surveyed to obtain an estimate of the retailers' portion of the marketing margin. Rather than isolate each of the retailing costs such as repackaging, markdowns, distribution and advertising, the retailers' cost accounting methods are based on a percentage of their cost of the wholesale boxed lamb.

Retailer	Market Share	Retailer's Cost	Weighted Cost
A	26%	18%	6.99%
B	25%	16%	5.97%
C	16%	12%	2.87%
Weighted average cost			15.83%

Based on the above information and using a weighted average with the weights pertaining to each retailer's relative market share, an estimate of 15.83% was calculated. The typical retailer's cost of retailing lamb in California would cost 15.83% of the retailer's cost of wholesale boxed lamb.

The next step is to convert this estimate to a cost per head basis. The 1990 wholesale price for boxed lamb averaged $2.40 per pound. To convert this to a cost per head basis, some assumptions must be made. The average live weight for lambs marketed in California for 1990 was 118 pounds. Assuming these lambs were classified as yield grade 2, they would yield 37.76 pounds of wholesale meat. At $2.40 per pound the retailer's cost on a per lamb basis would be $90.62. Applying the 15.83% estimate derived above, the retailer's portion of the marketing margin is $14.35 per lamb.

Estimate of the Competitive Marketing Margin

Slaughtering (Plant C)	$3.50
Fabrication and Packaging (Plant C)	9.25
	$12.75
Advertising and Wholesaling @ 15%	$1.91
Transportation Costs	0.74
	$15.40
Less by-products	$5.50
Total Slaughterers Margin	$9.90
Retail Costs	$14.35
Total Retailers Margin	$24.25

Estimation of the Competitive Farm Price

To arrive at an estimate for the competitive farm price (P_L^*), the retail price of lamb (P_{RL}) was taken from historical price data, the marketing margin (M), developed above, was subtracted, and the difference was converted using a conversion factor (K) according to the equation given previously ($P_L^* = (P_{RL} - M) / K$).

Since the marketing margin was based solely on marketing costs, excluding any economic rents associated with market imperfections that may widen the margin, the resulting estimate for P_L^* represents a competitive price based on current retail market conditions.[16]

To evaluate the market's performance, the competitive price, P_L^*, is compared to the average farm price for the years 1985 through 1990. Since the marketing margin is comprised of the slaughterer's and retailers' margins, both the competitive wholesale and retail margins (developed in earlier sections) is compared to their respective actual margins (those based on historical price data) to determine at which level, if any, market imperfections occur.

The estimated competitive farm price was subtracted from the average farm price, for each year 1985 through 1990. The resulting differences are listed in Table 7.

The results in Table 7 may be briefly summarized as follows:

i)   The differences between competitive farm prices and actual farm prices range from -$0.061 to +$0.195 per pound of lamb.

ii) The difference between actual slaughterers margins and competitive slaughterers margins range from -$9.628 to +$19.35 per head.

iii) The difference between actual retailers margins and competitive retailers margins range from $1.511 to $3.997 per head.

In general, farm prices are lower than they would be in a perfectly competitive market, and slaughterer and retailer margins are higher than they would be in a perfectly competitive market.

The results in Table 7 reveal some interesting trends to support the thesis that the California lamb market is dominated by a regional monopsony. As was pointed out previously, prior to 1988, there were two slaughter plants operating in California. The second plant was closed down late in 1987 leaving only one plant to service the entire area. The results in Table 7 reveal the dramatic nature of the change in structure. In 1985 and 1986, the difference between estimated com-

petitive and actual farm prices was relatively small, only 1.0 cent per pound of live weight, due largely to the competitive market that existed. In 1987, both plants competed heavily with each other, resulting in farm prices that were, in effect, higher than the estimated competitive price. This explains the -6.1 cent per pound difference between estimated competitive and actual average farm prices paid that year, and the negative difference in slaughterers' margins. Both firms invested heavily in the competition. One firm lost and closed down while the other survived. 1988 price and margin differentials were presumably the result of a recovery by the single surviving firm. In 1989 and 1990 price and margin differentials widened to a characteristically monopsonistic level.

