RESEARCH BULLETIN 711 AUGUST, 1959

UNIVERSITY OF MISSOURI COLLEGE OF AGRICULTURE

J. H. LONGWELL, *Director*

A Large Merchandising Experiment With Selected Pork Cuts

H. D. NAUMANN, EDWIN A. JAENKE, V. JAMES RHODES,
ELMER R. KIEHL AND D. E. BRADY

(Publication authorized August 31, 1959.)

COLUMBIA, MISSOURI

CONTENTS

ACKNOWLEDGMENTS

Appreciation is expressed for the fine cooperation of the personnel of the meat packer and retail chain. Appreciation is also expressed to Mrs. Virginia Holt and Mr. Richard Maxon for assistance in store observations and to Mr. Eugene Birmingham for assistance in grading the products. The bulletin is a report on Department of Agricultural Economics Research Project 216. "Consumer Pork", Animal Husbandry Project 218, and Home Economics Project 219.

Portions of this bulletin are taken from a manuscript by Edwin A. Jaenke entitled *Consumer Acceptance of Selected Lean Pork Cuts,* submitted as a Master's Thesis at the University of Missouri, February, 1958.

SUMMARY AND CONCLUSIONS

Shank portion smoked hams, rib end loin roasts, and center ham slices were sold in 14 chain stores in metropolitan Kansas City from June 10 through August 5, 1956. Sales were measured from paired displays of Lean and Regular cuts when these cuts were priced the same and when the Lean cuts were distinctively labeled and priced 4 cents a pound higher than the Regular cuts. Cuts were classified as Lean or Regular by University personnel on the basis of photographic standards for the cuts.

During the test, 826 Lean loin roasts, 664 Regular loin roasts, 2860 Lean shank portions, 2389 Regular portions, 2490 pounds of Lean ham slices and, 3244 pounds of Regular ham slices were sold.

When there was no difference in price or label, 59.7 percent of shank sales, 52.1 percent of ham slices sales, and 58.3 percent of loin roast sales were of the Lean product. These figures suggest that a small majority of the customers preferred the leaner products at an equal price. These results also indicate that the photographic standards used were to some degree effective in segregating shank portions and loin roasts and, perhaps, ham slices.

When the Lean products were specially labeled and priced 4 cents a pound higher than the regular products, 51.5 percent of shank sales and of slices sales, and 53.7 percent of roast sales were of the Lean product. While sales cannot be exactly equated with number of buyers, it is apparent that about as many buyers were willing to pay the 4 cent premium as were not. The presence of a price premium for Lean products affected sales of all the Regular product in the direction expected.

Total Lean sales for the three cuts were about $14,025 compared to about $10,810 for the regular cuts.

These results suggest that retailers might be able to develop a considerable market for leaner ham shanks and slices and loin roasts priced at a small premium. In most competitive situations, large retailers would probably sell both the Lean and Regular rather than forego completely the price-competitive Regular product. These results indicate that leaner products had a higher retail yield with no promotion nor point-of-purchase advertising other than the small label and the higher price marked on the package. What effect aggressive store-merchandising would have on the retail yield of leaner pork remains for some progressive retailer to demonstrate.

Carcass backfat thickness was not a satisfactory indicator of intermuscular fatness.

A Large Merchandising Experiment With Selected Pork Cuts

H. D. NAUMANN, EDWIN A. JAENKE, V. JAMES RHODES,
ELMER R. KIEHL AND D. E. BRADY

INTRODUCTION

"It's time hogs sell for what they're worth."[1] This statement has been repeated dozens of times in the past decade.

Aside from the operational problems in the marketing system, there are two valuation problems in selling hogs "for what they are worth." These valuation problems are related to "packer yield" and "retailer yield." First, the hog carcass is a composite of cuts of varying value. During the past half century the relative values of these cuts have changed so greatly that a top market hog today needs to be quite different. The prices of the four lean cuts (loins, butts, hams, and picnics) have risen greatly while the price of fat-for-lard and of certain cuts has fallen greatly (Figure 1). The greater the percentage of the four lean cuts of total carcass weight the greater in general is the yield to the packer. Thus, the first valuation problem is that of selling hogs according to their *packer yield.*

The "packer yield" problem has received much attention. Based on research at several experiment stations, carcass grade standards were developed. These standards are largely a function of average backfat thickness since research showed high relation of packer yield to backfat thickness (Figure 2).

The difference in value of U. S. No. 1 and U. S. No. 2 grades on the basis of packer yield alone has been calculated at 40 cents per hundred weight in terms of live hog values at Chicago for 1957 (1)[2]. While this difference in value is quite important to the producer, it has not been sufficient to overcome speedily the inertia of a marketing system long geared to mine-run buying. A considerable research and extension effort has been devoted to changing marketing

[1]Title of an editorial in *Successful Farming,* March, 1948, Page 3.
[2]Numbers refer to list of references in the back.

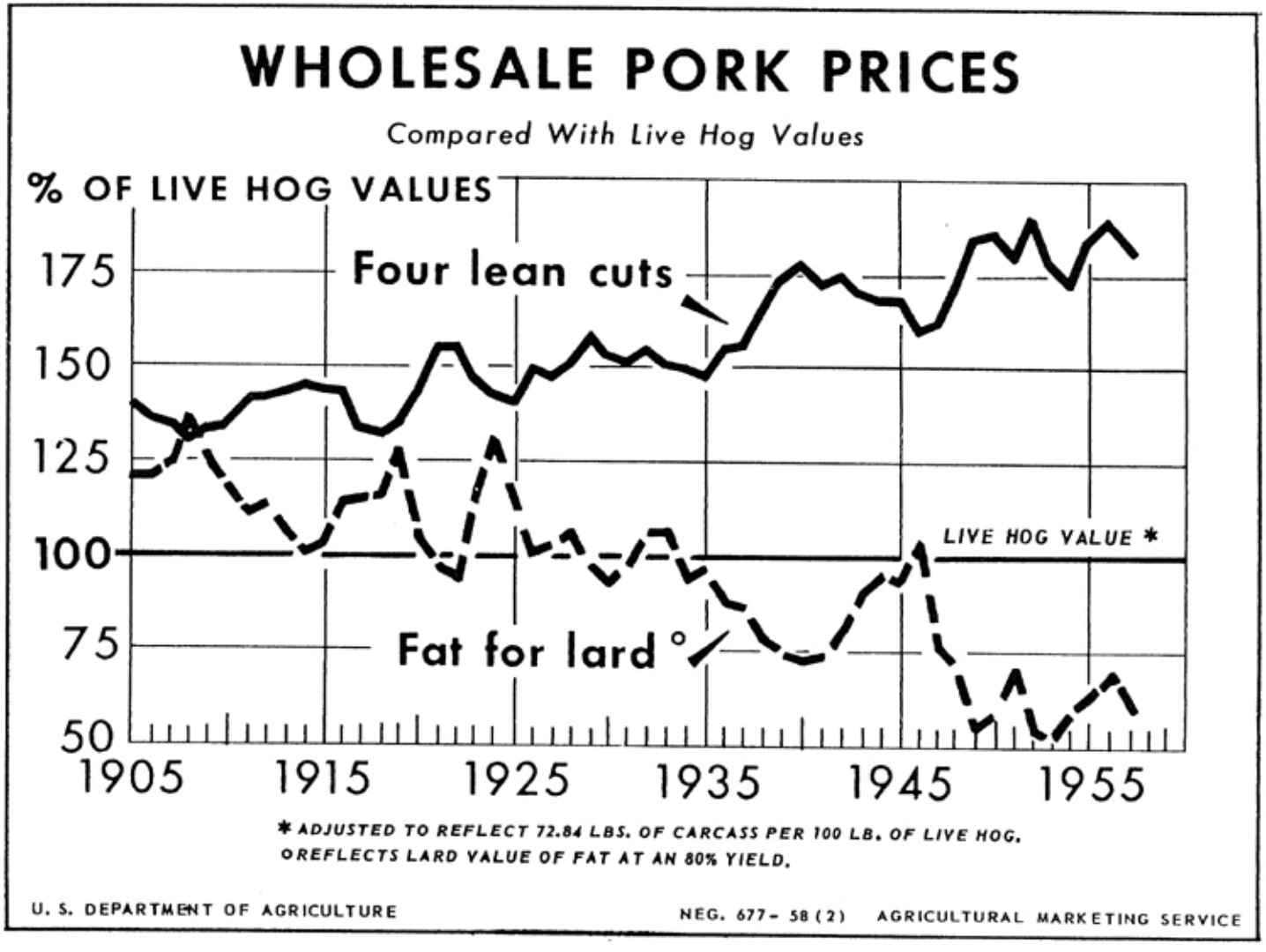

Figure 1—Price changes affecting packer yield.

