

SOCIAL SCIENCES

AGRICULTURAL ECONOMICS NUMBER 3

CORNELL UNIVERSITY AGRICULTURAL EXPERIMENT STATION, NEW YORK STATE COLLEGE OF AGRICULTURE AND LIFE SCIENCES, A STATUTORY COLLEGE OF THE STATE UNIVERSITY, CORNELL UNIVERSITY, ITHACA, NEW YORK

METHODS AND COSTS OF DISTRIBUTING BEEF TO THE FOOD-SERVICE INDUSTRY*

Thomas H. Stafford †

INTRODUCTION

The food-away-from-home industry in the United States is a vast and complicated industry. Its size is difficult to measure since the components are so diverse, including not only all commercial eating and drinking places, but also places where food is served as a secondary activity, such as hotels, motels, department stores, drug stores, industrial plants, institutions, planes, trains, vending operations, schools, and military establishments. In 1969 this food-away-from-home industry was referred to as a \$35 billion industry (4:39) and by mid-1972 it was described as a \$40 billion industry (6:17). It has been estimated that in 1969 it required "more than 34 billion pounds of food to satisfy the American public's eating-out appetite... [or] almost 20 percent of all the food produced in the United States" (26:2). Since the food-away-from-home market historically "has been viewed as a part of or an adjunct of the broad grocery market" (35:1), it is virtually impossible to verify either size estimates or growth rates. Suffice it to say that this industry is huge, important, and growing rapidly.

In 1969 the United States Department of Agri-

culture estimated that the single most important food group, in terms of dollar value, served in the food-away-from-home establishments was beef, accounting for 21.9 percent of the total cost of all food received (34:5). In fact, a study made by A. T. Kearney and Company in 1969 estimated that, of all beef sold, nearly 45 percent moved through the away-from-home market (17:18). The United States produced 21,870 million pounds of beef in 1971 (32:73), and an additional 1,310.7 million pounds of beef and veal were imported (32:142). Assuming the 45 percent figure to be reliable, the food-away-from-home market accounted for the consumption of nearly 101/2 million pounds of beef in 1971. Though somewhat speculative, these figures illustrate the correlative importance of the beef and the food-away-from-home industries.

In spite of the evidence that this beef market is a major segment of our economy, it has been almost completely ignored as a subject of public research. Van Dress and Freund, for example, observed that:

As a result of the historic identification of the away-from-home market with the broad grocery market, little has been done to define its structure, measure its impor-

* This project was initiated and funded by the Transportation and Facilities Research Division of the United States Department of Agriculture's Agricultural Research Service. This publication was edited and adapted by Professor Max E. Brunk from a thesis presented to the Cornell University Graduate School in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

† Former graduate student, Department of Agricultural Economics, New York State College of Agriculture and Life Sciences, Cornell University, Ithaca. Presently employed by United Dairy Industry Assn., 6300 River Road, Rosemont, Ill. 60618. Communications regarding this study should be addressed to Max E. Brunk, Department of Agricultural Economics, Cornell University, Ithaca, N.Y., 14850.

tance, analyze its performance, or examine its requirements. Yet, in recent years there is no part of the entire food industry, from farm to consumer, in which change has been so apparent as in the food service industry. Even greater change is indicated in the future in terms of the size of the market, the type of food and services required, the number, size and location of establishments, and the types of food services offered (35:1).

This same lack of information prevails for the suppliers of the food-away-from-home market. In fact, even the suppliers have been slow in recognizing this as a separate industry as shown by the following quote:

In fact, it was not until the 1960's that the great food-processing companies began to recognize food service as a separate and distinct industry. Only then did titles like Vice President-Institutional Foods or National Sales Manager for Restaurants, Hotels and Institutions appear on the corporate charts. (4:42)

The overall lack of information prompted this particular research effort. There being a large void in the literature, it was decided to broadly examine the portion of the beef industry that supplies the food-away-from-home market, in order to identify areas for further research.

Objectives

The specific objectives of this study are as follows:

- To describe and analyze the functions performed by representative firms within the present systems of beef distribution to the food-away-from-home market.
- To formulate a conceptualized cost model of physical distribution of beef to the food-service industry for the purpose of suggesting possible areas to improve distribution efficiency.
- To identify additional areas needing further research in regard to improving the efficiency of distributing beef to the food-service industry.

Definitions and Theoretical Background

The firms responsible for supplying the food (or specifically beef) needs to the food-service industry are commonly referred to as hotel-supply houses, purveyors, or specialized meat wholesalers. This collective group of firms will be referred to as handlers. They include independent purveyors, beef breakers, central commissaries (which prepare items for delivery to physically separated food-service operations), and the specialized sales outlets of packing companies.

The other group of firms examined in this study are the packers: the firms that actually slaughter, the animals. Occasionally, in this study, companies usually classified as packers were classified as handlers. They slaughtered hogs and/or low grades of beef, very little of which was sold in non-processed form to the hotel, restaurant, and institutional [HRI] market. These same firms purchased high-quality beef in carcass (or cut-up) form that was sold to the HRI firms. Thus they function more as handlers than as packers in relation to the food-service beef market. The approach taken in this study is that of a somewhat rudimentary systems analysis, a research technique that has been defined in many ways, but is best summarized by Parker: "*The systems concept*—considering the elements of related business activities as a co-ordinated whole instead of a group of independent and unrelated elements..." (27:19). This study is a systems analysis in that it is an attempt to examine some of the interactions of the firms involved in moving beef from the packer to the food-service industry. However, it is not a complete systems analysis in that some relationships within the systems were not examined and no "exact" mathematical relationships were developed.

Determining the cost of physical distribution was selected as the second objective of this study in order to ascertain whether substantial cost savings could accrue to this subsystem.

The method used to develop this cost model is essentially that of economic engineering (synthetic cost or building-block approach), which relies heavily on industrial engineering techniques combined with cost data. Essentially, physical relationships are measured in small units or blocks, which are then combined with estimates of costs to give the total cost of operations for a very efficient firm or channel. This type of approach has been used fairly widely to determine economies of size (see 16:543-721 and 10:270-279), although size was held constant in this study. One of the real advantages of this approach is that physical relationships as well as costs are determined, thereby allowing for easy updating or change, as technology or prices change for various parts of the operation.

This synthetic cost method was used to determine the cost of several alternative channels of distribution. That is, a single cost was determined for moving beef by several different channels from the packer to the food-service establishment, disregarding ownership of any of the firms. Nine channels were estimated in this manner to enable comparisons of several methods of physical distribution. Even though the costs determined within this model may not reflect *exact* costs, the relative efficiencies of the channels will be evident.

An Overview of the System

Beef differs markedly from most manufactured products. Instead of starting with many raw products, combining them into a finished good, and then distributing it, the beef distribution industry starts with a single complex product and produces many end products. Because of the nature of these products, much "manufacturing" or fabricating takes place throughout the system, thus the industry cannot be classified into the typical institutional framework of manufacturers, wholesalers, and retailers. Nevertheless, the classification scheme used (packers, handlers, and HRI firms) is similar to that of the marketing institutionalists. That is, each firm performs particular specialized marketing and "manufacturing" functions, and the interrelationships of the firms can be viewed as a channel of distribution.

A typical channel of distribution could be as follows: a packer located in the Midwest sells quarters to a breaker in Boston. The breaker cuts the quarters into primal cuts, selling some—for instance, the chuck and a few rounds—to retailers; others, such as ribs, loins, and remaining rounds, to purveyors; and the items left, such as flanks, briskets, and trimmings, to processors and Tenderers. The purveyors, located nearby, fabricate the ribs, loins, and rounds into steaks, roasts, and hamburger and sell them to restaurants in Boston or even as far away as Cleveland or the Virgin Islands. The restaurants may do some extra trimming on the products received, then cook the beef and serve it to their customers. Of course, the exceptions to this "typical" channel are many, and it is the purpose of the next few chapters to look at some of the exceptions as well as at the details of this particular type of channel.

Methodology

Because knowledge in this area is generally lacking, comprehensive interviews with a relatively small number of firms seemed the most practical way to obtain a detailed description of the industry. The use of semistructured, rather informal interviews allowed maximum flexibility, greater depth, and the expression of personal opinions of knowledgeable individuals. The sample was not random; rather, firms were selected on the basis of personal contact, cooperation, and availability to represent particular segments of the industry.

Data were gathered on costs while conducting the informal interviews. However, because records were inconsistent or nonexistent and interviewees were

unwilling to discuss costs, a limited case-study approach was used to determine the major cost components for the model. As already described, this part of the study used an economic-engineering or building-block approach to determine the cost of several channels of distribution. Most of the cost components were estimated with the aid of a capable engineering department of one of the companies. The information not obtainable from this company was gathered from equipment manufacturers, packaging material manufacturers, trucking firms, secondary literature, and firms interviewed in the first segment of the study. By using this limited approach to costing, the problems associated with wide variation in accounting procedures were avoided. The method of using physical relations also means that a particular firm can see where its operations differ from the model. It also allows for changes in prices and/or technology to be incorporated readily.