Thus, while this could not be considered to be conclusive evidence of the existence of a regional monopsony in the California lamb market, the fact that there remains only a single slaughtering plant to service the entire California market, and the results of the marketing margin analysis in Table 7 suggest that the structure of the industry has evolved to a point where competitive pricing is inadequate or nonexistent.

Table 7. Actual and Competitive Prices and Marketing Margins, California, 1985 - 1990

	Units	1985	1986	1987	1988	1989	1990
Avg. retail price	$/lb.	3.250	3.280	3.290	3.310	3.420	3.610
Avg. wholesale price	$/lb.	2.180	2.200	2.210	2.250	2.285	2.400
Avg. farm price	$/lb.	0.667	0.672	0.776	0.670	0.580	0.520
Competitive slaughterers' margin[1]	$/hd	4.96	5.10	1.51	6.32	8.42	9.90
Competitive retailers' margin[2]	$/hd.	13.03	13.15	13.21	13.45	13.66	14.35
Conversion factor farm to wholesale		3.125	3.125	3.125	3.125	3.125	3.125
Conversion factor wholesale to retail		1.250	1.250	1.250	1.250	1.250	1.250
Conversion factor farm to retail		3.920	3.920	3.920	3.920	3.920	3.920
Competitive farm price[3]	$/lb.	0.677	0.682	0.715	0.677	0.685	0.715
Actual slaughterers'	$/lb.	0.096	0.100	-0.215	0.156	0.473	0.775
margin[4]	$/hd.	4.963	5.126	-8.118	7.510	17.842	34.251
Actual retailers'	$/lb.	0.525	0.530	0.528	0.498	0.564	0.610
margin[5]	$/hd.	15.787	15.937	15.862	14.960	16.952	18.343
Difference between estimated competitive farm price and average farm price	$/lb.	0.010	0.010	-0.061	0.007	0.105	0.195
Difference between actual slaughterers' margin and the competitive slaughterers' margin	$/hd.	0.003	0.026	-9.628	1.190	9.422	19.350
Difference between actual retailers' margin & the competitive retailers' margin	$/hd.	2.756	2.787	2.652	1.511	3.294	3.997

1/Information used to estimate margins collected in October 1990 slaughterers' survey.
2/Data used to estimate margins collected in October 1990 retailers' survey.
3/ Formula used to estimate the competitive farm price: $PL^* = (PRL - M)/K$
4/ This estimate based solely on historical data using the following formula: $MWL=PWL - (PL^*K)$
5/ This estimate based solely on historical data using the following formula: $MRL-PRL - (PWL^*K)$

ALTERNATIVE STRUCTURAL CONSIDERATIONS

The previous sections of this paper have shown that the California lamb market has experienced increased backward and forward integration by lamb slaughterers, a significant decrease in the number of slaughter plants, a higher degree of specialization in lamb slaughtering and relatively thin markets with inadequate price discovery. The fact that there remains only a single slaughtering plant in California to service that market suggests dominance of the market by a spatial or regional monopsony.

Characteristically, a monopsony reduces the quantity of lamb purchased and sold into the retail market, and depresses the price received by lamb producers compared with perfect competition. A simple test for market performance suggests that prices currently being paid to lamb producers is below the theoretical competitive price. While this could not be considered conclusive evidence of the existence of a regional monopsony in the California lamb market, it does suggest that the structure of the industry has evolved to a point where competitive pricing is inadequate or nonexistent.

Economic theory suggests that there are two possible solutions to this problem.

1. Increased competition via the entry of additional processing and/or marketing facilities; or,
2. The existence of a countervailing market power to offset the monopsony buying power.