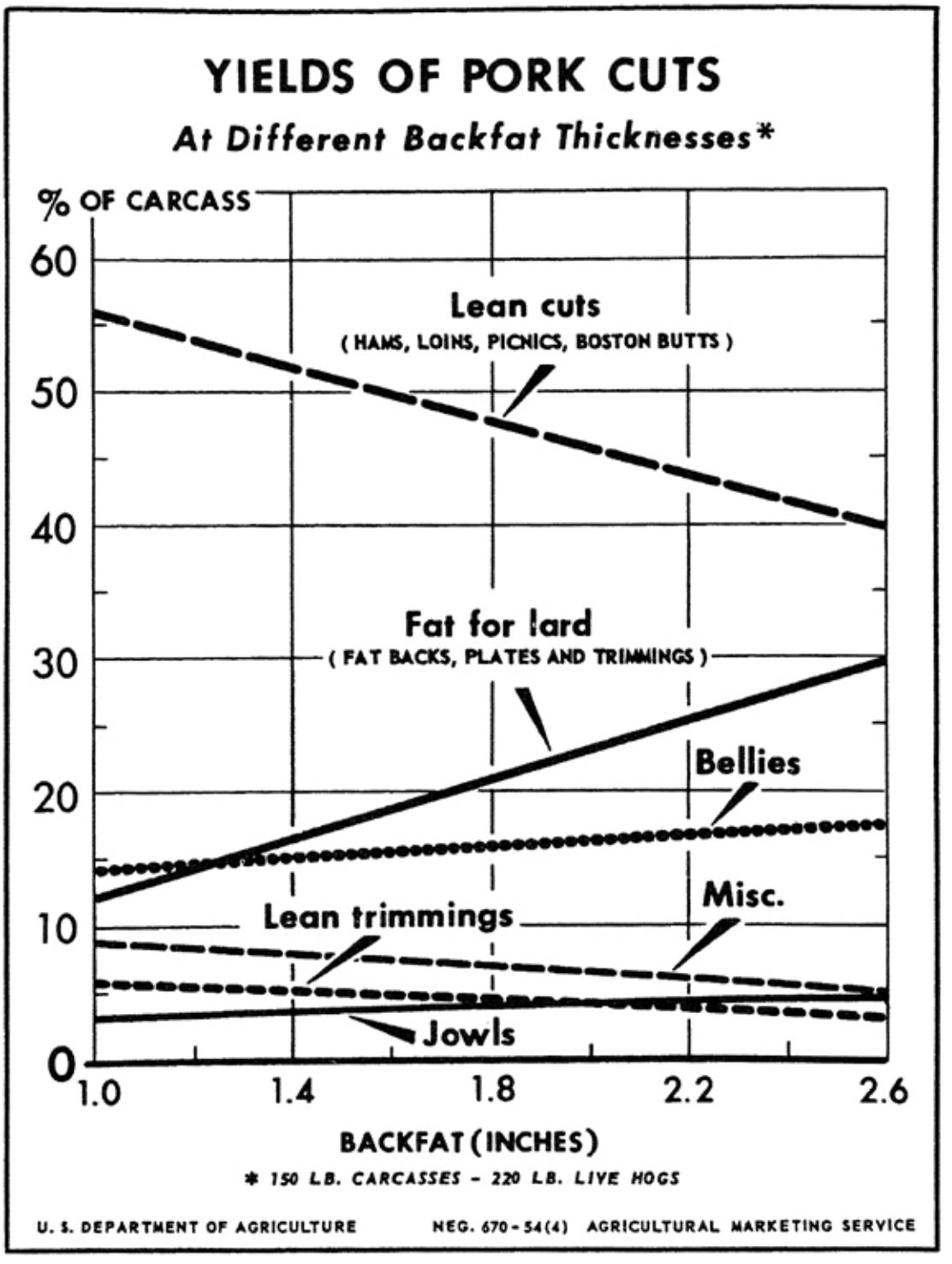

Figure 2—Packer yield of various cuts.

practices in order to sell hogs for what they are worth in terms of packer yield.

Interest in the second valuation problem has been stimulated by the hope that additional monetary incentives to production of meat-type hogs might be provided. Several preference studies and the everyday observations of many people indicate a very considerable distaste of most consumers for excessive pork fat. Therefore it is possible that pork cuts from lean hogs can be sold for a higher price at retail and will yield more to retailers than cuts from fatter hogs. Interest in the possibilities of greater "retailer yield"—and, eventually, greater farmer returns—from leaner cuts stimulated a large merchandising experiment by the staff of the Missouri Experiment Station.

REVIEW OF LITERATURE

Consumer preference research is a relatively new area of investigation. In the case of pork, very little preference research had been done before 1952 when the Department of Agricultural promulgated official grades for slaughter swine and pork carcasses. As a result of this development, plus the declining demand for pork, greater efforts were made to explore consumers' preferences for pork cuts. The common assumption had been that consumers wanted leaner cuts; and if breeding, feeding, marketing or trimming methods could be applied to obtain leaner retail pork cuts, the "Pork Problem" would be solved.

Vrooman, in 1952 in a study on consumer preferences for pork in five western Oregon cities, found "Consumers in all five Oregon cities covered by the study expressed a clear-cut preference for lean pork." (2) Fat, medium and lean cuts of pork chops, shoulder steaks, loin roast, shoulder roast, side bacon and ham steak were shown to 221 consumers. More than three-quarters of the consumers chose the leanest cut as their first choice except in the case of ham steaks. The fat cut of each of the products was given as last choice by 80 percent or more of the respondents. Vrooman also pointed out that difference in income had little effect on the preference stated.

In the winter and spring of 1953-54, Kirtley studied consumer reaction to various price differentials between lean and regular loin and rib chops. Both kinds of lean chops were from "well muscled, lean loins and were labeled 'Extra Lean Chops' ". The regular chops were from fatter loins and were displayed side by side with the leaner ones in a representative self-service store in Champaign, Illinois. During the six-week period, at premiums of 10 to 18 cents per pound, the lean chops outsold the regular or fatter ones by a ratio of three pounds lean to two pounds regular. As the premium increased, the lean to regular ratio decreased. Kirtley concludes that consumers have a marked preference for lean pork chops. "Thus, as leaner, well muscled, meat-type hogs are produced it should be possible to sell increased quantities of pork at the same price or the same quantity at a higher price or both." (3)

Kirtley reported that a limited effort to use USDA carcass grades rather than visual inspection as the sorting method was unsuccessful. Lean-fat variation

within grades was sufficiently large that inter-grade differences were mainly obscured.

While Kirtley's results were limited to one store, they indicated that "retail yield" from selling leaner cuts might considerably exceed the yield from cuts from fatter carcasses.

A large retail experiment was conducted by Trotter in ten self-service stores in Pittsburg. (4, 5) Center-cut pork chops and pork steaks cut from three carcass grades—A, B, and C—roughly corresponding to U.S. No. 1, 2, and 3, were displayed in eight self-service Kroger stores in paired ribbons. Varying price differentials, ranging from a minus 5 cents to a plus 15 cents per pound applied to the leaner cuts, were employed. In addition, the leanest and fattest grades were displayed in two stores with the price differential of 10 cents unchanged for the entire test period in an attempt to appraise any change over time in consumer acceptance of the graded cuts. No extra labeling was employed but prices were clearly indicated. The leaner Grade A cuts accounted for approximately 50 percent of total sales irrespective of the price differential.

Trotter was unable to pinpoint the reasons for the failure of the leaner cuts to sell faster, especially at the more favorable price ratios. He noted that there were considerable difficulies in administering the test and maintaining cooperation with store managers and personnel. A sample of 1100 buyers of the experimental cuts was interviewed. About 40 percent of the buyers were not aware that there were two displays and only 10 percent mentioned that they noticed differences in both prices and degree of lean. Trotter suggests that this failure of many customers to notice differences was partly due to the small differences between product groups. Trotter's results are inconclusive but in general are much less encouraging than Kirtley's.

In some very small sales tests at Iowa State, Gaarder and Kline found indications that "hog carcass grading doesn't seem to sort loins into groups that are different with respect to consumer preference." (6)

Preliminary reports of a pork sales test by Purdue researchers: "Tend-R-Lean" meat-type cuts from U.S. No. 1 hogs were sold in five stores for 12 weeks and sales were compared with sales in five other stores of regular pork sold at the same price. "Meat-type pork shoulders outsold 'regular' pork shoulders by 5.6 percent. Nine percent more meat-type bacon, and 13 percent more ham were sold. However, 'regular' pork loin cuts sold no better than meat-type loin." (7) The author's interpretation of these figures apparently indicates that the percentages were per 100 customers, although the data is not so specified. Such figures would be very difficult to interpret if the number of customers and/or other meat sales also were greater in those five stores carrying the meat-type product. Sales conditions in the other five stores must have been entirely comparable in terms of quality and quantity of displays, etc., if valid comparisons are to be made.

The differences among cuts are interesting. "In the case of pork loin cuts,

such as center cut chops and loin roasts which can be trimmed, consumers showed no preference for the meat-type pork. For cuts such as bacon, hams and shoulders, from which fat cannot be trimmed since most is inside, consumers seemed to prefer the meat-type." (7)

Later, the "Tend-R-Lean" and regular products were sold side by side in these five stores for a few weeks. Price differences for the same cuts ranged from zero to a 10-cent premium on lean center-cut chops. Results are given as a "percentage of pork dollar" spent on regular and meat-type products. Percentages for meat-type cuts were pork loins, 47; fresh Boston Butts, 64; fresh picnics, 28; sliced bacon, 17; and cured ham, 53. Poundage sales of lean cuts were obviously considerably less than sales of regular cuts, except for Boston Butts.

The authors observed that the meat-type pork was more watery and, consequently, had a shorter shelf life in the display counter.

Available data from this study are presently insufficient to evaluate it adequately. At this stage, the results appear to be less encouraging than Kirtley's report.

The University of Missouri Agricultural Experiment Station since 1952 has conducted several studies on consumer preference for pork. These have taken the form of taste panels, visual preferences, and consumer interviews. Based on these early studies and those conducted at other stations, it was concluded that the variability of pork cuts within the USDA grades was so great as to obviate any potential of a merchandising program based solely on U. S. grades.