DESCRIPTION AND ANALYSIS OF FOOD-SERVICE ESTABLISHMENTS

Types of Establishments Included in Food-Service Industry

The food-service industry, made up of the many establishments that prepare food for on-premise or immediate consumption, is a heterogeneous group of enterprises that can be classified into numerous segments. In their book, Kotschevar and Terrell (18:20-41) include the following types of food-service facilities:

1. College food units
 - a. Cafeteria service
 - b. Coffee shop or snack bar
 - c. Catering service
 - d. Union buildings
 - e. Faculty clubs
 - f. Residence halls
2. Commercial restaurants
 - a. Service restaurants
 - b. Cafeterias
 - c. Coffee shops
 - d. Drive-ins
 - e. Take-out-food
3. Hospital food service
4. Hotel and club food service
 - a. Essential meals
 - b. Food for or with entertainment
 - c. Catering for special needs
5. Employee food service
6. Industrial lunchrooms
 - a. Executive dining rooms

- b. Seated service
 - c. Cafeteria
 - d. Mobile and vending service
7. School food service
 8. Miscellaneous

There are other classification schemes. Van Dress and Freund, in describing the structure and characteristics of the food service industry, classify them as:

1. Separate eating places
2. Separate drinking places
3. Drug or proprietary stores
4. Retail stores
5. Hotels, motels, or tourist courts
6. Recreation or amusement places
7. Civic, social, or fraternal associations
8. Factories, plants, or mills
9. Other public eating places
10. Hospitals
11. Sanatoria, convalescent or rest homes
12. Homes for children, aged, handicapped, or mentally ill
13. Colleges, universities, professional or normal schools
14. Other institutions

Though not sampled, there are also the food-service operations that function in elementary and secondary schools, the military services, federal hospitals, federal and state correctional institutions, in-transit feeding operations (e.g. planes, trains, and ships), and boarding houses (35).

Regardless of the classification scheme, it should be apparent that what is referred to as the food-service industry is a remarkably heterogeneous group of firms. In fact, it really is many industries with a few common elements that include 1) procurement, 2) preparation, and 3) service (13:6). These elements vary widely in specifics for the various food-service establishments.

Semistructured personal interviews were conducted with 39 food-service establishments. Although classification is somewhat arbitrary, the 39 interviewed establishments included 14 conventional restaurants (both small, "local" restaurants and large, well-known, or "fancy" restaurants), 8 restaurants operating in hotels or motels, 4 limited-menu restaurants (2 steak houses and 2 hamburger carry-outs), 3 restaurant chains, 2 private clubs, 2 hospitals, 2 restaurants in department stores, 2 university food-service operations, 1 contract-vending company, and 1 airline.

Procurement

One of the first questions to consider in the procurement function is that of products needed. The HRI firms interviewed served a wide variety of beef items. The more tender steaks and roasts are served by

most of the HRI firms, whereas the less desirable (or less tender) cuts, such as chucks and round steaks, are not served by nearly so many. The type of firm seemed to influence the type of products served. However, a more important determinant of products served was the clientele, for example, persons looking for a high-service, high-quality meal, primarily as entertainment; the businessman or working man buying lunch; the students of a residence hall; or institutional patients with special dietary needs. Of course, the type of firm has a positive although not perfect correlation with the type of clientele. It is obvious that the food-service establishments, taken as a group, do use a beef product mix that is quite different from that moving through retail stores.

Knowing that the firms serve many types of beef products leads to the question of what its purchased form was. A convenient classification is: quarters, primals, subprimals, and portion-controlled. While these classifications are not precise, they do have some generally accepted meanings within the trade. A quarter is either a forequarter or hindquarter and is approximately half of the side, being split between the 12th and 13th ribs. Quarters are cut into primals: the primal round, the loin, the rib, and the chuck. The subprimals come from the primals; unfortunately there are many "levels" of subprimals although most have in common some degree of trimming and/or "deboning". Examples of subprimals are: sirloin, short loin, full tenderloin, sirloin tip, or knuckle. The final category, portion-controlled, generally refers to steaks, chops, or patties cut to a specific weight, such as 16-ounce T-bone steaks or 2.5-ounce hamburger patties.

The forms in which the firms purchased their beef items varied greatly (table 1). Even though several firms did not get their entire needs in portion-controlled form, 22 of 37 establishments bought at least some portion-controlled beef. The reasons given for purchasing the particular forms were many and diverse (exhibit 1).

The trade magazines of the various segments of the food-service industry have discussed the merits of buying precut meats for many years. Wanderstock states:

Changes in hotel and restaurant meat purchasing practices have been dramatic. There has been a decided shift from carcasses to quarters, to primal cuts, to pre-fabricated cuts, to portion cuts, and even to precooked (rare, medium, well-done) meat.

The only justification for buying carcass meat is when all parts of the carcass can be utilized in the food service operations. High labor costs and the relative unavailability of trained butchers in hotels and restaurants has led to the shift away from on-premise fabrication to purchasing ready to use meat from purveyors. These pur-

Exhibit 1. *Reasons for purchasing particular form of beef*

Reasons for buying portion-controlled beef Lack of skilled help Labor too expensive Convenience and ease of handling No use for trim and no waste Better quality and cost control Too big an investment to do own fabricating

Reasons for not buying portion-controlled beef Wants to or must utilize labor Chef's or owner's preference Cheaper to cut own Has uses for by-products of cutting Better quality for fresh-cut steaks Steaks are small volume; better to cut as needed Wants to control aging Portion-controlled comes frozen; do not like frozen

Reasons for buying subprimals instead of larger cuts Less labor involved Boneless products give more consistent final product Less transport cost Better yields No use for extra trim

Earlier Levie gave the following 14 advantages of precut meat portions:

1. Uniform quality
2. Uniform portions
3. Exact cost knowledge
4. Predetermined unit cost
5. Menu pricing simplifications
6. Waste controlled
7. By-products eliminated
8. Balanced inventory
9. Pilferage control
10. Reduction of kitchen staff
11. Menu variety
12. Simple elimination of slow moving items
13. Simplifications of purchasing and receiving
14. Some management redirected to other areas (19:19)

There are, of course, many other articles in which cutting tests are demonstrated and/or the reasons for buying meat as precut portions and oven-ready roasts are illustrated. (3:11; 2:12,21; 1:58; 39:32-38;* 40:38,39; 28:30; 37:54; and 23:159.) Almost all of these articles lead to the conclusion that, economically, meat should be purchased in a precut form and that the entire industry should and will be changing to the portion-control concept.

A question related to that of physical form refers to frozen beef. Of the 35 firms responding to the question about frozen purchases, 4 said they bought all frozen, 9 bought some, and 22 firms said they bought none. Of the 22 firms saying they would not

veyors are able to utilize their expertise as well as the volume of meat processed to create a market for by-products which are of no use to hotels but can be sold through the appropriate channels. (36:60)

Table 1. *Number of firms purchasing beef, by product form and type of firm*

Form	Firms purchasing					Total HRI firms
	Conventional restaurants & restaurant chains	Restaurants in hotels & motels	Limited-menu restaurants	Universities & hospitals	Others*	
number						
For steaks and roasts						
Portion-controlled	4	2	1	0	3	10
Subprimals	5	3	0	0	1	9
Portion-controlled & subprimals	5	0	1	1	1	8
Subprimals & primals	1	2	0	0	1	4
Portion-controlled, subprimals, & primals	0	1	0	2	0	3
Subprimals, primals, & quarters	2	0	0	0	0	2
All forms	0	0	0	1	0	1
Total reporting	17	8	2	4	6	37
For ground beef						
Patties	2	0	2	0	0	4
Bulk	4	1	1	0	1	7
Grind their own	4	1	0	0	0	5
Patties & bulk	1	1	0	1	0	3
Bulk & grind their own	1	0	0	0	1	2
Patties & grind their own	0	0	0	0	1	1
Patties, bulk, & grind their own	0	0	0	2	0	2
Total reporting	12	3	3	3	3	24

*Others include 1 vending-contract feeder, 2 restaurants in department stores, 1 airline, and 2 private clubs.

buy frozen products, 6 said they would occasionally freeze leftover or excess quantities. The 4 firms that purchased all their beef frozen included a budget-type steak house, an airline, a regular sit-down restaurant, and a restaurant within a department store. The 9 firms that purchased some frozen included 5 regular restaurants, 1 hotel, 2 hospitals, and 1 university faculty club. Those refusing to buy frozen included 2 carry-out, hamburger-type restaurants, 2 clubs, 5 hotels, and 12 "regular" restaurants. Varied reasons were given for using or not using frozen beef products (exhibit 2).

Exhibit 2. HRI firms' reasons on purchasing frozen beef

Reasons for purchasing frozen beef
Only way product is available
Use it for large banquet trade
The price is right
Ease of supply and stocking—infrequent deliveries
Reasons for NOT purchasing frozen beef
Poor quality and/or taste
Too much bleeding
Would require retraining of staff
Lack of freezer space
Not enough flexibility
Can't cook from frozen state on present equipment

The periodicals of the trade have discussed the advantages and disadvantages of frozen meats for several years. Most of the conclusions seem to agree with the following quote from Levie:

...many operators are not interested in using the frozen product, as it might reduce their quality. On this point, it is the author's opinion that frozen steaks under optimum conditions, all other factors being equal, will score as high as fresh steaks when tested objectively for palatability. During the next ten years, frozen steak sales should skyrocket.

Seldom can a skilled taste panel tell the difference between fresh meat and the frozen product—if the meat was palatable and fresh, frozen at low temperature, held at relatively even storage temperature no longer than the dictates of good practice, defrosted before cooking, and prepared the same as the fresh meat.

Frozen product offers two distinctive advantages:

Price—Product can be purchased or contracted at the low end of a price cycle....