While there are definite advantages to some forms of additional processing or marketing facilities (either through a new investor owned firm or a producer organized cooperative), two major considerations make this alternative less desirable than the existence of countervailing monopoly selling power.

i) Currently, sheep numbers in California alone are insufficient to support two slaughter plants. Based on current sheep numbers, two plants located in California would require an additional 800,000 head to be imported from out-of-state, over and above the 230,000 head currently imported for slaughter, if both plants were to operate at minimum efficient size.

ii) The entry of an additional marketing facility would encourage the new and incumbent firms to achieve a mutually profitable market-sharing arrangement that could result in an equally inefficient duopsony situation.

Thus, while a new marketing facility would in-crease competition at the slaughter level, there do not appear to be any guarantees that such a facility would benefit the industry in terms of achieving a perfectly competitive equilibrium (since a monopsony might be replaced by a duopsony), or increasing the efficiency of pricing and marketing.

Countervailing Monopoly Selling Power

A market structure consisting of a monopsony buyer of a factor and a monopoly seller of the factor is called a bilateral monopoly — that is, a market situation with a single buyer and a single seller. The exact effects of a countervailing power in a bilateral monopoly are actually indeterminate. It is not possible for the seller to behave as a monopolist, nor for the buyer to behave as a monopsonist at the same time. Three general outcomes are possible:

i) one of the participants may dominate and force the other to accept their price and/or quantity decisions;

ii) the buyer and seller may collude or bargain to get the price and quantity; or

iii) the market mechanism may break down.

The theory of monopoly and monopsony can provide some guidelines to the possible outcomes of a bilateral monopoly, which in turn may provide some insights into the effects of the introduction of countervailing market forces into the California lamb market.

A graphical analysis is most convenient for examining bilateral monopoly. In Figure 5, D is the derived demand curve for lamb as an input. D is either the value of the marginal product of lamb or the marginal revenue product of lamb, depending on whether the final output is sold under conditions of perfect competition or monopoly. S is the relevant portion of the marginal cost curve of the monopoly seller of the factor. Although, by definition, a monopoly has no supply curve, if a monopoly were constrained to sell at fixed prices (rather than where marginal cost equals marginal revenue), then the upward sloping portion of the monopolists marginal cost curve above its average variable cost curve would indicate amounts that would be supplied. Thus, when the monopoly power of the seller is ignored, S is the supply curve for the factors, and MO is the monopsonist's marginal outlay for lamb.

Ignoring, for the moment, that the seller of lamb has monopoly power, then the conventional monopsony

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solution is that X^B units of lamb would be purchased at a price r^B per unit.

Now ignore the monopsony power of the buyer and consider only the monopoly power of the seller of lamb. D is the average revenue curve for the monopolist, and the corresponding marginal curve, MR, is the monopolists marginal revenue curve. Thus, the profit maximizing monopolist will sell X^S units of lamb at a price of r^S per unit.

Since there is only one buyer and one seller of lamb, they will have reached some agreement about the price of lamb. There will obviously be some conflict in this bargaining situation, since the monopoly seller prefers a price rS which is much higher than the monopsony buyer is willing to pay (r^B).

It is impossible to determine the actual price that will be established without making some assumptions about the bargaining strength and skills of each firm. The actual position of the price within the possible range between r^B and r^S provides a measure of the relative bargaining abilities of the monopsonist and the monopolist.

There are a number of interesting possible solutions to bilateral monopoly. For example, if a producer cooperative preferred to obtain the highest possible price for lamb consistent with the optimal quantity of lamb for the buyer, then it would attempt to establish the price at r^{XS} in Figure 5. On the other hand, if the cooperative preferred to sell the maximum quantity of lamb possible, then it would establish a price for lamb of r^C per unit, and sell x^C units of lamb. The actual price that would be established as a result of the bargaining process is indeterminate and depends upon the relative bargaining ability of the two sides. The point is, however, that the introduction of a countervailing mo-

nopoly selling power in the form of a producer bargaining cooperative may possibly result in higher prices for lamb as well as a higher quantity of lamb sold for slaughter.