Birmingham *et al.* (8) in 1953 interviewed 361 households in Columbia, Missouri. The preferences before cooking were as follows:

	Choice No. 1	Medium
Bacon	42.4%	54.6%
Ham	47.4%	48.7%
Chop	38.5%	55.4%

The preferences after eating were as follows:

	Choice No. 1	Medium	No Preferences or No Answers
Bacon	40.8%	48.2%	11.0%
Ham	33.1%	40.2%	17.7%
Chop	39.9%	41.5%	18.6%

In about 40 percent of the cases, the respondent's visual preference differed from his eating preferences. Birmingham concluded, "The majority of the respondents preferred lean pork."

An unpublished pilot study was conducted at the Missouri Station during November and December of 1955. Seventy-two randomly selected households

cooperated in a visual and taste preference of chops and center ham slices.

Lean and regular cuts were separated on the basis of internal fat, using a photographic standard developed at Missouri. The lean and regular ham steaks or chops were placed side by side on a cardboard backing board and wrapped in cellophane. The housewife was asked to indicate which she preferred. The slices or chops were then prepared in the household and the two adult members indicated their taste preference.

On the basis of visual preference, the leaner rib and blade chops and ham slices were each preferred by about two-thirds of the respondents. However, on the basis of taste, there was little consistent difference in the chops. The fatter ham slices were slightly more popular.

In January, 1956, workers at the Missouri Station used photographs in their studies of consumer pork preferences. Photographs had been made of representative side-by-side comparisons used in the study described above. These pictures of lean and regular ham slices and chops were shown to about 300 shoppers in three of the super markets in Columbia, Missouri. They were then asked which they would buy if both were priced alike.

The ham slice with the smaller amount of internal fat was preferred by about 67 percent. The blade chop with the smaller amount of internal fat was preferred by about 80 percent. All interviewers were impressed by the widespread desire to avoid excess fat in pork as indicated by the numerous comments as well as the preferences.

It was concluded from these studies that the visual differences in the ham and loin standards were sufficiently large that most consumers could discriminate. The inconclusiveness of the eating results suggested that palatability was not noticeably related to the visual standards. It appeared that an experimental sales test would be useful. Visual preferences were obviously quite important and it appeared likely that eating experiences would not be different from those anticipated by the purchasers. The difficulties of interpreting sales test results when eating satisfaction may *not* have been correctly anticipated have been discussed elsewhere. (9)

EXPERIMENTAL PROCEDURE

General Organization of Experiment

The organization of a sales test involves a tremendous number of decisions —some of which may appear to have rather obscure reasons. The large amount of decision-making prior to this test stemmed from two causes. First, all but a few of the very many variables had been controlled insofar as possible. Second, intimate cooperation with two large firms was required to obtain a large amount of specially selected products from a packer and merchandise them through a chain. A brief review of these general decisions and their reasons may be instructive.

A test involving about a dozen supermarkets for eight weeks was considered the minimum size for adequate results and about the maximum size for available resources. Complete control of product selection beginning with the carcass was necessary.

Various pork products were considered. Primary interest was in the effect of the amount of internal fat. The particular interest of the packer encouraged selection of the ham shank portion and ham slices. The rib end loin roast was chosen as a fresh cut with considerable variation in internal fat. While it would have been interesting to use rib end loin chops as well as roasts, the extra record-keeping problems appeared too great.

It was decided that classification on the criterion of internal fatness was to be made on the basis of photographic standards for each cut, rather than carcass grades. The initial decision to use only one photograph per cut, with the fatter cuts going into one group and the leaner into another, was later modified to use two photographs. Those cuts falling between the two photographs were excluded from the study.

It was essential that carcass weights and backfat thicknesses be obtained and related to the classifications of leanness obtained. There was considerable discussion about the precise ranges of each to utilize and the relative desirability of obtaining Lean cuts from any backfat thickness where available or only from leaner carcasses.

Two types of displays were initially desirable. One type would involve side-by-side or even jumbled displays of Lean and Regular cuts with no labeling or price difference. This type would test the degree to which customers did seek and buy the leaner cuts. The second type was a single display of either a Lean or Regular product. The Lean product would be priced higher and would be specially labeled half of the time and not labeled the other half. It was planned that these would be displayed in a randomized design of the type popularized by Brunk. (10) Analysis would compare total volume and total revenue from sales of each product with and without labeling. These plans had to be modified to meet store conditions.

Many helpful suggestions were received from Trotter and others with experience in this area. These suggestions influenced many detailed decisions on coding the product, keeping records, maintaining cooperation at store level, obtaining retail union clearance, maintaining displays, etc.

It was planned to run the test in April and May, 1956, but it was delayed until June 4. A pre-test week had been recommended but was not planned. However, it became apparent during the first two days that several problems would impair the usefulness of the first week's data. Therefore, that week was treated as a pre-test and the test was extended another week to provide eight weeks of data for analysis.

Retail Store Design

Fourteen chain store supermarkets in the Kansas City metropolitan area

were used for the test. These stores were divided into three groups as follows:

Group I Stores. This group of eight stores displayed all three of the test products—rib end loin roasts, shank end smoked hams and center cut ham slices. The eight stores were selected from among the 14 stores to provide a representative sample of the Kansas City area. The test products were in a side-by-side, paired-ribbon display. The position of each paired display within the meat case was determined by normal chain-store merchandising procedure. Center ham slices were normally near the first position of the display case as determined by the flow of traffic past the meat case. The roasts were usually near the center with shank hams toward the end of the meat counter. The position of Lean and Regular cuts of a particular test product was rotated weekly to eliminate any effect of position. The two treatments applied to this group of stores were:

Treatment C—The Lean product with no distinctive labeling, priced the same as the prevailing chain price, and sold alongside the Regular product.

Treatment D—The Lean product, labeled "Selected Meat Type Pork" priced 4 cents above the prevailing chain price, and sold alongside the Regular product. (Figure 3)

These treatments were rotated within the eight stores every two weeks throughout the study. Table 1 gives the rotational design for Group I stores.

Figure 3—Side by side display with Lean (labeled on left) priced four cents higher than Regular.

TABLE 1--TREATMENT AND POSITION, ROTATIONAL DESIGN FOR GROUP I STORES

Time	Stores							
	A	B	C	D	E	F	G	H
	Treatment							
First Week	C-1	D-2	C-2	D-1	C-2	D-2	C-1	D-1
Second Week	C-2	D-1	C-1	D-2	C-1	D-1	C-2	D-2
Third Week	D-1	C-2	D-2	C-1	D-2	C-2	D-1	C-1
Fourth Week	D-2	C-1	D-1	C-2	D-1	C-1	D-2	C-2
Fifth Week	C-1	D-2	C-2	D-1	C-2	D-2	C-1	D-1
Sixth Week	C-2	D-1	C-1	D-2	C-1	D-1	C-2	D-2
Seventh Week	D-1	C-2	D-2	C-1	D-2	C-2	D-1	C-1
Eighth Week	D-2	C-1	D-1	C-2	D-1	C-1	D-2	C-2

Note: C-1 Treatment C with Lean product in first position.
C-2 Treatment C with Lean product in second position.
D-1 Treatment D with Lean product in first position.
D-2 Treatment D with Lean product in second position.

Group II Stores. This group of four stores displayed shank end smoked hams in a modified Latin square design. To reduce customer comparison, the displays of the product were separated, generally by a distance of four to six feet. Treatment B was the control treatment matched by Latin square design against Treatment A.

The original purpose of this phase of the test was to determine the feasibility of a retail store's handling only one grade of pork. The only purpose in having both the Lean and Regular cuts displayed in a particular store at the same time was to comply with the cooperating chain's policy of guaranteeing a choice to its customers. The assumption was then made that by isolating one of the cuts, a reasonably realistic test would be possible. The distance between the Lean and Regular display was to have been 15 to 20 feet. However, practical limitations of meat counter space prevented this spacing.

The treatments used in Group II stores were:

Treatment A—The Lean product, labeled as "Selected Meat Type Pork," in the preferred (first) position and priced 4 cents above the prevailing chain price. The regular product, four to six feet distant in the "second" position. (See Table 2.)

TABLE 2--MODIFIED LATIN SQUARE DESIGN USED IN GROUP II STORES

Time	Stores			
	I	J	K	L
	Treatment			
First Two Weeks	A	B	A	B
Second Two Weeks	B	A	B	A
Third Two Weeks	A	B	A	B
Fourth Two Weeks	B	A	B	A

Treatment B—Same products, pricing and labeling but the Regular product in the preferred (first) position.

Group III Stores. A third group of two stores displayed Lean and Regular loin roasts and shank hams in side-by-side displays for the full eight weeks. The relative position of the Lean and Regular cuts was rotated weekly to remove the effect of position. During the entire test the Lean cuts were labeled "Selected Meat Type Pork" and were priced 4 cents above the prevailing Kansas City chain price.

The displays were sufficiently close in the Group II stores that the experimental situation was very much the same as in the Group III stores, excepting that only shanks were displayed in the former. The purpose of the Group III experiment was to observe the development of sales under constant conditions for the full eight weeks.