Storage—Frozen product is simple to handle, requires little space, lends itself to proper inventory rotation, and overstocked conditions are usually easily worked out without any hardship. (19:90)

Other authors may emphasize different aspects of frozen meats, but in general most agree that frozen meats, properly handled, can be at least as good as fresh, offer additional advantages, and are apt to become an even more predominant factor in the food-

service industry. (See 9:24; 41:62-64; 2:12,21; and 22:41.)

The aspect of frozen meats concerned with further processed and/or precooked meats was not examined because this study is focused on the fresh or raw beef industry only. However, in retrospect, a complete systems analysis of the industry should definitely examine frozen, precooked beef and the implications for the industry. It is clear that such meats are becoming a major factor in the industry (see 21:41).

Another aspect of forms concerns imported versus domestic beef. Of the 33 firms reporting on imports, 29 HRI's used no imports or at least did not specify them. Three HRI firms used some imports: all used some boneless imports for grinding, one also served a cheap precooked round at recreation parks, and another bought precooked roasts for sandwiches. One firm had tried imports but didn't like the taste and because they feared that dock strikes might stop the supply, they specified domestic beef only. In general there seemed to be no strong aversion to imported beef. Most HRI firms wanted a fairly high quality of beef, which domestic supply provided.

Ten of the firms reporting used at least some Prime beef, 29 used at least some Choice, and 5 used at least some below Choice grade. Several specified a certain segment of a grade, such as Top Choice or Low Prime, although it was not clear that they had a way to determine if they received what they specified.

Since aging also contributes to quality, the HRI firms were asked whether they used aged beef. They responded as follows: 19 used aged beef entirely, 5 used some, and another 5 used none. The length of time for aging varied from 3 to 4 days to 4 to 5 weeks, with most firms allowing 2 or 3 weeks. Some of the beef was purchased aged, while some was aged on the firms' premises.

Many companies received beef in several types of packaging (table 2). With this in mind, most of the firms were asked about differences in condition on arrival, but not one attributed any such difference to packaging. However, several of the firms did have

*Table 2. Type of beef packaging delivered to HRI firms**

<i>Packaging form</i>	<i>Number of firms</i>
Vacuum bag	18
Individually wrapped and boxed	9
Boxed with layers separated by paper	7
Wrapped in "butcher" paper	7
Naked (no packaging)	6
Poly bags	5
Oilskin	1
Special polysleeve, plus box	1
"Cupcake" type trays with flexible covering	1

*31 HRI firms reporting.

preferences. Some liked vacuum-packed beef because of its keeping quality and low shrinkage, although 2 firms disliked it because of "improper aging" and trouble with blood souring in the summer. Several others either wanted no packaging or did not really care about the type of packaging, usually giving frequent delivery as their reason.

Among the 36 HRI firms reporting, 17 (more than 45%) used only 1 or 2 beef suppliers (table 3). This seems to indicate a high degree of loyalty to a supplier and/or a lack of acceptable alternatives.

Quality, service and price were the major factors mentioned for buying from a particular supply source, with more than 70 percent of the firms mentioning some aspect of quality, about 51 percent indicating a service aspect, and 45 percent stating price as a consideration (table 4). Most firms did not buy from packers because of the large quantities and because the packer and the food-service establishment were too far apart.

Because service seemed to be an important consideration in choosing a supplier, the HRI firms were asked what services their beef suppliers performed (table 5). Three firms mentioned services that they would like but could not get: promotion of their business, provision of promotional material, and daily deliveries.

Price also seemed to be an important factor in choosing a supplier, so the HRI firms were asked how the purchase price was established (table 6). Most of the firms were price takers. There is some evidence of price kickbacks and special services done

Table 3. Number of beef suppliers used by HRI firms*

Suppliers	Number of firms
5 or more	8
4	4
3	7
2	9
1	8

*36 HRI firms reporting.

Table 4. HRI firms' reasons given for buying beef from particular supplier*

Reasons	Number of firms
Good quality; consistent quality; fresh	24
Service; good delivery; personal and/or long time relationship	17
Low price; consistent prices, priced consistent with quality	15
Location; nearby	8
Availability of type & quantity of product	7
Corp.-headquarters specifications	7
Product line	3
No kickbacks	2

*33 firms reporting.

Table 5. Services provided to HRI firms* by beef suppliers

Services provided	Number of firms receiving services
Special trim	6
Special cuts or products, including frozen entrees	5
Cutting demonstrations or help in cutting	5
Research and providing new methods	5
Emergency delivery	4
Good delivery	3
Trouble shooting	2
Mechanical tenderization	2
Help in merchandising	1
Help in handling of products within the firm	1
No kickbacks	1
Personal attention	1
Warehouse the product	1
Aging of the products	1
Menu planning	1
Monthly newsletter of market conditions	1
No out-of-stocks	1
Good chemical tenderization	1
No special services provided and/or desired	16

*31 firms reporting.

Table 6. Methods of establishing beef purchase price at HRI firms

Method	Number of firms
Suppliers quote	22
Bid for the business	5
Negotiated by central purchasing	3
Negotiate when quote is "out-of-line"	3
Formula price	2
Bargains, paying cash	1
Ceiling price based on purchase price vs. selling price vs. yield	1

for the buyer and/or chef, although this was not proved within this study. This possibility was indicated by a few firms mentioning that they were dealing with a particular firm to eliminate kickbacks.

Having determined the supplier, the next question dealt with order procedures (table 7). In all but one case, the products were ordered for future delivery and thus were purchased sight unseen. Of course, the HRI firms do reject some products delivered to them, but in general they trust the supplier to deliver what has been specified.

Table 7. Ordering procedures for HRI firms

Procedures	Number of firms
Via phone to supplier	19
Via phone to central purchaser, who buys from supplier	7
Via sales representative	4
Via phone to supplier only in emergency	2
Butcher goes to market himself	1

Table 8. *HRI firms' methods of determining beef order quantities*

Method	Number of firms
Combination of experience, past data, banquets, bookings and or special events	16
Experience, no real data base	9
Based on consumption, inventory level, and bookings	1
Par, based on restaurant's business abstracts	1
Based on HRI's forecast, reviewed periodically by corporation management	1
Historical records	1
Menu requirements—knows approx. no. of each kind of meal	1
Total number reporting	30

Table 9. *Inventory of beef maintained at HRI firms*

Inventory amount	Number of firms
1 week's supply plus adjustments for banquets	4
4 to 5 days' supply	3
2 to 3 days' supply	10
1 to 2 days' supply	4
3 days' supply in cooler plus 1 week's supply frozen	1
Extra stockpile if price is right	1
Varies according to distance and volume	1
Emergency amount only	1
Absolute minimum, no specific amount	1
Varies according to product	2

The basic procedures used for determining the order quantities were examined (table 8). Most firms use little more than an educated guess, and do essentially no mathematical forecasting. A question related to order quantities is that of inventory levels (table 9). Here again, essentially no firm used any type of mathematical or scientific inventory control system.

Since the food-service establishments seem to have "seat-of-the-pants" ways of determining order quantities and inventory levels, the possibility of having too much beef on hand seems great. This is likely because most of the establishments are highly service oriented and therefore do not want to risk running out of a particular product. With this in mind, they were asked what they did with extra or leftover beef (table 10); a large percentage reported essentially no excess quantities of beef left over.

One reason that adequate supplies are a minimal problem could be the frequency of delivery (table

Table 10. *Procedures used for leftover or excess beef at HRI establishments*

Procedures	Number of firms
Freeze some or all of the excess	15
Transfer leftover to other units	3
Place tenders in oil until they can be used	1
No real problems with leftovers or excess	18

Table 11. *Number of beef deliveries received by HRI firms*

Deliveries	Number of firms
Daily deliveries	10
7 to 10 per week	1
6 per week	2
5 per week	1
4 per week	4
3 per week	10
2 per week	6
1 per week	1
1 per week or per 2 weeks	1

11). Only 8 firms received as few as 2 deliveries a week, though none had a volume that required several truck-loads per week. That is, most firms received frequent, small deliveries, thereby shifting inventory maintenance concern to the suppliers.

Preparation

Once the beef has been delivered to the HRI unit, the staff must do any necessary further fabricating (table 12). Some of the larger firms had separate butchering staffs, whereas others added meat cutting to the job of the chef or cook. Most of the food-service firms were unwilling to reveal how much then paid the employees who received and fabricated beef, however the few that did report indicated a fairly high wage level (table 13). Typically, the chefs were paid substantially more than were the butchers, but they usually spent much less time working with

Table 12. *Persons responsible for cutting beef at HRI units*

Employee fabricating beef	Number of firms
Chef or cook plus helpers	12
Butcher plus helpers	11
Owner-manager	1
No cutting done, except cooked roasts	8

Table 13. *Wage rates for persons involved with beef at HRI firms*

Employees	Wages
Chefs or cooks	\$150/wk., \$225/wk., \$160/wk., \$145-\$200/wk., \$163/wk., \$4.25/hr., \$4.75/hr., \$5.25/hr., \$6.50-\$7.00/hr.
Butchers	\$175/wk., \$3.34-\$3.78/hr., \$2.50/hr.
Butcher helper	\$125/wk.
Kitchen man	\$108/wk.
Receiving steward	\$130/wk., \$2.00/hr.
Supervisor	\$185/wk.
Asst. supervisor	\$125/wk.
Student part-timers	\$1.60/hr.