Cooperative Farm Bargaining

When inequities in the market exist due to the existence of very few (or a single) buyers who do not compete for supplies, and many sellers, some of whom are locked into production of certain commodities because of capital investment, poor alternative uses for land or an inability to enter into production of other commodities, farm bargaining is a viable alternative to improved competitiveness of markets.

As individuals, lamb producers are at a distinct disadvantage when it comes to bargaining. Most lamb producers are not large enough to control the quantity of lambs that would have an impact on the market. Nor can producers control the timing of their sale. Often lamb buyers will use time to their own advantage knowing that producers must sell at relatively discrete time periods. Few individual producers have the time to thoroughly analyze the market in order to make rational marketing decisions. In fact, they usually rely on buyers for market intelligence. Since the timing of a sale is critical to the producer, it is often the buyer who controls the terms of the sale, the quality standards, the method and time of delivery and the price, all of which influence a lamb producer's net returns. Finally, producers do not have the time or resources to finalize a sale to their own satisfaction.

However, a bargaining association or cooperative can deal with most or all of these factors. Farm bargaining associations or cooperatives can take several different forms (and these are discussed later in this paper), but they have a number of common characteristics:

1. Their primary purpose is to achieve fair and reasonable prices and terms of sale for their members.
2. They use a few highly skilled employees whose attention is focused on developing market intelligence, maintaining communications between producers and buyers, and improving the market channels for their members.
3. Capital investment in buildings and equipment can be minimized, except in the case of a full-fledged marketing cooperative.

Figure 5. Bilateral Monopoly
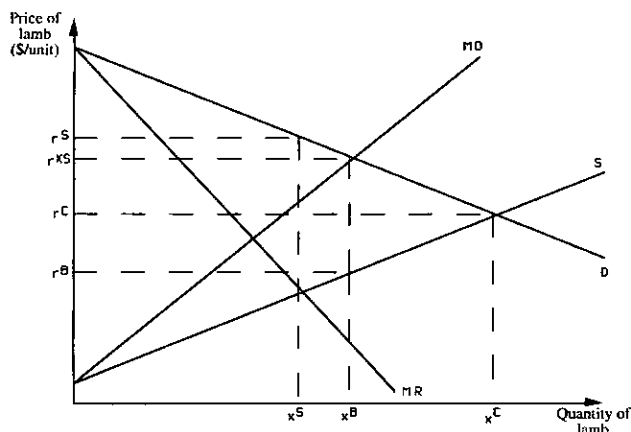
Most bargaining associations have five basic goals:
1. Price enhancement in the market.
2. Price stability throughout the year and between years.
3. Coordination of marketing functions.
4. Determination of the nonprice terms of sale.
5. Sharing participation in the market.

However, farm bargaining does have some limitations. Many failures in bargaining efforts can be traced to heightened expectations by producers for unreasonable prices and/or terms of sale. The constraints on price include a need to negotiate prices and terms that will continue to maintain the interest and profit of the buyer or processor. Prices must be maintained at a level that will foster the continued existence of the industry. This means that the entire marketing channel must be constantly monitored and analyzed to ensure that the market will not collapse as a result of excessive market power at the producer end of the channel. For example, the price of lamb at retail could be too high to compete with other meats, thus decreasing its appeal to consumers, which in turn would decrease the demand for lamb at the producer level. Finally, there are also legal constraints that a bargaining association faces. The principal one is the obligation of the Secretary of Agriculture to prevent unfair price enhancement under the terms of the Capper-Volstead Act of 1922.

Types of Cooperative Associations

Cooperative associations may take many forms, but broadly fall into two categories.
    A) Marketing/Processing Cooperatives; and,
    B) Cooperative Bargaining Associations.

A) Marketing/Processing Cooperatives

A marketing cooperative actually takes title to the produce of its members and negotiates the prices and terms of sale on behalf of its membership. This can result in gains for producers from some of the profits garnered in other stages of the marketing chain. Typical examples include many California fruit, nut and vegetable cooperatives, and any of the major dairy cooperatives found in California. These cooperatives may operate one or more pools, divert products to alternative uses, and average out returns to members of the pool. Most cooperatives also provide for retains to be held, which can be used for expanding capital equipment, equalizing the market, or to carry out marketing functions on behalf of its members.