Selection of stores

The individual stores used in this study were selected in cooperation with the chain store management to provide, as nearly as possible, a representative sample. The stores were selected on the basis of the following criteria:

(a) Stores with self-service meat counters.
(b) Stores representing all levels of purchasing power.
(c) Stores representing the various social groups as to race, religion and nationality.
(d) Stores that were geographically scattered in accordance with (c) above.
(e) Stores of the different sizes common in Kansas City. Size in this case refers both to physical dimensions and the dollar volume of meat sales and customer count. Seven of the stores were of the more modern supermarket size, while the other seven were of the older, smaller, neighborhood type. Five of the small stores each had four check-outs while the largest store had nine. All stores had wholly self-service meat counters. Total weekly volume of meat sales in the fourteen test stores ranged from $1400 to $4100 and weekly customer count ranged from 2000 to 4500. Estimates by each store manager of average family income of customers ranged from $65 per week to more than $150 per week.
(f) Stores where the manager, head meat cutter and employees were expected to have a cooperative attitude toward projects of this type.

A random method of selection of 14 test stores was not possible. A judgement sample, based on the criteria presented above, was the best and most practical substitute.

Grading and Handling at the Packing Plant

The retail pork cuts used in this test were shank end smoked hams, rib and loin roasts, and center-cut smoked ham slices.

The shank portion of the cured ham was selected not only for its relative importance among the cured pork products but also for its adaptability to a test of this type. Customers can detect apparent differences in fat to lean ratios when they see the faced end of a shank ham portion.

Cured ham center slices were the third product tested in this study. Very little preference work had been conducted on cured center slices and in view of their increasing importance in the retail trade it seemed appropriate that they be included. Once the decision had been made to use shank end smoked hams, it seemed logical from an operational standpoint to test also the adjoining center slice. The ham therefore yielded two retail test cuts. The ham butt portion was diverted from experimental purposes to normal retail trade.

The cuts used in this study were from hogs slaughtered and processed at the plant of the cooperating packer. To yield more useful and practical results, the normal methods and procedures of both the cooperating packer and chain store were followed as closely as feasible.

As the carcasses were being railed to the coolers, a preliminary backfat measurement (at the last rib) and carcass weight were taken. Those carcasses that met the specifications according to backfat and weight as shown in Columns 1 and 2 of Table 3 were directed into separate coolers. These were chilled overnight. The next day the backfat thickness was measured on the chilled carcasses. These measurements were taken at three points on the carcass: (1) over the first rib at the junction of the last cervical and first thoracic vertebra, (2) over the last rib at the junction of the seventh and eighth vertebra below the last lumbar vertebra,and (3) opposite the last lumbar vertebra. An average was checked against the standards shown in Column 3 of Table 3. The carcasses were then clearly marked as 0, 1, 2, 3, or 4 on the loin and on the ham to insure complete identification throughout the study.

TABLE 3--SPECIFICATIONS USED IN SELECTING TEST PRODUCT AND THE EXPECTED RETAIL GRADE

Hot Carcass Weight (pounds)	Hot Measurement At the Last Rib (inches)	Chilled Carcass Average Measurement (inches)[a]	Test Grade	Retail Grade[b]
140 - 160	1.0 - 1.3	1.0 - 1.3	0	Lean
	1.3 - 1.6	1.3 - 1.6	1	
156 - 175	1.6 - 1.9	1.6 - 1.9	2[c]	
	1.9 - 2.2	1.9 - 2.2	3	Regular
	2.2 - 2.5	2.2 - 2.5	4	

[a]Average of measurements at first rib, last rib and last lumbar.

[b]Retail grades Lean and Regular were classified on the basis of the photographic standards from all the test grades.

[c]Grade 2 was used only when carcasses from 3 and 4 did not yield an adequate supply of Regular grade.

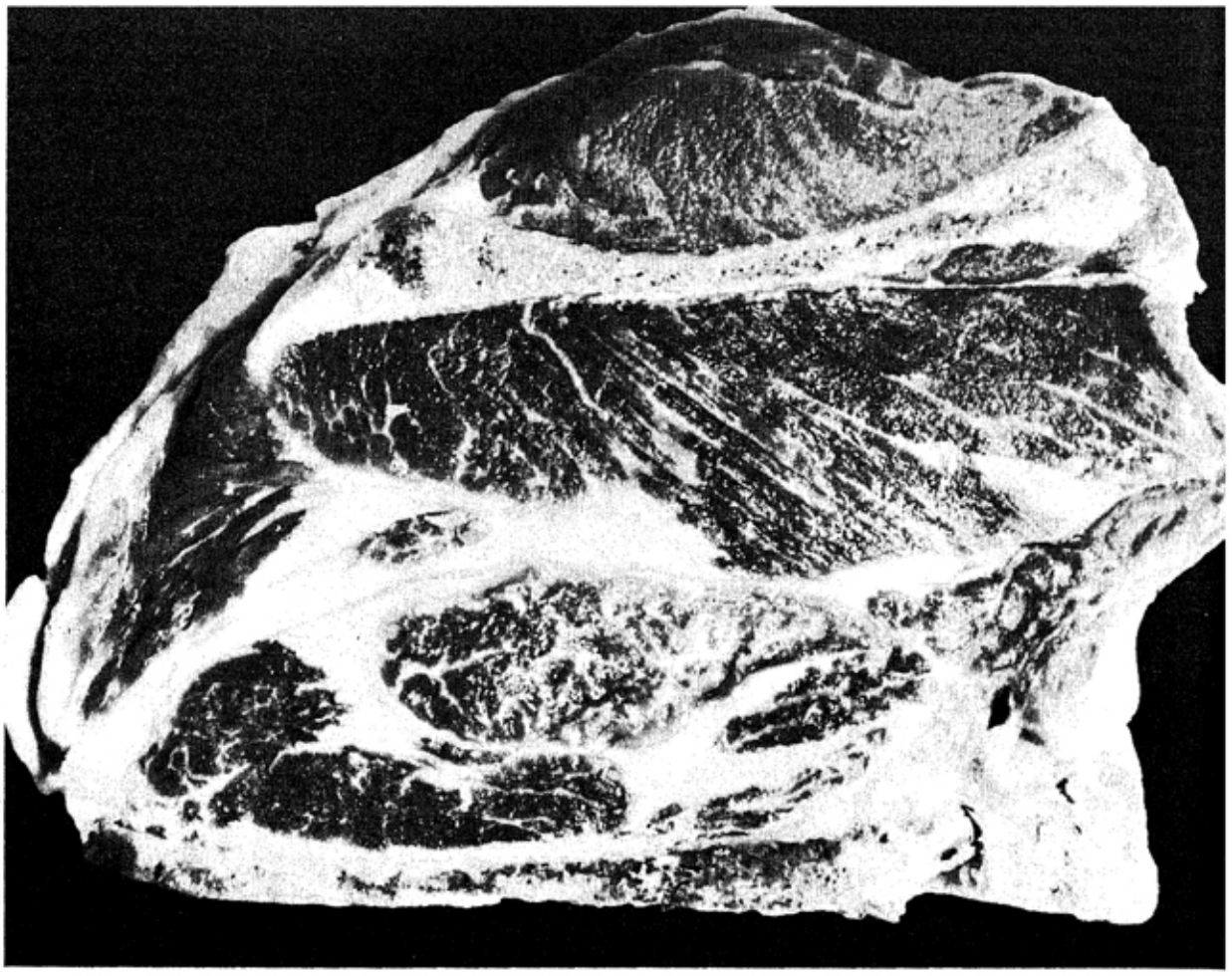

Figure 4—Photographic standard for rib-end loin roasts.

The hams were removed from the carcass a full two and three-quarters inches from the point of the aitch bone. The whole hams were sent to the curing cellar to be pumped and smoked. From the cutting operations hams of the 0 and 1 grade were kept separate from those of the 3 and 4 grade. After the hams left the smokehouse, they were boxed by grade and were readied for shipment.

The loins, usually in the 12 to 16 pound weight class, were graded as they came off the cutting line on the basis of photographic standards (Figure 4). This photograph served to delineate the breakpoint—i.e., any loin with a larger proportion of internal fat than was present in the photographic standard was classified as a Regular and those loins with a smaller proportion of internal fat were graded Lean.

Grading and Handling at Retail Level

The meat used in this study was trucked, under refrigeration, to the Kansas City warehouse of the retail chain stores. The loins were ready for distribution to the stores, having been graded, marked, and boxed at the packing plant. These loins, packed eight to a box, were delivered to individual test stores. Further cutting was done as needed by each meat cutter in each store. Rib end

loin roasts were removed from the whole loin by making a cut between the sixth and seventh rib. Any necessary trimming was made, leaving an attractive 2½ to 3½ pound roast. The roasts were then wrapped in clear film, sealed, weighed, priced, labeled, and readied for display in the meat case.

The whole smoked hams were further processed at the Kansas City warehouse. Regular operational procedures were followed as closely as possible. The whole hams were cut on the power saw, the point of break being approximately one inch below the aitch bone. The butt half was channeled into non-test sales. Approximately two inches of the shank half was removed to be used for center slices. The shank end ham portions were vacuum packed in poly-vinylidine chloride bags. University of Missouri personnel graded the product into the Lean or Regular category, according to the ham photographic standard shown in Figures 5 and 6.

The hams were stored at the warehouse pending delivery to the individual test stores. Weighing and pricing were done at each store as normal procedures prior to display. The Lean shank end hams had an average weight of six pounds five ounces; the Regular hams averaged five pounds fifteen ounces.