Table 14. Use of fabrication by-products by HRI firms

<i>By-products and use</i>	<i>Number of firms</i>
Bones and/or trimming for soup and/or stock	12
Trimnings for ground beef	16
Some trimming and pieces for stew or hash	11
End pieces for kabobs and/or stroganoff	6
Short ribs as such	3
Rib cap for pot roast	2
Trimnings for stuffed peppers	1
Small pieces for Chinese food	1
End pieces for employee food	2
Render fat for use	4
Sell fat and/or bones	13
Throw away fat and/or bones—worthless	4
No by-products	6

beef. There was no clear indication as to which method, having a butcher or the chef fabricate, was economically best for HRI firms.

Unionization of the workers can be related to wage rates, thus the HRI firms were asked about unions. Of the 25 firms reporting, 13 were nonunion; 5 were partially union, referring to only certain geographic areas; and 7 were completely union. Some of the unionized firms stated that the unions seemed to make little difference, whereas others claimed that the unions were so strong that they prevented a change to portion-controlled items and other attempts to reduce labor requirements.

For the firms fabricating their beef, the question arises of the by-products of this process and of their use or disposal (table 14). In general the value of such by-products as trim, fat, end pieces, and bone was low.

Direction of Change

The interviews with food-service establishments gave no clear indication of probable changes for the industry. Some of the interviews left the rather weak impression that the chain-type operations were moving toward more centralization of control. This takes the form of purchase specifications, including elimination of non-fabricated cuts, and restriction of the number of suppliers from which units may purchase.

The concept of preportioned cuts seems to be fairly well accepted, and more firms appear to be buying or considering buying their beef needs in this fabricated form. One of the major obstacles to changing to portioned beef is that some labor union contracts force maintenance of butcher shops. Another factor is that since present HRI employees can fabricate, some firms do not want to change until it becomes economically essential.

The industry seems to be adopting frozen beef more slowly than the portioned meats, probably be-

cause the capital requirements for handling frozen beef are high and it is considered to be an inferior product. There is also no major incentive to "go" frozen as long as frequent deliveries of fresh are available for essentially the same price as, or less than, less frequent frozen deliveries.

Few firms seemed to realize that frequent small deliveries may cost more in the long run than fewer, larger deliveries. However, several firms actually indicated a preference for even more deliveries, which would eventually have a marked effect on the cost of the total distribution system.

Conclusions

The food-service industry is a heterogenous group of establishments with the common function of preparing food for on-premise or immediate consumption. The various types of enterprises tend to specialize in their use of cuts, parts, and grades of beef, but in general their interactions with the beef suppliers are similar. As a whole, the product mix of beef used by the food-service establishments is quite different from that sold in the retail stores, consisting largely of higher quality meat and better grade cuts. This was shown by the fact that they purchased predominantly the more tender steaks and roasts and that 18 of the 31 firms who specified grades ordered high Choice or Prime. A large percentage of the beef sold in most supermarkets is of the lower quality cuts such as chuck and round steaks and of low Choice or Good grades.

With few exceptions, the HRI firms relied heavily on their suppliers for various types of help. Many expected a great deal of personal service from the supplier, including selecting the quality and types of beef served, cutting the meat to the HRI's specifications, maintaining an inventory, providing frequent and often immediate deliveries, and helping in some day-to-day operations. Most of the food-service firms expected this high degree of service and seemed oblivious to the possible associated costs.

Some food-service firms did check prices and occasionally gave their business to the lowest bidder, but most of them were more concerned about quality and service than about price. Although there was no direct evidence, the feeling pervaded that some firms purchased supplies from whoever gave the best "under-the-table deals", even though the actual cost to the food-service firm might have been higher.

The amount and type of change taking place in the food-service industry is virtually impossible to determine, given the lack of a data base. The most obvious is the rapid increase in the amount of food eaten away from home. The managements of the establishments preparing the food seem to be growing more

aware of ways to increase economic efficiency, as evidenced by the many that now buy portion-controlled cuts. However, the fact that only a few have examined their inventories and ordering procedures and that most still require frequent (possibly costly) deliveries indicates that there is much room for improvement in economic efficiency among the HRI firms.

DESCRIPTION AND ANALYSIS OF BEEF HANDLERS

Types of Handlers

Having seen that the food-service establishments rely heavily on their suppliers for a large variety of help, the next logical group of firms within the beef distribution system to examine is the supplier, or handler, group. As defined, the handler group includes independent purveyors or HRI supply houses, breakers, central commissaries, and specialized (food-service) sales outlets of packing companies. This heterogeneous group of firms was examined as a group because they all handle the slaughtered beef that eventually is served in food-service establishments. In a loose sense, these firms can be classified as the food-service wholesalers who perform those functions in meat wholesaling that are specifically associated with the food-service market. Although the same types of firms are not always included in this group, food-service wholesaling has generally been recognized as a separate industry since World War II (31: 2). Today it accounts for the major portion of beef that moves into the food-service industry, with the middlemen and commissaries being the primary sources of meat supplies for approximately 92.3 percent of the food-service industry (34:435).

The slaughterers distribute beef to branch houses, breakers, boners, processors, retail butcher-locker plants, hotel supply houses, and directly to retailers. Because the functions performed are so varied, retail-type branch houses, boners, processors (such as canners, curers, smokers, sausage makers, and prepared food makers), retail butcher locker plants, and retailers have not been included in this study. Even though the breakers function differently than do the other handlers, they deal with a substantial amount of the product that eventually is served at food-service establishments and are therefore included in this group.

In general, the handlers bring in such cuts of beef as sides, quarters, primals, and subprimals; they serve as short-term warehouses, fabricate some or all of the beef items, perform various other ser-

vices, and distribute the beef, other products, and services to their food-service clientele. To determine the nature of the products they deal with and their operating and selling procedures, 36 handler-type firms were interviewed. Where meaningful, these firms have been classified as 2 central commissaries, 5 breakers, and 29 purveyors. No distinction was made for the 3 firms classified as purveyors, but which were actually food-service-type divisions of packers, since they acted primarily as autonomous purveyors. Because the interviews were only semistructured, not all 36 firms had responses for all the questions.

The size of the firms interviewed ranged from an operation conducted in a small, converted house to large, modern plants, to companies with several plants. Although many firms were unwilling to reveal the exact size of their operations, the various measures of size that were given have been summarized (table 15).

Table 15. *Size of 30 handler firms interviewed, by volume and value of sales*

<i>Annual meat sales</i>		<i>Annual beef sales</i>		<i>Annual total sales</i>
million pounds	million dollars	million pounds	million dollars	million dollars
Purveyors				
.62	.65	.46	.48	1.20
2.00	*	1.28	1.02	1.60
*	*	1.28	*	*
2.25	*	1.80	*	*
3.00	*	1.80	*	2.00
*	1.50	*	1.35	*
*	*	1.80	1.40	2.25
*	*	2.50	*	*
*	3.50	*	*	*
3.13	*	2.50	*	4.00
*	*	3.00	4.25	*
*	*	*	*	5.00
5.00	*	3.00	*	*
*	*	*	5.7-6.18	9.50
6.25	*	3.00	*	*
5.00	*	3.75	*	*
*	*	5.00	*	*
10.00	12.50	8.00	10.40	*
10.00	*	9.00	*	*
*	*	12.07	*	*
*	*	*	*	13.50
15.23	*	15.00	*	*
Breakers				
*	7-9.0	*	3.85-4.95	*
19.20	*	19.20	*	*
26.25	15.00	26.25	15.00	15.00
40.00	*	40.00	*	*
50.00	*	50.00	*	*
Central commissaries				
*	*	.32	*	*
*	*	7.50	*	*

*No response.

Products Handled

Most handlers sell a large variety of items to the food-service industry. Some firms specialize in meats or even selected grades of certain kinds of meat, others try to satisfy all the refrigerated and/or frozen needs of the food-service operator, while still others try to be a "supermarket", providing a full range of supplies for HRI firms. Breakers tended to specialize in beef only, whereas the other types of handlers carried a variety of products (table 16).

In addition to beef, most handlers sell many other items that they deal with only as wholesalers. They neither fabricate nor manufacture all the products they sell: of the sample firms, 26 handled poultry, but only 10 fabricated it; 24 handled prepared meats, but only 5 manufactured them (table 17). In other words, most of the firms restricted their production operations to those products that are fabricated similarly.