For the California lamb industry, a full marketing cooperative would:
    1) establish a new slaughtering and central cutting facility
    2) package lamb from its members, slaughter them and market them to the wholesale/retail trade.
    3) establish an improved price discovery system described above.

While this form is possibly the most desirable in terms of producer power and control in the marketing channels, two major factors make it less desirable choice than other alternatives.

As pointed out earlier in this section, there is insufficient volume of raw product in California alone for two slaughter plants. The risk associated with relying on out-of-state lambs to utilize a plant of minimum efficient size could turn an alternative plant unviable. A plant solely reliant on out-of-state lambs could face a $5.00 per head cost disadvantage. This means that the incumbent slaughterer in California would have to be competed out-of-business, or purchased by the cooperative.

Establishing a full marketing cooperative would require the full personal and financial commitment of its membership. While not entirely impossible, lamb producers to date have not shown ample willingness to enter into a full commitment of the magnitude described.

A partial marketing cooperative could take several forms, but essentially could:
    1) maintain control of supply of lamb to the slaughtering facility
    2) purchase the services of the slaughtering facility on agreed upon contractual arrangements
    3) maintain ownership of the slaughtered lamb, and market the lamb to the wholesale/retail sector.

The establishment of this type of cooperative would preserve the current slaughter plant and utilize its facilities, but take over the control of pricing and marketing, thus increasing producer power in the marketing channel. Again, such an arrangement would require the personal and some financial commitment from its membership. While less investment is required than a full marketing cooperative, such an arrangement still has much risk attached and would require the cooperation of the incumbent slaughterer to process the lambs. A careful analysis and much planning would be required to successfully overcome the current market channel blockages.

B) *Cooperative Bargaining Associations*

Cooperative bargaining associations, unlike marketing cooperatives, often do not take title to the produce of its members. Rather, they exist to intervene on behalf of their member producers. There are several different forms of cooperative bargaining associations. They can range from an organization that is essentially a marketing cooperative but which does not take title of the produce, to a form of exclusive bargaining agency that is organized and supported by a government agency.

a) *Bargaining or Sales Agent*

Many bargaining associations operate under variations of an exclusive bargaining agent arrangement. Membership agreements generally provide that, as exclusive bargaining agents, the association will bargain or negotiate prices and terms of sale on behalf of the members. The members agree that they will not sell or contract for sale of their produce except under minimum conditions that are established by the association.

Under this type of organization, the bargaining association negotiates prices and terms of sale of contracts between the member and the buyer. The farmer and buyer remain in contact and the title of the produce passes directly from seller to buyer. While this type of arrangement doesn't have the flexibility of a marketing cooperative, the member obviously retains a certain amount of control and freedom in the exchange. Typical of this type of organization are the California Tomato Growers Association and the Michigan Agricultural Cooperative Marketing Association. The California Canning Peach Association started out this way.

b) *Exclusive Representative in Collective Bargaining*

. The essence of this type of organization is that it is usually a large bargaining organization that handles many commodities. The prime example in the U.S. is the National Farmers' Organization (NFO). Bargaining is carried out by elected Marketing Area Bargaining Committees who are elected on a county-wide basis for each commodity.

c) *Market Service Association*

A market service association is generally involved in providing market intelligence to its members on a timely basis. Some believe such a cooperative is a precursor or forerunner to a fully fledged bargaining association. The service organization does not engage in bargaining with buyers, but provides members with price and other market information to improve grower interfaces with buyers.

The California Tomato Grower Association started out with this type of organization before becoming a full cooperative bargaining association. Apart from assisting members in finding casual labor, and providing reliable market information to its members, it also took a leadership role in establishing uniform grade standards under State of California Regulations and established a series of "recommended prices" to enable its members to bargain with knowledge rather than in a vacuum.