The cured ham center portions were graded by University of Missouri personnel, using the same ham photographic standard. Hams were wrapped in butcher paper, marked, and packed ready for transfer to individual stores. The center cuts were about two inches thick and weighed about three pounds. As each store received them, the head meat cutter cut individual center slices as was normal practice in his store. Usually individual ham slices averaged about 12

Figure 5—Photographic ham standard for first four weeks of sales tests.

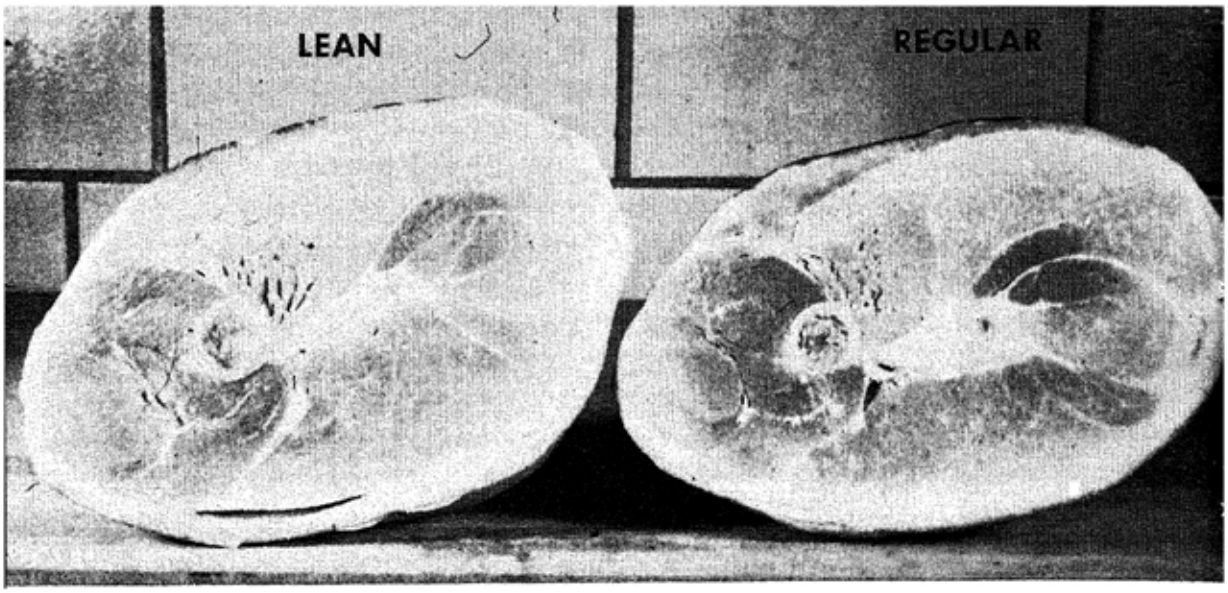

Figure 6—Photographic ham standard for second four weeks of sales test.

ounces. These were then wrapped in clear film, sealed, weighed, labeled, priced and readied for display in the meat case.

Collection of Sales Data

Time of study. This retail pork sales test was conducted continuously from June 11 to August 6, 1956. A week of pretesting preceded, during which many of the problems of supply, display, training, record keeping, etc., were resolved.

Sales data gathered in certain inventory periods or portions of some inventory periods had to be discarded because correct experimental procedures were not strictly adhered to.[3] In most of the cases of discarded data the displays of the test products were inadequate. Either the supply of the product was short so that the display could not be maintained, or if the test product was available, for some other reason, it was not displayed properly. In two instances, the store meat section personnel did not record numbers and weights of loin roasts that were placed in the case. In these cases the entire inventory period of two or three days had to be discarded. Over the eight-week test period, the fourteen stores had a combined total of 336 inventory periods. Of these, 12 complete inventory periods were discarded. These were scattered over time so that bias in the results did not occur.

In other cases, portions of an inventory period had to be dropped from the test. Wherever a store was visited on non-inventory days and one of the test product displays was approaching the minimum standards, an inventory was taken and further sales were not recorded until the displays had been replenished. Only data from the portion of the inventory period prior to the time of stopping the test were used. While the minimum display requirements varied under different circumstances, generally it was required that at least three representa-

[3]For definition and discussion of inventory period see p. 20 of this manuscript.

tive cuts of each grade be on display in order for the sales data to be used. The data presented in this paper include only those gathered under satisfactory conditions.

The basic price level of the test products was determined and adjusted by the cooperating chain store in accordance with their normal procedures. It was the philosophy of the researchers that useful results are obtained only if the research project adheres to normal practices in the industry. Therefore, the Regular test products were priced at the competitive Kansas City area level as determined by the chain store management. In instances where a premium was placed on the Lean cuts this price was 4 cents above the price of the Regular cuts. The determination of 4 cents as the premium for the Lean cuts was the result of discussion between the management of the cooperating packer, retail chain store and University of Missouri personnel. Table 4 gives the actual prices charged during the time the test was conducted.

TABLE 4--ACTUAL PRICES OF TEST PRODUCT

Cut	Dates	Price	
		Regular	Lean
Center Ham Slices	June 4-June 10	$ .95	$ .99
	June 11-Aug. 6	.99	1.03
Shank End Smoked Ham	June 4-June 14	.49	.53
	June 15-June 16*	.39	.43
	June 17-July 19	.49	.53
	July 20-July 21*	.39	.43
	July 22-Aug. 6	.49	.53
Rib End Loin Roasts	June 4-June 14	.49	.53
	June 15-June 17 *	.45	.49
	June 18-June 24	.39	.43
	June 25-July 5	.35	.39
	July 6-July 12	.49	.53
	July 13-July 14*	.39	.43
	July 15-Aug. 6	.43	.47

*Friday and Saturday Sales--usually accompanied by advertisement in Kansas City newspapers.

Record Keeping and Control. From the outset it was realized that complete control and accurate sales records were of paramount importance. To accomplish this degree of control, the complete cooperation of store personnel was essential. A letter from the management of the cooperating chain stores in Kansas City explaining the study and stressing the importance of complete cooperation and accurate data served as an introduction.

An experienced meat cutter and buyer in the chain store organization was assigned as coordinator. Accompanied by two University of Missouri personnel,

the coordinator visited each of the test stores one week before the study began. He explained the study and demonstrated the cutting, the handling, the labeling, the pricing records, and the display procedures to be used. Throughout the study, the knowledge and personality of the coordinator as well as the respect and popularity he generated among the store employees made him invaluable in handling different problem situations.

During the pre-test week many minor problems were reconciled. Instructions were repeated so that all the personnel in each meat section could become familiar with the procedure. This week gave each store an opportunity to clean out any inventory of non-test products and to build up an inventory of the test product. It provided an opportunity to coordinate the different phases of the study.

During the eight-week test period each store was checked daily by University of Missouri personnel. On each Monday, Wednesday, and Friday two University representatives and the coordinator took complete inventories and computed the sales for the preceding sale period. Each store was inventoried at approximately the same time of day throughout the study. This regularity served to keep time periods between inventories nearly constant. On the other days of the week (including Sundays, since 13 of the test stores were open on Sundays) one University of Missouri researcher and the coordinator made visits. The time of these checks varied to prevent store meat section employees from expecting visits at the same time each day.

The daily visit consisted of checking to see whether the display was satisfactory, if the labeling and pricing was correct, if records were up-to-date, etc. If anything was found in unsatisfactory condition, the discrepancy was mentioned to the head meat cutter. In nearly all cases the problem would be cleared up immediately.

While the Monday, Wednesday, and Friday visits were also to insure a good display and correct pricing, labeling, and records, the primary purpose was to take a complete inventory of test products on hand as well as the amount received since the last inventory, and then to determine the sales data. Because the complete inventory was conducted every Monday, Wednesday, and Friday, any obvious discrepancies were recognized immediately. Since the time period was short, the memories of the meat section personnel were still fresh enough to provide explanations and reasons. Although considerable work was involved in getting inventories, the positive and timely control facilitated by these frequent checks was vital.

The shank end smoked hams and the center slices on hand were counted and weighed by the research staff. This process involved both the meat in the display case and that in the cooler. The personnel in the store meat sections had no responsibility for record-keeping on these two products.

In the case of loins, a slightly different procedure was followed. Loins were usually cut and wrapped as needed to maintain a good supply in the display case.

This processing was done by each store as needed. It was not feasible to use inventory data based on store deliveries of whole loins as was the case with other test products. Because of the perishable nature of fresh pork, some of the whole loins were diverted from test uses with no rib end loin roasts ever being cut. The workable alternative was to delegate to the head meat cutter or his assistant the responsibility of weighing and counting the number of loins placed in the meat case.

To rely on the busy personnel in the meat department for this data was not entirely satisfactory. But through close supervision and frequent inventory checks, it is felt that most errors or discrepancies were detected.

SALES RESULTS

Type of Analysis

The analysis of the sales data follows predetermined lines in accordance with the broad objectives of the study. These objectives were to measure and define the consumer preference for lean pork cuts, to determine and to demonstrate the merchandising potential of selling selected lean pork cuts, and to test the effectiveness of a classification system for certain pork cuts.

The presentation of the sales data begins with the scope and size of the study as expressed by over-all totals. The data resulting from each of the three groups of test stores follow.