Individual handlers can have essentially the same choice in the form of beef they purchase as do the food-service firms. That is, they can buy beef in any form, from sides to preportioned cuts (tables 18 & 19). Even though 3 firms indicated that they purchase live animals, the amount of beef going to the HRI

Table 16. *Types of products distributed by handlers*

Products	Purveyors	Breakers	Central commissaries	Total handlers
	number			
Beef only	0	4	0	4
Beef, pork, lamb only	1	0	0	1
Red meats only (beef, veal, pork, lamb)	3	0	0	3
Red meats, poultry	2	0	0	2
Red meats, prepared meats (luncheon meats, hot dogs, etc.)	0	1	0	1
Red meats, poultry, prepared meats	6	0	0	6
All meats, meat by-products, items containing meat	1	0	0	1
Red meats, poultry, refrigerated nonmeats	1	0	0	1
Red meats, poultry, prepared meats, groceries	1	0	0	1
Red meats, poultry, prepared meats, refrigerated nonmeats,	11	0	0	11
Red meats, poultry, prepared meats, refrigerated nonmeats, groceries	1	0	1	2
All HRI needs	2	0	1	3
Total firms	29	5	2	36

Table 17. *Types of products fabricated or produced by the handlers*

Products	Purveyors	Breakers	Central commissaries	Total handlers
	number			
Beef only	1	4	0	5
Beef and pork	0	0	1	1
Beef, pork, lamb	1	0	0	1
Beef, veal, lamb	1	0	0	1
Red meats	13	0	0	13
Red meats, poultry	7	0	0	7
Red meats, prepared meats	1	1	0	2
Red meats, poultry, prepared meats	2	0	0	2
All meats, meat-by-products, items containing meat	1	0	0	1
No fabrication done	0	0	1	1
No response	2	0	0	2
Total firms	29	5	2	36

Table 18. *Form of beef purchased by handlers*

Form	Purveyors	Breakers	Central commissaries	Total handlers
	number			
Live and quarters	0	1	0	1
Live and primals	1	0	0	1
Quarters (or sides)	0	4	0	4
Quarters and frozen portioned	1	0	0	1
Quarters, primals, subprimals	10	0	0	10
Quarters, primals, subprimals, portioned	1	0	0	1
Primals, subprimals	7	0	0	7
Primals, subprimals, portioned	3	0	0	3
Subprimals	5	0	1	6
Portioned	0	0	1	1
All forms	1	0	0	1
Total	29	5	2	36

trade from their own slaughter was such a small part of their HRI beef market that these firms were classified as handlers, not packers. Also, of the 29 purveyors, 27 purchased at least some subprimals, 23 purchased some primals, 13 purchased some quarters and 6 purveyors purchased portion-controlled cuts. This pattern of purchases appears to be quite different from the 1959 Ullensvang study. Ullensvang reported that "of 227 firms handling beef, 59% buy in whole carcass form and nearly the same amount of 57.5% buy primal cuts. Only 22% indicated that they ever bought sides and 37% indicated that they ever bought quarters" (31:97). The limited sample of this study, however, seems to indicate a definite switch to purchasing much smaller units of beef, including sub-

Table 19. *Beef items purchased and sold by handler firms**

NAMP† Product number	Item	Number of handlers	
		Buying	Selling
101	Beef side	9	5
102	Forequarter	12	7
121	Short plate	8	11
127	Crosscut chuck	17	15
103	Primal rib	22	22
1109R	Rib, bone-in, tied, roast-ready	23	28
1112R	Rib eye roll	24	22
1112	Rib eye steak	5	27
155	Hindquarter	15	7
	Flank	11	13
156	Hindquarter, trimmed	10	9
158	Primal round (rump & shank on)	22	18
1168R	Inside round	23	25
172	Full loin trimmed	18	17
181	Sirloin (loin end)	18	23
183	Sirloin butt (bnls.) trimmed	18	22
184	Top sirloin butt (bnls.)	25	28
1184	Top sirloin butt steaks	5	27
189	Full tenderloin, regular	26	29
1189	Tenderloin steaks, close trim	5	27
173	Short loin, regular	24	25
179	Short loin (B.I.) short cut	21	25
180	Strip loin (bnls.)	23	28
1180	Strip loin steaks	7	27
1173	Porterhouse steaks	6	25
1173A	T-bone steaks	6	25

*Note: Several firms did not report in detail product bought or sold.
†National Association of Meat Purveyors' designation for particular cut.

primals, which were almost nonexistent in the late 1950s.

Related to form is the question of whether the meat is fresh or frozen. Only 5 firms bought frozen sub-primals and no firms purchased anything larger than subprimals in frozen form (table 20). The general impression about frozen meats, from comments made by handlers, was that if it is purchased frozen it should be sold frozen (exhibit 3).

Table 20. *Fresh vs. frozen beef purchased by handlers*

Form	Purveyors	Breakers	Central	Total
			commissaries	
number				
All fresh	17	5	0	22
All frozen	0	0	1	1
All fresh, except frozen boneless for grinding	7	0	0	7
Mostly fresh, some frozen boneless for grinding, some frozen subprimals	4	0	1	5
Fresh quarters, frozen portions	1	0	0	1
Total	29	5	2	36

Exhibit 3. *Handlers' comments on buying fresh or frozen beef*

Comments
Negative comments on frozen
Buy only fresh because of refreezing problems Sell mostly fresh and vacuum packed products; have good enough shelf life Don't like frozen Buy all fresh because it's easier to work with
Positive comments on frozen
Buy boneless items such as strips, frozen, if the market is low, and then stockpile them
Buy frozen rib eyes because it's the only way to get the desired size and trim

Another form question deals with imported versus domestic beef (table 21). Of the 20 firms who purchased some imported beef, 19 bought some for grinding. According to those questioned, the major reason for buying imported beef is price (exhibit 4).

Exhibit 4. *Handlers' comments on buying imported beef*

Type of firm	Comment
Purveyors	Frozen import for grinding (use 6000 lb./wk. = approx. 24.5% of total beef sold by firm) Use for ground beef because it's cheaper Use 1000 lb./wk. for ground beef
	Not even 1%; use some for grinding or specialty items Use 10,000 lb./wk. for grinding (= approx. 5.6% of total beef) Less than 1%; use less than 600 lb./wk. for ground beef
	Buy trimmings and loins Buy imported tenders—are cheaper and some clients want inexpensive fillet; buy them through a broker, wrapped in a plastic film
	Use 30-35,000 lb. twice a month for sausage kitchen Use Canadian boneless beef to add to trimmings for ground beef
	Almost 50% of beef used in grinding comes from Australia Use 600-700 lb./wk. of shanks to supplement trim for grinding Use Australian shanks to mix with trim for ground beef
Central Commissaries	Use some Australian beef for sandwich meat and ground beef because of good price Import almost 50% of beef for grinding; use 50,000 lb./wk., contract directly with country of origin Import very little—top rounds and boneless round cubed—because of price
	Import in 60-ton lots to help even out domestic supply Used primarily for ground beef and in sausage kitchen, some fancy steaks

Table 21. *Imported beef purchased by handlers*

Type or use	Purveyors	Breakers	Central commissaries	Total handlers
	number			
No imported beef purchased	10	5	0	15
Imported for grinding use only	13	0	1	14
Imported for grinding plus loins, sandwich meats, specialty items, steaks, etc.	4	0	1	5
Imported cheap tenderloins	1	0	0	1
Total	28	5	2	35

Having examined the types of products purchased, the question that follows is on product origin and reasons for choosing a particular supplier (tables 22 & 23). Only 3 purveyors dealt exclusively with breakers, although others used breakers for some of their supply. Although not summarized the interviews did indicate that most handlers purchased their beef needs from a wide variety of sources. Only 2 firms mentioned having just 1 supplier, and 1 purveyor said he had at least 20 different suppliers. Since handlers have many suppliers, it was a surprise to see quality as the major reason for buying from a particular one. This seems to indicate that to get the quality and/or grade of beef wanted for their customers, the handlers are forced to go to a number of sources.

Table 22. *Type of suppliers used by handlers*

Suppliers	Purveyors	Breakers	Central commissaries	Total handlers
	number			
Packers	11	4	0	15
Breakers	3	0	0	3
Packers and breakers	11	0	2	13
Packers and through brokers*	1	1	0	2
Some slaughtering + other packers	2	0	0	2
Total	28	5	2	35

*Does not include beef import brokers.

Table 23. *Reasons given by 26 handlers for buying beef from particular supplier*

Reasons	Number of firms
Quality	15
Service	11
Price	8
Availability of product	6
Willingness to take small orders	4
Convenience	3

Operating Procedures

Once the beef has been received and stored by the handlers there are 2 major variations in method of operations. In one, the job-shop operation, the handler prepares (fabricates) an order to a customer's specifications and delivers it within a few hours, or in some cases the next day. This type of operation usually requires highly skilled butchers who can prepare the entire order for a customer. For example, if an order included roast-ready ribs and T-bone and tenderloin steaks, a butcher or a team of butchers, would select the primal ribs, short loins, and full loins of the specified quality, age, and weight range and fabricate them into roast-ready ribs and T-bone and tenderloin steaks, wrapping each cut as it is finished. The parts left over, for example, the porterhouse and club ends of the short loin and the strip loin, sirloin, and tenderloin tip, would be returned to the holding cooler to be used for another order.¹ This concept is well summarized by Brasington: "Custom service includes the selection of meats of a certain quality, age, and weight, and the cutting, boning, and trimming of meats in accordance with the customer's specifications" (11:1).

The second variation, producing for inventory, differs from custom service in that products are usually not fabricated to any particular customer's specification, production is better scheduled, and all, not just a part, of the original cut is fabricated. For example, production could be set up to start with several short loins to fabricate all the club, T-bone, and porterhouse steaks that can be made, regardless of portion size. Quite often, producing for inventory is accomplished on an automated production line and a large staff of skilled butchers is not required as for custom-service work. Producing for inventory also allows the fabricating of one type of product for a longer period of time, which requires less setup time than does custom-service work where the butchers have to setup for each new order.

Producing for inventory in the fresh-meat business is a recent phenomenon because of the highly perishable nature of meat; its use is made possible by the recent advances in packaging and freezing techniques. The sampled handlers used both methods and occasionally combined the methods (table 24). Typically, only the larger plants used any kind of production line setup and because neither inventory nor custom-service methods predominated in the sample firms, it seems evident that advantages and disadvantages accrue to each.

¹For details of cutting procedures see 19:161-229 or 24:7-38, or 25:5-51.

Table 24. *Handlers' fabrication procedures**

Fabrication method	Handlers
Job-shop or custom-order basis	15
Produce for inventory	13
Produce for inventory and custom orders	7

*Note: only 7 plants visited could be classified as production-line firms.