Other examples of market service associations include the California Citrus Mutual, the California Association of Winegrape Growers, the Olive Growers Council of California, and the Central California Lettuce Producers Cooperative.

d) *Exclusive Agency Bargaining*

While exclusive agency bargaining is not currently an option available to California producers, it is included here for completeness and as a future possibility for California.

In 1972, the Michigan legislature adopted the Agricultural Marketing and Bargaining Act under which it established a board that would:
i) provide a mechanism that would define a bargaining unit
ii) determine recognition of a bargaining cooperative to represent all growers in the bargaining unit
iii) provide for mediation and arbitration; and
iv) enforce a set of rules related to fair bargaining.

An association may qualify for accreditation by filing a request to the Board and submitting evidence that it meets certain standards required by the Act. All producers within a bargaining unit must be allowed to join the association if they choose to. Uniquely, the Board addresses the "free rider" problem by requiring nonmembers of the accredited bargaining association to pay their proportionate share of the costs of providing a bargaining service.

For California lamb producers then, a cooperative bargaining association could take

any of the forms described above, but in essence could

1) maintain control of the supply of lamb to the slaughtering facility
2) establish a producer pricing system (such as the yield grade pricing outlined earlier) that would increase the efficiency of pricing lamb.

Such an arrangement would be less than total control, but could achieve the basic aims of the industry. Control over marketing and wholesale/retail marketing margins would be indirect and not entirely controllable.

The success of a bargaining cooperative hinges on its ability to organize and control enough live lamb volume to force price concessions by the slaughterers. A critical factor is that members must commit to marketing through the association so that it has actual control of the lambs.

CONCLUSIONS

This study has examined the changing structure of the California sheep and lamb industry. As the industry has evolved over the last 30 years, the decline in the number of producers, and in the number of sheep and lambs has created significant changes in the structure of the industry. A critical examination of the current structure of the sheep and lamb industry in California reveals several significant changes that have resulted from production instability. These are briefly outlined as follows:

i) Increased backward integration by lamb slaughterers.
ii) Decline in the number of slaughter plants.
iii) Higher degree of specialization in lamb slaughtering and increased forward integration.
iv) Thin Markets - Inadequate Price Discovery

A comparison of the neoclassical models of perfect competition and monopsony reveals that the conditions under which a monopsonist maximizes profits results in i) lower prices to producers, ii) higher prices to consumers, and, iii) smaller quantities of lamb sold into the market. Therefore, one would expect that if a monopsony in lamb marketing exists, the marketing margins of the slaughterer and retailers would be much wider then in the competitive case.

Using an equation to determine competitive farm prices and the marketing margins of slaughterers and retailers it was found that for all but one year, farm prices were lower than they would be in perfectly competitive markets, and slaughterer and retailer margins were higher than they would be in a perfectly competitive market.

The critical examination of the structure of the California lamb and sheep industry and the results of the marketing margin analysis provide sufficient evidence that performance problems in the system appear to stem from a lack of competition at the slaughterer level and an inadequate price discovery system.

Economic theory suggests that there are two possible solutions to this problem.

1. Increased competition via the entry of additional marketing facilities; or
2. The existence of a countervailing market power to offset the monopsony buying power.

While there are advantages to some farms of additional marketing facilities (either through a new investor owned firm or a producer organized cooperative), two major considerations make this alternative less desirable than the existence of a countervailing monopoly selling power. First, there is insufficient sheep numbers in California alone for two slaughter plants. Second, the entry of an additional marketing facility could result in an equally inefficient duopsony.

Therefore, the creation of a countervailing market power in the form of a bilateral monopoly could be used to offset the monopsony buying power of the single slaughter plant remaining in California. The bilateral monopoly could take several forms, but would probably be most effective as a cooperative farm bargaining association; either as a full marketing cooperative or a cooperative bargaining association.

Several types of cooperative bargaining associations are actually precursors to a full marketing cooperative, but essentially they provide the institutional mechanism to enable producers to offset the buying power of a regional monopsony.