The analysis will include:

1. A paired comparison of sales data when the lean cuts are sold alongside the regular product and both are priced and labeled the same. This phase of the analysis will examine the efficiency of the selection or classification system used in the study. It will offer data concerning the consumer's ability to discern and select the leaner cuts, assuming he desires pork with less fat.
2. Comparison of sales data where the test involved a paired display of the high priced, distinctively marked Lean product and the cheaper, fatter Regular cut. This comparison has relevancy if future merchandising is to involve selling both a premium and a regular product. It would also have significance during an interim when there is a limited supply of the leaner pork.
3. A paired comparison of Treatments C and D to determine the effect of higher price and labeling as against the same price and no labeling. The purpose of this test is to define and measure the consumer's preference and willingness to pay a premium for the leaner cut.

Total Volume

During the eight-week test, sales data were gathered on almost 44,000 pounds of meat in the fourteen stores. The breakdown of total sales by number

of cuts sold and total pounds sold for each of the test products is presented in Table 5. Since a paired display of Lean and Regular was in all stores at all times, sales ratios of Lean and Regular can be usefully computed for all stores. Breakdowns of these ratios by factors affecting them will be made later.

TABLE 5--TOTAL NUMBER AND TOTAL POUNDS OF TEST PRODUCTS SOLD DURING TEST PERIOD (JUNE 11 TO AUGUST 6, 1956)

Test Product	Lean		Regular		Total	
	No.	Lbs.	No.	Lbs.	No.	Lbs.
Loin Roasts	826	2,692	664	2,177	1,488	4,869
Shank End Hams	2,869	18,072	2,389	14,228	5,249	32,300
Center Ham Slices[a]		3,490		3,244		6,734

[a]Data on center ham slices consisted only of total pounds sold.

The over-all Lean to Regular sales ratios for the total eight-week period were very similar for the rib end loin roasts and the shank end smoked hams but were considerably less in the case of center slices. These figures are shown in Table 6.

TABLE 6--OVER-ALL LEAN TO REGULAR SALES RATIOS DURING EIGHT WEEK TEST PERIOD

Test Product	Lean to Regular Ratio	
	No.	Lbs.
Loin Roasts	1.24:1	1.24:1
Shank End Hams	1.20:1	1.27:1
Center Ham Slices[a]		1.08:1

[a]No data on number of center ham slices sold.

The difference between the Lean to Regular sales ratios of shank end hams, when computed on the basis of pounds sold, and on the basis of number of hams sold, results from a difference in the average weight of lean and regular hams, when average weights are compared. The Lean shank end smoked hams averaged 6.3 pounds, while the Regular hams had an average weight of 5.9 pounds. In the case of the rib end loin roasts, both the Lean and Regular cuts averaged 3.3 pounds.

Gross dollar sales show a more favorable Lean-Regular ratio because of the 4 cent premium often obtained on the Lean cuts. Approximate gross sales were $8960 of Lean and $6690 of Regular shank portions for a ratio of 1.34:1. Approximate gross sales of $3520 and $3210 for Lean and Regular slices, respectively, gave a sales ratio of 1.10:1. Lean loin roasts provided 56.0 percent of gross loin sales with gross sales of about $1160 compared to Regular gross sales of about $910, giving a sales ratio of 1.27:1. Total lean sales for the three cuts were about

$13,640 compared to about $10,810 for the Regular cuts. It should be remembered that revenue totals were affected by the particular size of the differential and by the proportion of time it was in effect.

A further breakdown of the overall sales by two week periods shows the trends in sales over the eight week period. These data are presented in Table 7. The rib end loin roasts sold at about the same Lean to Regular ratio throughout the study. For the shank end smoked hams a different situation is encountered. The Lean to Regular sales ratio increased considerably as the study progressed. Lean to Regular sales ratios on center ham slices varied only slightly during the test, with no consistent trend.

TABLE 7--LEAN TO REGULAR SALES RATIOS BY TWO WEEK PERIODS (ALL STORES)

Two Week Periods	Loin Roasts		Shank End Hams		Center Ham Slices
	No.	Lbs.	No.	Lbs.	Lbs.
June 11-June 24	1.25	1.25	1.03	1.05	1.12
June 25-July 8	1.28	1.26	1.17	1.24	1.04
July 9-July 22	1.19	1.21	1.24	1.33	1.08
July 23-Aug. 5	1.23	1.24	1.44	1.62	1.05

During the early part of the experiment, (1) the Regular products appeared to be a little leaner than the bulk of the products being sold in other stores of the chain, and (2) the Lean-Regular sales ratios might be hampered by the absence of any "gap" between Lean and Regular which could aid consumer discrimination. It was decided that at the end of four weeks the very leanest portion of the Regular products would be eliminated from the displays. A second set of pictures was used, (Figure 6) so that the leaner end of the Lean and the fatter end of the Regular were separated by a short gap. Since display positions were rotated weekly and treatments were rotated biweekly, the product change was possible without other adjustments. However, the product change does greatly complicate any inferences as to trend in sales ratios over time.

As shown in Table 8, the Lean-Regular sales ratios increased from the first to the second four-week period for shank portions with or without a price difference. Explanations of these variations are purely conjectural. The Lean and Regular center ham slices were not markedly different in appearance and the presence or absence of 4 cents per pound premium on a $1.00 item was a relatively minor matter. How much of the increase in the shank portion ratio should be attributed to the fatter Regular product in the second period and how much should be attributed to rising repeat sales of the Lean? Any optimistic answer must be tempered by the *decline* in the loin roast ratio (in the absence of a price or label difference) in the second period.

Results When No Difference in Price or Label

The number of Lean shank portions sold was 59.7 percent of the total; the

TABLE 8--SALES RATIOS (LEAN TO REGULAR) OF CUTS BY FOUR WEEK PERIODS (ALL STORES)[a]

	Loin Roasts	Shank Portions	Center Ham Slices
I. When No Price or Label Difference			
June 11-July 8	1.66:1	1.29:1	1.10:1
July 9-Aug. 5	1.14:1	1.69:1	1.08:1
II. When A Difference in Price and Label			
June 11-July 8	1.09:1	1.01:1	1.07:1
July 9-Aug. 5	1.25:1	1.13:1	1.06:1

[a]Slice ratios computed from data in pounds; other ratios, from data in number of pieces.

weight of Lean ham slices was 52.1 percent of the total; and the number of Lean loins sold was 58.3 percent of the total.

It is evident that Lean shanks and loins were more popular than the Regular cuts. However, the Lean ham slices sold at only a slightly higher rate than the regular. These results are derived solely from the eight stores in Group I since there was always a price and label difference in the other groups. However, the ham slices were in short supply relative to shanks so that only six of the eight stores carried slices.

Results of Price and Label Difference

In half of the Group I stores at any given time and in all Group II and III stores all the time, the Lean products were labeled "Selected Meat-Type Pork" and priced 4 cents per pound above the Regular price.

In all groups, sales of the higher-priced leaner products equaled or slightly exceeded the sales of the Regular products (Tables 9, 10 and 11). While number of sales cannot be equated exactly with number of buyers, about as many buyers were willing to pay the 4-cent premium as were not.

It can be postulated that buyers did not pay any attention to price and that sales were about equal because of random selection. There are two arguments against that hypothesis. First, the consistently smaller ratios with a price difference than at the same price indicate that price had its expected effect on be-

TABLE 9--SALES OF CUTS WHEN NO DIFFERENCE IN PRICE OR LABEL[a]

	Lean	Regular	Ratio Lean to Regular
Ham Shank Portion	1118	756	1.48:1
Ham Slices	1712	1571	1.09:1
Loin Roasts	330	236	1.40:1

[a]Slice data in pounds, other data in number of pieces.

TABLE 10--NUMBER OF SHANK PORTIONS SOLD BY STORE GROUP WHEN A DIFFERENCE IN PRICE AND LABEL

	Store Group	Lean	Regular	Lean to Regular Ratio
I.	Side-by-side displays; 8 stores	844	849	1.00:1
II.	Separated displays; 4 stores	506	451	1.12:1
III.	Side-by-side displays; 2 stores	392	338	1.16:1
	Total	1742	1638	1.06:1

TABLE 11--SALES OF HAM SLICES AND LOIN ROASTS WHEN A DIFFERENCE IN PRICE AND LABEL

Cut	Store Group	Lean	Regular	Lean to Regular Ratio
Slices[a]	I. (8 stores)	1778	1672	1.06:1
Roasts	II. (8 stores)	281	237	1.18:1
Roasts	III. (2 stores)	215	191	1.12:1

[a]Slice data is in pounds; other data is in number of pieces.

havior. Second, casual observation by the enumerators and a series of special systematic observations indicates that most buyers examined more than one package of the product.[4] It can still be argued that this examination may have been fairly superficial. While the degree of examination in selection appears higher than that found in Pittsburgh by Trotter, it is true that some selections were made without regard to the test variables. It does not appear profitable to speculate as to effect on sales ratio if superficial selections had not been superficial. It is more relevant to ask what would be the effect on repeat sales if the superficial shopper found at the time of carving that he had a leaner product? The only clue—an inadequate one—is that lean shank sales trended upward during the test as was shown.

Most of these results are consistent with a model in which a minority of buyers select without inspecting *both* displays, another small minority select carefully for lean, and a majority consider a number of factors including possibly size, color, total price, shape, and fatness. Sales ratios will not vary quickly nor widely away from one to one in such a situation when one or two variables like fatness and price are quietly varied by relatively small amounts.

[4]See page 31.