The custom-service method allows the purveyor to give unique products to his customers, to deal in strictly fresh products, and to use relatively inexpensive packaging. The inventory operation requires a limited variety of standardized products, more expensive packaging, and possibly conversion to a frozen operation. However, the inventory-type operation allows better scheduling, thus reducing peaks and valleys of work loads, reduced setup times, specialization of labor with the possibility of lower wages, and possibly more uniformity in cutting.

Although freezing does not have to be associated with any particular method of operation, it does make some difference in operating procedures. The amounts of freezing done by the handlers varies greatly (table 25). Most firms were specific in their reasons for preferring fresh or frozen (table 26). Of particular interest were the many references to customer's desires rather than to their own operating preferences.

Table 25. *Fresh vs. frozen beef sold by handlers*

Form	Purveyors	Breakers	Central commissaries	Total handlers
	number			
Sell only fresh beef	3	3	0	6
Sell only frozen beef	2	0	1	3
Sell mostly fresh beef	14	2	1	17
Sell mostly frozen beef	2	0	0	2
Sell some combination of fresh and frozen	7	0	0	7
Total	28	5	2	35

Table 26. *Reasons given by 16 handlers for selling fresh and/or frozen beef*

Reasons	Number of firms
Fresh	
Customers demand fresh	10
Lack of freezer space	2
Too costly to freeze	1
Lack of technical skill	1
Frozen	
Customers demand frozen	5
Convenience	3
Less labor	1
Long shelf life	1

Table 27. *Type of packaging used by handlers*

Type	Number of firms
For steaks	
Individually wrapped, then boxed	8
Layered with paper separations in poly-lined box	4
Vacuum-packed	2
Trays and overwrap plus box	1
For roasts and subprimals	
Vacuum-packed	13
Poly-bag	7
For primals	
Cheese cloth	2
Poly-bag	1
For ground beef	
Poly-bag	3
Tubs (cardboard type)	1

Table 28. *Number of shifts worked at handler firms*

Shifts	Purveyors	Breakers	Central commissaries	Total handlers
	number			
One	17	5	1	23
Two	6	0	0	6
Three	0	0	1	1
One production plus three shipping	1	0	0	1
One production plus one-half cleanup	1	0	0	1
Total	25	5	2	32

The type of packaging can also affect handlers' as well as the food-service establishments' operating procedures. Most of the handlers use several types of packaging (table 27), and within each of these types, a number of different systems and materials are used.

Significant changes in packaging have taken place in the last few years and more are anticipated. Some are designed to allow ease of handling, whereas other types, usually more expensive and time-consuming, are used to help maintain quality. Of the 14 firms that reported about their packaging of steaks, 10 used a form that helped to maintain quality (individual wrapping, vacuum packing, and overwrapping trays). Of the 19 firms reporting on packaging used for roasts and subprimals, 13 used the more expensive protection of vacuum bags. This seems to indicate that many firms are trying to use better packaging to preserve quality and wholesomeness.

Another difference in the operating procedures of the various firms is the number of shifts worked (table 28). Most plants are in operation for only one shift, indicating that labor may be more important than capital, or that there are too many firms and/or insufficient management.

Table 29. *Unionization of handler firms*

Union status	Purveyors	Breakers	Central commissaries	Total handlers
	number			
Unionized	19	4	0	23
Nonunion	6	0	2	8
Partially union	1	0	0	1
Total	26	4	2	32

Table 30. *Wage-rate range in handler firms*

Type of labor	Unionized		Nonunionized	
	No. firms reporting	Wage range	No. firms reporting	Wage range
		\$/hr.		\$/hr.
Cutters	16	3.40-5.70	6	3.50-5.00
Handlers	11	3.00-4.26	4	2.25-5.00
Drivers	8	3.80-6.00	5	2.50-4.90
Shippers	8	3.00-5.50	3	2.25-3.20
Grinders	2	3.77-3.82	0	---
Supervisors	0	---	3	3.00-5.00
Breakers	3	4.17-4.74	0	---
Boners	2	4.10-4.39	0	---
Wrappers	4	3.15-4.17	1	2.25
Clean-up	0	---	1	2.95

Unionization and wage rates usually affect operating procedures (tables 29 and 30). As with the HRI firms, many handlers would not reveal their pay scales, however, a range of wage rates were reported which indicate that unionization does not always mean higher wages. A large range of rates was evident, not only between job classifications but also among companies. Some of the latter variations exist because the responsibilities of particular job specifications differ, but more seem related to geographic location. For instance, in most of the categories listed, the companies reporting toward the high end of the scale were usually located in the metropolitan areas of the Northeast, and the companies with lower rates tended to be in smaller communities.

Selling Procedures

Having examined the operating procedures of the handlers, the next general area of investigation concerns where and how the product is sold. Most handlers sell to a variety of firms although several sold the bulk of their products to a very limited clientele (table 31). Some concentrated on selling to schools and institutions, some on high-class restaurants, one purveyor even concentrated on selling to large hotels that had their own butchering staffs, and others sold to nearly anyone. The examination of clientele also showed that many handlers sell to other handlers.

Table 31. *Type of clientele served by handlers*

Clientele	Purveyors	Breakers	Central commissaries	Total handlers
	number			
Regular restaurants	26	1	2	29
Hotels-motels	24	1	1	26
Institutions	22	0	0	22
Business or industrial plants	22	0	0	22
Schools and universities	21	0	0	21
Fast-food or specialty restaurants	21	0	0	21
Airlines	11	0	0	11
Retail stores	7	5	0	12
HRI-type purveyors	4	5	0	9
Retail-type wholesalers	4	4	0	8
Other	6	1	0	7

The geographic dispersion of the clientele of the handlers is difficult to measure, however, a rough classification of geographic areas served by the handlers was attempted (table 32). The handlers' business tended to be concentrated in relatively small geographic areas. Also, the sampled firms were somewhat larger than the industry average and therefore their clientele tended to be dispersed more than might be expected.

Service is a primary factor for the HRI firms in choosing suppliers and is also economically important to handlers. The interviewed handlers offered a wide range of services, with only 4 indicating that they offered only their own products (table 33). Virtually no management knew what these "extra" services cost them, although a few indicated that the owner-manager's time was essentially the only cost. Of the 24 firms responding, 13 offered extra services to anyone, 6 to their larger accounts only, 4 to their good, bill-paying customers, and 1 limited its extra services to the immediate geographic area. To increase their sales, several firms actively sought clients need-

Table 32. *Geographic distribution of handlers' marketing area*

Type of area	Purveyors	Breakers	Central commissaries	Total handlers
	number			
Local or regional (within state)	5	0	1	6
Statewide	4	0	0	4
Several states	9	4	0	13
Essentially all of U.S.	2	0	1	3
At least some international	4	0	0	4
Total	24	4	2	30

Table 33. *Special services provided to customers of the handler firms*

Service	Purveyors	Breakers	Central commissaries		Total handlers
			number		
Special trimming	14	1	0	0	15
Emergency deliveries	10	1	0	0	11
Meal planning	9	0	1	0	10
Cutting demonstrations	9	0	0	0	9
Specialty products	8	1	0	0	9
Trouble shooting	7	0	0	0	7
Research	7	0	0	0	7
Seminars in cutting methods, product use, & new handling techniques	1	0	0	0	1
Daily delivery	0	1	0	0	1
Same-day delivery	1	0	0	0	1
General help & service to institutions	1	0	0	0	1
Running tests	1	0	0	0	1
Selecting meat for particular customers	1	0	0	0	1
Instructions on serving and cooking	1	0	0	0	1
Student group observation for academic credit	1	0	0	0	1
Demonstrations and menu planning advice	1	0	0	0	1
Lectures for institutional food-service people	1	0	0	0	1
Total menu concept	1	0	0	0	1
Precooked items—manufacturing “idiot-proof” products	0	0	1	0	1
Full range of services or anything requested	9	0	0	0	9
Anything on request, but nothing solicited	2	0	0	0	2
No special services provided	1	3	0	0	4

ing a particular extra service. At the other extreme, several firms reluctantly provided services.

Sales to the food-service industry are made primarily by telephone, field salesmen, and through contract bids (table 34). Although the phone is the major means, an unexpected number of handlers have salesmen. Part of the reason for this is that they serve a dual purpose—the salesmen solicit new accounts and provide services for present customers. None of the handlers described their salesmen as making deliveries but rather as taking orders or checking to see if goods or services are needed. In other words, by a very large majority, most sales were made sight-unseen.

Substantial manpower is involved in selling, both in the field and on the phone (table 35). However, it should be pointed out that many of the persons

Table 34. *Handlers' procedures for making sales to customers*

Sales methods	Purveyors	Breakers	Central commissaries		Total handlers
			number		
All by phone	5	3	2	0	10
Mostly (over 50%) by phone, but some salesmen	8	1	0	0	9
Both phone and salesmen (50-50)	5	0	0	0	5
Mostly (over 50%) by salesmen, but some by phone	3	0	0	0	3
All by salesmen in the field	5	0	0	0	5
Through brokers and distributors	1	0	0	0	1
Mostly by phone, but some through brokers	0	1	0	0	1
Some contract bids	4	0	0	0	4

Table 35. *Number of handlers' salesmen in field and on phone*

Field salesmen	Firms	Telephone salesmen	Firms
number		number	
0	8	1	4
Less than 10	14	2	5
10-20	5	3	5
Over 20	2	4	4
Not specified	2	Over 5	5
		Not specified	7

on the telephone and some of the field salesmen had other major responsibilities. For instance, in many of the smaller firms the owner-manager was also the major salesman.