The success of a bargaining cooperative hinges on its ability to organize and control enough live lamb volume to force price concessions by the slaughterers. A critical factor is that members must commit to marketing through the association so that it has control of the market. Only in this way can a bargaining association succeed in correcting the market imperfections created by a monopsony; to bargain for fair and reasonable prices and terms of sale; to coordinate marketing functions and improve price stability both during and between years.

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FOOTNOTES

[1] "California Livestock Statistics," California Ag. Statistics Service, 1990.

[2] "Report of packers filed with the Packers and Stockyards Administration," USDA, 1990.

[3] ibid.

[4] "Livestock Slaughter Summary" USDA, March 1991.

[5] "Report of packers filed with the Packers and Stockyards Administration," USDA, 1990.

[6] Slaughterers survey, October 1990.

[7] Slaughter sheep usually quoted with 4 percent pencil shrink and feeder sheep 3-4 percent. Livestock, Meat, Wool Market News, Weekly Summary and Statistics, Livestock Division. USDA.

[8] A correlation coefficient, r, is a statistical measure that shows the relationship between two sets of data. A perfect relationship between farm and retail prices could be said to exist if the calculated r equals 1. Conversely no relationship could be said to exist if r equals 0.

[9] "Lamb Quality Studies," Smith, Y.G., Proceedings 22nd Annual Reciprocal Meat Conference, 1982.

[10] "Livestock Slaughter Summary," USDA, March 1991.

[11] Slaughterers survey, October 1990.

[12] "Lamb Council: Looking Back on a year of Challenge and Frustration," National Wool Growers, January 1991.

[13] Consider the current lamb slaughter market in which the monopsonist purchases live lambs to produce a lamb carcass for retail consumption. The monopsonist's production function states output (q) as a function of the quantity of live lamb (x) that is purchased.

$$q = h(x)$$

The cost equation (C) and revenue function (R) are therefore

$$R = pq$$
$$C = rx$$

where

p = price of lamb in the wholesale/retail market
r = price of lamb purchased from lamb producers

However, as explained, the price of lamb as an input (r) is an increasing function of the quantity purchased (x). Thus,

$$r = g(x) \text{ where } g'(x) > 0$$
$$\text{and } c = g(x) \cdot x$$

The marginal cost of lamb therefore is:

$$f(dc, dx) = x \cdot g'(x) + g(x)$$

Since $g'(x) > 0$, the marginal cost of lamb exceeds its price for all x > 0.

Assume, for generality, that the demand curve facing the monopsonist is downward sloping and that price (p) is a decreasing function of output (q). Thus,

$$p = f(q) = f[h(x)]$$

where $f'(g) = f'[h(x)] < 0$

Therefore,

$$R = f[h(x)] \cdot h(x)$$

Thus, the marginal revenue of output from additional units of live lamb (x) is:

$$f(dR, dx) = f[h(x)] \cdot h'(x) + f'[h(x)] \cdot h(x) \cdot h'(x)$$

Setting the marginal revenue of output from additional lamb equal to the marginal cost of lamb:

$$f[h(x)] \cdot h'(x) + f'[h(x)] \cdot h'(x) \cdot h'(x) = x \cdot g'(x) + g(x)$$

or, more simply

$$(p + q \, f(dp, dq)) \, f(dq, dx) = r + x \, f(dr, dx)$$

[14] Retailers' survey, October 1990. Slaughterers' survey, October 1990.

[15] Included in these cost estimates are allowances for a normal return on investment.

[16] One complicating factor is determining whether P_{RL} taken from historical price data is at an optimal competitively established level. If equation 1 is to yield a purely competitive farm price (P_L^*), implicitly P_{RL} must also be assumed to be a purely competitively established price, since P_L^* is a dependent variable in this analysis. If this assumption is incorrect then both estimates, P_{RL} and P_L^*, are higher than would occur in a purely competitive market (for reasons explained earlier).

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