Effects of Price and Labeling, Store, and Display Position on Sales Ratios

Treatments C and D (C = no price difference; D = price and label difference) had a significant effect on the shank portion sales ratios but not on the loin roasts or ham slice ratios. The shank portion ratio was 1.48:1 for treatment C and 1.00:1 for Treatment D. Note in Table 10 that the Lean-to-Regular ratio for the eight stores in Group I (when Treatment D was in effect) was slightly lower than the ratios for the other groups of stores which never had Lean and Regular at the same price. It is possible that alternating a price differential and no price differential incurred more price resistance to the Lean than situations in which the price differential was continually present. In only one case were the Lean-Regular ratios as high as when there was no difference in price and labeling (Table 8). It is possible that the special label attracted more repeat purchasers in those stores in which it was available continually.

An analysis was made of Lean and Regular sales in pounds and dollars per 1000 customers, and also of dollar sales as a percent of total meat sales. As indicated in Table 12, and in Tables 13, 14, and 15, the excess of Lean over Regular was larger in every case in Group I stores when there was no price difference.

TABLE 12--EXCESS OF LEAN OVER REGULAR SALES IN GROUP I STORES

	Pounds Per 1000 Customers	$ Per 1000 Customers	% of Total Meat Sales
When Same Prices			
Shanks	10.6	4.94	.55
Slices	1.2	1.15	.13
Loins	1.2	.41	.05
When Different Prices			
Shanks	.8	1.35	.15
Slices	.2	.63	.07
Loins	.6	.38	.04

Total Lean plus Regular sales (pounds, dollars, percent of total meat sales) were greater for shanks and loins when price was the same than when there was a different price, but the reverse was true for center slices (Tables 13, 14, and 15).

As another method of comparing the price effects, coefficients of cross-elasticity were estimated for sales in Group I stores. The percentage rise in the price of Lean in the C and D experiments was divided by the percentage decrease in the pounds of Regular product sold (in the entire test and also per 1000 customers). Coefficients of cross-elasticity were approximately 1.49, 1.56, and -0.36 for the entire test, and 1.64, 2.04, and -0.26 per 1000 customers for shanks, slices, and loins, respectively.

The comparative responsiveness of the sales ratios of the three cuts is poorly related to these cross-elasticity coefficients primarily because the latter were not affected by changes in sales of Lean. The high coefficient for slices was caused

TABLE 13--SALES OF SHANK PORTIONS

	Group I and II Stores		Group III Stores
	Price Difference	Same Price	Price Difference
Sales of Lean			
Total Lbs.	5283	7035	5736
Lbs. per 1000 customers	22.3	29.4	19.6
Total $ sales	2714	3305	2943
$ sales per 1000 customers	11.45	13.80	10.06
% lean $ sales of total meat sales	1.29	1.54	1.09
Sales of Regular			
Total Lbs.	5090	4506	4633
Lbs. per 1000 customers	21.5	18.8	15.8
Total $ sales	2393	2112	2173
$ sales per 1000 customers	10.10	8.86	7.43
% lean $ sales of total meat sales	1.14	.99	.80
Sales of Regular plus Lean			
Total Lbs.	10,373	11,541	10,369
Lbs. per 1000 customers	43.8	48.2	35.4
Total $ sales	5107	5427	5116
$ sales per 1000 customers	21.55	22.66	17.49
% lean $ sales of total meat sales	2.43	2.53	1.89

by the fact that the percentage price change (the divisor in the computation) was only 4 percent for slices while it was approximately 8 percent for the other cuts. Thus, the small absolute response of the sales of slices to the price change appears as significant as the larger absolute change in sales of shanks when cross-elasticities are computed. A slight decline in Regular sales when there was a price premium on Lean produced the negative cross-elasticity for loins.

A considerably better index of the impact of price ratio changes on sales ratio changes was obtained by this index:

$$\text{Ratio-elasticity} = \frac{\text{percentage change in sales ratio.}}{\text{percentage change in price ratio.}}$$

Thus, the Lean to Regular sales ratio of ham slices declined from 1.09:1 to 1.06:1 with a rise in the price ratio of Lean to Regular from 1:1 to 1.04:1. The 2.8 percent decrease in SR (Sales Ratio) divided by the 4.0 percent increase in PR (Price Ratio) yields an index of -0.7 for loin roasts. This index, like other arc elasticity coefficients, is asymmetrical for price ratio increases and decreases.

TABLE 14--SALES OF LOIN ROASTS

	Group I Stores		Group III Stores
	Price Difference	Same Price	Price Difference
Sales of Lean			
Total Lbs.	920	1086	696
Lbs. per 1000 customers	3.9	4.5	2.4
Total $ sales	413	428	318
$ sales per 1000 customers	1.74	1.79	1.09
% lean $ sales of total meat sales	.20	.20	.12
Sales of Regular			
Total Lbs.	771	797	610
Lbs. per 1000 customers	3.3	3.3	2.1
Total $ sales	322	330	255
$ sales per 1000 customers	1.36	1.38	.87
% lean $ sales of total meat sales	.15	.15	.09
Sales of Regular plus Lean			
Total Lbs.	1691	1883	1306
Lbs. per 1000 customers	7.1	7.9	4.5
Total $ sales	735	758	573
$ sales per 1000 customers	3.10	3.17	1.96
% lean $ sales of total meat sales	.35	.35	.21

The values given below were computed by averaging the indices for price ratio increase and decrease.

The indices of ratio-elasticity obtained were shanks -5.0, loins -1.8, slices -0.7. To appraise these values, the reader may readily discover for himself that this index has a value of zero for independent goods, positive values for complementary goods, and negative values for substitutes. The larger the ratio-elasticity, the greater the responsiveness of the sales ratio to price ratio changes. For goods which are perfect substitutes, any deviation of the price ratio from 1:1 results in a sales ratio with zero in the numerator or denominator.

This index of ratio-elasticity might have some general usefulness as a substitute for, or complement of, the cross-elasticity coefficient in studies in monopolistic competition.

Sales ratios by stores for four-week periods ranged from 0.75:1 to 2.26:1 for shank portions, from 0.85:1 to 1.41:1 for slices, and 0.84:1 to 2.57:1 for loin roasts (Table 16). However, differences in sales ratios by stores for the entire test were not significantly different when tested against the pooled interaction. (11)

TABLE 15--SALES OF HAM SLICES (GROUP I STORES)

	Price Difference	Same Price
Sales of Lean		
Total Lbs.	1712	1776
Lbs. per 1000 customers	9.9	10.1
Total $ sales	1764	1758
$ sales per 1000 customers	10.21	9.98
% lean $ sales of total meat sales	1.19	1.15
Sales of Regular		
Total Lbs.	1672	1572
Lbs. per 1000 customers	9.7	8.9
Total $ sales	1655	1556
$ sales per 1000 customers	9.58	8.83
% lean $ sales of total meat sales	1.12	1.02
Sales of Regular plus Lean		
Total Lbs.	3385	3348
Lbs. per 1000 customers	19.6	19.0
Total $ sales	3420	3315
$ sales per 1000 customers	19.80	18.81
% lean $ sales of total meat sales	2.31	2.18

As a matter of practical interpretation of results, store variation was sufficient to encourage the use of several stores in a sales experiment.

Sales ratios by display position did not differ significantly although they closely approached significance for loin roasts in the Group I stores. The interaction of stores and position was significant for the six stores selling slices. In three stores the sales ratio was higher for Lean in the first position[5] and in three other stores for Regular in the first position. It is common knowledge that relative position is an important factor affecting sales in any self-service type store. In the over-all study whenever those cuts priced higher and labeled Lean were in the first position they sold at a higher Lean to Regular ratio than when they occupied the second position.

Relationship of Consumer Income and Store Size to Sales Ratios

Several other relationships were examined to check some of the common assumptions or hypotheses made regarding pork consumption.

[5]First position refers to the first test product display encountered as the shopper passes the meat counter via the normal traffic flow.

TABLE 16--LEAN-REGULAR SALES RATIOS BY STORES AND CUTS BY FOUR-WEEK PERIODS[a]

Stores	Shanks		Slices		Loin Roasts	
	1st Period	2nd Period	1st Period	2nd Period	1st Period	2nd Period
Group I Stores						
A	1.29:1	1.61:1	1.33:1	1.09:1	1.73:1	1.09:1
B	.99:1	1.23:1			1.64:1	2.57:1
C	.98:1	1.43:1	1.15:1	.99:1	1.82:1	1.43:1
D	1.08:1	1.13:1	1.08:1	.90:1	.89:1	1.59:1
E	2.19:1	2.08:1	.85:1	1.41:1	1.71:1	.95:1
F	.75:1	1.18:1	.93:1	1.05:1	1.52:1	.84:1
G	1.38:1	1.50:1			1.11:1	1.08:1
H	.99:1	.82:1	1.08:1	1.04:1	1.25:1	1.62:1
Group II Stores						
I	.76:1	.86:1				
J	1.12:1	2.26:1				
K	1.19:1	.76:1				
L	.93:1	1.55:1				
Group III Stores						
M	1.02:1	1.25:1			1.17:1	1.65:1
N	1.19:1	1.27:1			1.04:1	1.00:1
Range	0.75:1 to 2.19:1	0.76:1 to 2.26:1	0.85:1 to 1.33:1	0.90:1 to 1.41:1	0.89:1 to 1.82:1	0.84:1 to 2.57:1

[a]Ratios calculated for pounds of slices and number of pieces of other cuts.