Many HRI firms prefer frequent, small deliveries. Since this has an unfavorable effect on their efficiency, many handlers require minimum order quantities (exhibit 5). There is a wide range of minimum orders and a variety of methods for determining minimum requirements. The latter is partly attributable to the fact that the cost of making deliveries of various sizes is almost undeterminable. Of course, many firms have looked at this problem and know that the cost per pound decreases with larger orders because of fixed expenses involved in making a stop. However, there is by no means a consensus on what the costs are, and many firms have not considered the problem at all.

The frequency of small deliveries is further illustrated by the size of some of the handlers' delivery vehicles (table 36). Again, the sample bias toward relatively large firms means that the size of delivery vehicles used by most average handlers is probably

Exhibit 5. *Minimum order quantities required by handlers*

Handlers and their comments on minimum orders

Purveyors

No minimum required by 4 firms
 No response by 8 firms
 At least 100 lb. and \$100
 Try to eliminate very small customers, but no set minimum
 Will service big accounts with small emergency quantities, but won't service small accounts
 150 or 175 lb.—not economical to service anything less
 Approximately 200 lb., not worth it otherwise
 \$50 or 100 lb.—but lenient with new accounts having growth potential. Also furnish small, special orders for good customers
 \$25
 \$30
 50 lb.—at times less
 Most accounts big, therefore no need for minimum
 50 lb.—but will supply good customers with smaller emergency quantities
 \$50
 50 lb.
 \$100
 \$200 local, \$300 out of town
 2 cent upcharge for less than 1000 lb
 60 lb. or \$60, which they hope is profitable
 100 lb. but sometimes less in some areas

Breakers

No minimum required by 2 firms
 No response by 1 firm
 600 lb. when freight is paid, none otherwise
 Less than 100 lb., buyer pays freight

Central Commissaries

No response by 1 firm
 Case lots

Table 36. *Size of owned or leased trucks used for delivery by handler firms*

<i>Vehicle size</i>	<i>Number of firms</i>
Station wagon	1
1-1,999-lb. capacity vans or panel trucks	6
2-3,999-lb. capacity trucks	7
4-5,999-lb. capacity trucks	5
6-9,999-lb. capacity trucks	12
10-19,999-lb. capacity trucks	10
20-20,999-lb. capacity trucks (or trailers)	3
30,000-lb. and over capacity trucks (or trailers)	5

much smaller than indicated. Several handlers, especially among breakers, delivered fairly sizable orders to retail outlets and were therefore using larger trucks than would otherwise be required.

Truck ownership status is related to delivery and service (table 37). Many firms believe they can service their customers better by directly controlling delivery,

Table 37. *Ownership status of delivery vehicles of handler firms*

<i>Status of vehicles</i>	<i>Purveyors</i>	<i>Breakers</i>	<i>Central commissaries</i>	<i>Total handlers</i>
	number			
Own their trucks	14	1	1	16
Own some trucks, but also use common carriers (including air & water)	9	1	1	11
Lease trucks	2	1	0	3
Lease some trucks, but also use common carriers	1	0	0	1
Contract with one firm to do all delivery	0	1	0	1
Own or lease no trucks (all beef sold F.O.B.)	0	1	0	1
Totals	26	5	2	33

Table 38. *Handlers' methods of establishing a beef selling price*

<i>Methods</i>	<i>Firms using method</i>
	number
Essentially cost plus a fixed percentage	4
Essentially cost plus a fixed cent	5
Essentially cost plus a variable factor	12
Use Yellow* and/or Green* Sheets as a guide and/or basis	9

*Yellow Sheet is common name for "National Provisioner Daily Market Service" price list, and Green Sheet is common name for "Hotel, Restaurant and Institutional Meat Service Report" published by National Provisioner, Inc.

Exhibit 6. *Handlers' comments on their price-smoothing attempts*

Comments

No attempt to smooth out price variability (12 firms)
 Try to maintain same prices for one week (6 firms)
 Try to keep price for ground beef steady
 Try to buy and freeze beef at low market to keep prices fairly level during periods of variability Might try to protect customers from high prices on an up market Take half of any change at a time on a weekly basis; (e.g., if up 10 cents, will raise 5 cents in week 1 and 5 cents in week 2) Go up fast, down slow
 Sends out bids weekly, won't go down as fast as market
 Try to smooth as much as possible, 2 to 3 weeks behind the ups and downs, primarily because of aging 90% of work is contracted, which allows only small price flexibility
 Try to change prices, at most, twice a year Try to avoid peaks and bottoms, especially for large accounts For big chains, contracts run 20 to 50 weeks; for airlines, contracts run for 4 months; for others it is market price
 Follow the market except try to smooth out a little during the summer

using common carriers only for long-distance hauls and/or in emergency situations.

The determination of price is of major importance in selling (table 38). In most cases, price determination procedures were far from refined. Only one company had run extensive time and motion studies to determine labor costs, and although they felt that their estimates of production costs were not accurate, they did try to relate them to their prices.

Price variability is related to pricing policies. Several of the HRI firms mentioned their dislike of the wide fluctuations in market prices. Some handlers did try to affect this variability but the majority made little or no attempt to smooth out market price fluctuations (exhibit 6).

Relationship to the Rest of the Industry

Having examined the major functions of the handlers, the last area of investigation is their relative efficiencies. The purveyors were asked to state in what ways they felt they were more (or less) efficient than the food-service establishments (exhibit 7). Their answers tended to repeat the advantages for HRI in buying portion-controlled meats. That is, they emphasized the advantages of volume and specialty of skills in the purveyors' operations.

Exhibit 7. *Purveyors' answers to: "How are purveyors more efficient than HRI firms?"*

Answer

More efficient in cutting and trimming
 Economies of scale: can process and fabricate beef more efficiently
 No different
 Restaurants can portion-control cuts cheaper than purveyors because of packaging
 More efficient cutting because they're geared for it; restaurant butchers, by comparison, aren't that good
 More efficient, better butchers
 Cut more accurately, trim better, provide better control for HRI
 More efficient
 No advantage in portion-cutting over large restaurants with butcher shops; for small restaurants portion-controlled items give better control
 HRI can't do the job; not skilled enough
 Purveyors can do job better, producing a more uniform product; at the HRI firms, lack of butchering skill precludes uniformity of product
 Purveyor cost control much better than HRI
 HRI firms not as skilled or efficient
 No skilled labor at HRI
 Purveyors cheaper, faster, and control better than HRI
 HRI has big sanitation, inventory-control, and banquet-ordering problems, should buy portion-controlled cuts
 More uniformity, cheaper to end user, better use of trim

The purveyors were also asked how they were more efficient than packers (exhibit 8). They tended to emphasize the advantages of relatively small, independent businesses located near customers, mentioning the ability to buy selectively, to give a personal touch to products and services, and to provide small, frequent deliveries. None of the firms mentioned lack of efficiency as a problem of small size, especially when compared with packers.

Exhibit 8. *Purveyors' answers to: "How are purveyors more efficient than packers?"*

Answer

Better service and cheaper labor
 Better service
 Better delivery, more frequent shipments, better credit terms and special trim Better service, better product; sometimes cheaper than packers because of better markets for by-products Have power to buy quality and quantity needed, thus don't need to "get rid of" poor quality products Better distribution, better product, better quality control Personal attention, greater variety of cuts; thinks packers can't be more efficient
 Give customers what they want when they want it More personalized than production-line setup Service Service and dependability of delivery, although some "big guys" give good service Produce as much and give better service Better service and product Have essentially same products; only advantages are better customer service and credit Packers can't give as much service, can't meet all specs., and won't portion-cut to order Better service, can handle small accounts; closer, thus more responsive to customer's needs Consistently better products and service Customer service—standard product More flexible, better service; can correct mistakes and solve problems instantly Consistent quality; portion control, workmanship, line of provision, and quality of the people are all good

Exhibit 9. *Breakers' answers to: "How are breakers more efficient than packers?"*

Answer

Provide service and flexibility for HRI purveyors
 Extend better credit to purveyors; closer in terms of personal relations, although Western packers have a labor advantage
 Purveyors can buy fresh products, therefore can select their own and buy in small quantities
 In the West, boxed beef must be sold, too rapidly at times, and can't be sold to small accounts; packers have 50% less shrink and 50% more efficiency, but lose their advantage in distribution

Although the breakers perform only a few more functions than most packers do, they were also asked how they were more efficient than packers (exhibit 9). Again the answers tended to emphasize the advantages of being relatively small, independent businesses near their customers. The answers did not suggest any major functions that breakers perform better or more efficiently than do packers.

Direction of Change

The interviews with the handlers gave the impression that their part of the food-service industry is changing and the rate of change is likely to increase. There is also a strong indication that the food-service industry will continue to grow, which means the handlers who supply it will do likewise.

The several different types of handlers seem to be evolving at very different rates. Two distinct types appear to be emerging: high volume, relatively low-quality purveyors and lower-volume, high-quality, high-service purveyors. Those with larger volume and lower quality seem to be growing very rapidly as a result of supplying frozen preportioned items to the mass feeders, such as schools, universities, and other institutions, and to other dispensers such as frozen-food and/or full-line distributors. The high-quality purveyors, though not developing so rapidly, seem to be growing by concentrating strictly on the high-quality food-service establishments. The importance of the breaker, whose major contribution is to simplify supply difficulties, is declining as packers and purveyors solve supply problems through vacuum-packing and other technological advances.