The store managers were questioned regarding the average income levels of their customers. They considered size of checks cashed, the predominant, if any, type of occupation, the prevalence of daily or weekly shopping habits, etc. The coordinator was quite familiar with the Kansas City area and was able to add some degree of consistency and reliability to the estimates of the store managers. In addition, general impressions were accumulated during the nine weeks of the study regarding the general level of income of the customers of each store. From this general information the 14 stores were ranked according to customer income from highest to lowest. While no claims are made for the preciseness of this ranking, it may be assumed that no major inaccurracies are present.

The Lean-to-Regular sales ratio of each store for the entire eight weeks was computed and these ratios were ranked from highest to lowest. Rank correlations were computed comparing the store ranking by customer income and by Lean-to-Regular sales ratio for each of the test products.

On the basis of information gathered in this study, the higher Lean-to-Regular ratios of center ham slices and rib end loin roasts showed some degree of association with higher customer income level. In the case of the center ham slices, the coefficient of rank correlation was 0.60 and for rib end loin roasts, it

was 0.52. However, with shank end smoked hams the coefficient of correlation was 0.17.

Rank correlation was also directed at the relationship between sales ratios and volume of meat sales; between sales ratios and total pounds of test product sold; and between sales ratios and average weekly customer count. The purpose of these calculations was to determine whether the size of the store as rated by three categories—volume of meat sales, number of customers, or total volume of test product sold—was an influential factor. The coefficients of rank correlation obtained indicated size of store was not a meaningful factor.

Systematic Observation of Customer Buying-Behavior

A staff member unobtrusively but systematically observed customer buying-behavior for parts of one, or usually two, days in each test store. These observations were not obtained by a systematic sample of the test period and may not be entirely representative. Approximately 79 percent of the customers passing the meat display case did not stop at any of the test displays, and approximately 9 percent actually purchased a test package (Table 17). Of the 209 customers who paused at the test displays, 77 percent examined more than one package. Of the 92 purchasers, all but two examined more than one package (Table 18). Twenty-two of these 92 purchasers did not examine both Lean and

TABLE 17--SUMMARY OF BUYING BEHAVIOR OBSERVED CUSTOMERS

Action	No. Performing Action by Shopping Units*			
	Women Alone	Man Alone	Men, Women	Total
Ignored Test Products	416	221	160	797
Examined and Purchased	56	14	22	92
Examined and Did Not Purchase	58	24	35	117
Total	530	259	217	1006

*Shopping units defined without regard to presence or absence of children or other adults of same sex.

TABLE 18--SUMMARY OF BUYING BEHAVIOR OF THOSE CUSTOMERS WHO PAUSED AT TEST PRODUCT DISPLAYS

Action	No. of Shopping Units	Percentage of 209 Who Examined Products
Looked at one package	47	22.5
Looked at two or more packages	162	77.5
Compare both Lean and Regular packages	108	51.7
Examined Labels	129	61.7
Asked clerk about display	1	.5
Purchased 1 or more packages	92	44.0
Did not buy	117	56.0

Regular packages. While the *degree* of customer awareness of the test variables cannot be accurately measured, it appears that selection was preceded by some examination of both Lean and Regular packages by more than three-fourths of the purchasers.

Opinions of Store Managers and Head Meat Cutters

At the conclusion of the study the store manager and head meat cutter of the test stores were asked to complete a questionnaire pertaining to their opinion of the potential of retailing leaner pork. The concensus of these key store personnel was that pork sales would increase considerably if leaner pork were displayed. They felt that over a longer period, sales volume of leaner pork cuts would be three times that of the Regular cuts. This may be an over-optimistic estimate.

YIELD OF LEAN CUTS BY U. S. CARCASS GRADES.

During preliminary studies and during the progress of the sales test it became increasingly apparent that U. S. carcass grades were of limited utility in predicting the amount of internal fat in hams and loins. Carcasses from the leaner grades (Medium and No. 1) yielded from 47 to 61 percent Lean hams and from 53 to 63 percent Lean loins (Table 19). Conversely, the fatter grades (No. 3 and No. 4) yielded 34 percent Lean hams and from 19 to 29 percent Lean loins.

TABLE 19--DISTRIBUTION OF LEAN AND REGULAR HAMS AND LOINS BY CARCASS GRADES

Carcass Grade	Hams		Loins	
	Lean %	Regular %	Lean %	Regular %
Medium	61.2	38.8	63.9	36.0
No. 1	47.5	52.5	53.4	46.6
No. 3	34.8	65.2	28.8	71.2
No. 4	34.4	65.6	19.4	80.6

Thus, it would appear that a substantial proportion of "meat-type" hogs, when internal fat was used as an index of meatiness, were overfinished. It was also apparent that many of the less highly finished hogs were not "meat-type" when evaluated by the same criterion. Certainly, these results indicate that backfat thickness was not a satisfactory index in the selection of pork cuts with a small proportion of internal fat.

BIBLIOGRAPHY

1. Gerald Engelman and Raymond O. Gaarder *Marketing Meat-Type Hogs,* Marketing Research Report No. 227, pp. 13-14.
2. C. W. Vrooman, *Consumer Report on Pork Products,* Oregon State College, Station Bulletin 521, Corvallis, August, 1952, p. 14.
3. M. B. Kirtley, "Consumer Acceptance of Lean Pork Chops," *Illinois Farm Economics Journal* No. 233, June 1955. pp. 1580-82.
4. C. E. Trotter, "Consumer Preference for Lean and Fat Type Pork Cuts." Ph.D. thesis, University of Minnesota, 1957.
5. C. E. Trotter and Gerald Engelman, "Consumers Fail to Recognize Differences in Pork Grades," *Science for the Farmer* 5:1, Summer, 1957, Pennsylvania State University
6. R. O. Gaarder and E. A. Kline, "What Do Consumers Want From Pork?" *Iowa Farm Science,* December, 1956, p. 8.
7. Jim Stevenson and Norton Smith, "Will the Meat-Type Hog Pay Its Way?" *Economics and Marketing Information,* June 27, 1958, Purdue University.
8. Birmingham, D. E. Brady, S. M. Hunter, J. C. Grady, and E. R. Kiehl, *Fatness of Pork in Relation to Consumer Preference,* Missouri Research Bulletin No. 549, May, 1954.
9. V. James Rhodes, "The Measurement of Consumer Preferences," Journal of Farm Economics, November, 1955, pp. 648-9.
10. Max E. Brunk, "Sample Surveys and Experimental Design," and "Discussion," Journal of Farm Economics, May 1955, pp. 223-236.
11. Sidney Weintraub, Price Theory (New York: Putnam Pub. Co., 1949). pages 47-49.

• • •

APPENDIX

TABLE 20--ANALYSIS OF VARIANCE OF SHANK PORTION SALES RATIOS, GROUP I STORES

Source	D. F.	M. S.	F
Total	63	2.063	
Treatment (Price Label)	1	7.714	4.56*
Position	1	3.610	2.14
Store	7	3.326	1.97
Time	1	2.848	1.68
Tr X P	1	.095	.06
Tr X S	7	3.225	1.91
Tr X T	1	.314	.19
P X S	7	1.768	1.05
P X T	1	.158	.09
S X T	7	1.158	.66
Error	29	1.691	

*Significant at .05 level using pooled second and third order interaction as error.

TABLE 21--ANALYSIS OF VARIANCE OF SHANK PORTION SALES RATIOS, GROUP II AND III STORES

GROUP II STORES

Source	D. F.	M. S.	F
Total	15	.626	
Treatment (Position)	1	.028	.09
Time	1	1.525	5.07
Store	3	1.086	3.61
Tr X T	1	.056	.19
Tr X S	3	.828	2.75
Tr X S	3	.380	1.26
Error	3	.301	

GROUP III STORES

Source	D. F.	M. S.	F
Total	15	.44	
Store	1	.04	.05
Position	1	.00	.00
Time	3	.38	.51
S X P	1	.82	1.11
S X T	3	.29	.39
P X T	3	.47	.64
Error	3	.74	

TABLE 22--ANALYSIS OF VARIANCE OF CENTER SLICE SALES RATIOS, 6 GROUP I STORES

Source	D. F.	M. S.	F
Total	47	.09	
Treatment (Price and Label)	1	.07	.97
Position	1	.19	2.64
Time	1	.02	2.78
Store	5	.09	1.30
Tr X P	1	.004	.01
Tr X T	1	.017	.02
Tr X S	5	.016	,02
P X T	1	.062	.86
P X S	5	.261	3.62*
T X S	5	.148	2.05
Error	21	.072	

*Significant at .05 level.

TABLE 23--ANALYSIS OF VARIANCE OF LOIN ROAST SALES RATIOS, GROUP II AND III STORES

GROUP II STORES

Source	D. F.	M. S.	F
Total	63	2.99	
Treatment (Price and Label)	1	2.17	.63
Position	1	14.27	4.16
Store	7	1.99	.58
Time	1	.02	.01
Tr X P	1	16.89	4.92*
Tr X S	7	1.28	.37
Tr X T	1	.00	.00
P X S	7	1.63	.48
P X T	1	1.51	.44
S X T	7	2.81	.82
Error	29	3.43	

GROUP III STORES

Source	D. F.	M. S.	F
Total	15	.49	
Store	1	.99	2.06
Position	1	.97	2.02
Time	3	.36	.75
S X P	1	1.38	2.88
S X T	3	.21	.44
P X T	3	.31	.65
Error	3	.48	

*Significant at .05 level.