Various types of suppliers are expanding their product mix to include more of the food service's needs. By delivering more items at one time, the suppliers can make fewer, larger deliveries to the food-service operators. This growth is further enhanced by the ruling of December 20, 1971, which modifies the 1920 Packer Consent Decree. It "permits Swift & Company, Armour and Company, Cudahy Co. and Wilson & Co., Inc., to manufacture and wholesale more than 100 non-meat items previously barred to them by the decree" (5:5). This does not necessarily mean that these companies will change their product mix, but that it is now possible for them to supply more of the total needs of the food-service industry. Many other firms, both packers and handlers, as well as traditional retail wholesalers, were already moving in this direction. Some retail-type warehouse operations are adding institutional products, along with preportioned meats, and are supplying the food-service industry from their warehouses.

Some major changes are also taking place within the handlers' operating procedures. Because of the product's availability, many purveyors are now buying a substantial amount of their beef in a vacuum-packed, subprimal form that requires much less labor to fabricate into roasts and steaks and yields fewer less desirable "by-products". Another major change is increased production for inventory. By combining this concept with a production-line system, many firms are able to increase their labor productivity substantially. In fact, one firm reported that it required approximately 50 percent more labor to custom cut than to cut for inventory. Because changing from custom service to inventory production requires major capital investments, the change-over will be gradual.

Related to the inventory concept is the increased use of freezing. Liquid nitrogen or other types of cryogenic freezing techniques have improved the quality of the frozen products and have made freezing cheaper for the large-volume operators. Precooked frozen meats should also grow in importance.

Already, the vacuum-packing idea has drastically changed the nature of much of the beef supplied to the food-service industry and should continue to do so. Some of the technical difficulties of vacuum-packing have been overcome and it is being rapidly accepted.

Over all, food-service handlers appear to be specializing more in terms of products processed and clientele served, and growing more sophisticated in processing and packaging methods and more like traditional manufacturers, with a periphery of firms providing the specialized needs of a few customers.

Summary and Conclusions

Most food-service establishments purchase beef from the supply firms classified as handlers, who, in general, purchase various products from several sources, transform it into items such as portion-controlled steaks and roasts, and then sell to establishments within the food-service industry. Most of the firms handle more products than they fabricate, although a few, who sell a limited number of products, fabricate everything they sell. Many firms seem to be adding product lines and diversifying to dilute overhead costs.

A majority of the handlers purchase some beef in the subprimal form, which yields fewer products. Few firms purchase much frozen beef, although 29 of the 35 interviewed sold at least some frozen beef. Not all the interviewed firms use imported beef, but handlers as a group appear to be important buyers from this source.

Most handlers select their beef suppliers on the basis of quality, service, and product availability, with only a few using price as the major criterion. This seems to indicate that prices are nearly the same or that price is of little importance. Since most handlers base their prices on their incoming costs and most food-service firms take whatever price is offered to them, the cost of the incoming beef is likely to be relatively insignificant to the handlers.

The handlers can be roughly categorized as custom service (job-shop) or as inventory-production operations. The latter type seems to be growing in importance, although a few firms are doing more of the traditional custom-service type of work. This appears to indicate the economic advantages of inventory operations, but also that this method might mean a sacrifice in some of the special service aspects that are so important to many food-service customers. Most of the firms producing for inventory and several of the custom-service operations have adopted special packaging and/or freezing to maintain quality and wholesomeness.

The handlers sell most of their products sight-unseen to a fairly wide range of customer types. Even though many firms had customers dispersed throughout a fairly large geographic area, most of their sales were made locally. This indicates that the local reputation of the handler is very important. Virtually all handlers recognize that service to customers is vital, although few know the costs involved in providing these services. Most firms do not view delivery as an extra service, but as a necessary part of the business. They recognize that frequent, small deliveries are costly, as shown by the minimum-order requirements, but seem not to know much about their cost. Thus a primary cost component of the distribution system may be inefficient, and a major research effort will be needed to bring this fact to the attention of the managements of the handlers and the food-service firms.

The handlers generally see their major role as securing and fabricating products to meet customer needs. They feel, because of their size, specialization, and location, that they are the best-qualified source of beef (and other supplies) as well as special services, for the food-service industry, with the best possible combination of price and quality.²

Some of the changes taking place within the handler firms include: the further specialization of types of handlers, especially in regard to quality of products and services offered to certain types of clientele; more diversification of product lines offered, including many nonmeat items; more use of the beef cuts that

require little additional preparation, such as sub-primals; more technical innovations in the physical operations, for example, cryogenic freezing, vacuum packing, and conveyORIZED cutting lines; and in general, more sophistication in applying the broad principles of management.

DESCRIPTION AND ANALYSIS OF THE PACKERS

The last group of firms to examine in the food-service beef distribution system is the packer group, probably the most visible and well-known segment of the system, whose major functions are slaughtering and distributing fresh and processed meats.

Types of Firms Included in this Study

Because federal inspection of all meat involved in interstate trade is required, most beef used by the food-service industry originates in federally inspected slaughtering facilities. As of June 30, 1971, there were 705 federally inspected plants slaughtering beef in the United States (32:72), 10 of which were interviewed for this study. Because of the exploratory nature of the study, these personal interviews were only semistructured.

The packers interviewed had varying numbers of slaughtering facilities; they included firms with very different sales volumes and cattle-slaughtering capacities—beef only and multi-species slaughtering plants (table 39). Where meaningful, the packers will be referred to as small, medium, or large on the basis of total sales. Operating procedures after slaughter, the nature of the products handled, and how packers sell beef to the food-service industry will be examined.

Table 39. *Characteristics of the 10 interviewed packers*

No. of packers	No. slaughtering plants	No. of packers	Total sales (million \$)
6	1	4	less than 100
2	2-5	3	100-500
2	over 5	3	over 500
<i>Cattle slaughtered (millions)</i>		<i>Kinds of animals</i>	
3	less than 1	5	Beef only
5	1-100	5	Multi-species
2	over 100		

²For a theoretical discussion of why handlers can be justified in the distribution channel, see (8).

Operating Procedures

Though general administrative or overhead costs were not examined in detail, the 4 packers with more than 1 slaughtering facility were asked what functions they performed at headquarters that were not performed at each individual plant (exhibit 10). These were normally of the coordinating type and/or staff-related functions. When compared with single-plant firms, the multi-plant companies appeared to have no particular advantages or disadvantages.

Within the actual slaughtering facilities, after slaughtering the animals by either Kosher or regular method, the hot carcasses are moved to a chill cooler via the bed or the rail system. Before chilling, most of the packers shroud the sides, which are then held in the chill cooler overnight or, by some firms, for as long as 2 days. After the shrouds are removed, the sides are usually taken to a holding cooler where they are ribbed and graded. The carcasses are then selected by company personnel for particular customers and/or further fabrication. In the plants that use a kill-and-chill operation, all the carcasses (except bruised ones) are usually quartered and then loaded for shipping. The plants that do further fabricating move the carcasses to another part of the cooler or a separate room and break them into primals, either on rails or on a boning line. Fabrication into sub-primals is generally accomplished on various types of automated lines. Both primals and subprimals are then packaged (or left hanging naked) and either moved into inventory or shipped out. The major variations in operation were the degrees of automation within the fabrication and packaging functions, but within total operations, observed variations were slight.

Five of the 10 packers indicated purchasing some beef from other packers for fabrication into specific

Exhibit 10. *Headquarter functions of multi-plant packers*

<i>Packer size</i>	<i>Unique headquarters' functions</i>
Medium	Livestock and extra beef purchases, beef sales, and advertising
Large	Union negotiations, market information, future planning, some money problems, research and development, legal matters, sanitation advice and research, advertising, label approval, accounting, training, some marketing (e.g., with national accounts), supplier selection, guidelines for products, and several other functions
Large	Livestock and extra beef purchases, selling coordination, and advertising
Large	Control of livestock purchases and advertising

Exhibit 11. *Packers' comments on purchase of non-live beef*

<i>Packer size</i>	<i>Comment</i>
Small	Buy carcass, primals and some subprimals, all in fresh form, through brokers and directly, to supplement own kill
Medium	Buy very little, less than 5%, from local packers to supplement own kill. Will buy fresh carcass only
Medium	Buy less than 1%, only if price is extremely good
Large	Buy all forms of beef, mostly fresh primals and subprimals because of lack of breaking facilities
Large	Buy many dress carcasses and few fabricated cuts to supplement own slaughter because food-service division has specific needs

cuts not produced in sufficient quantity by their own slaughtering (exhibit 11). This beef was usually bought to supply the needs of customers in the food-service industry.

One of the firms also purchased some imported beef because of price and because it was the only way to meet their needs for lean boneless beef and to balance the total beef supply.

Only 1 of the 10 packers was not unionized and 1 large firm stated that part of its operation was not unionized. The obvious reason for this high rate of unionization is the size of the firms and the number of employees in one location (as many as 300 unionized employees for even a small packer).

Wage rates also play a major role in the competitive position of the packers. Five firms indicated their general level of wages, which seemed to be somewhat, although not totally, higher than the rates reported by handler and HRI firms (exhibit 12).

The amount of time each packer operated his plant varied considerably (exhibit 13). In general, packers

Exhibit 12. *Wage rates reported by packers*

<i>Packer size</i>	<i>Wage rates</i>
Small	\$4.06 base labor, \$4.66 for boners, \$5.06 for kill floor
Small	\$4.50 for cutters, \$3.90 for handlers, \$4.30 for shippers, \$3.90-\$5.10 for kill floor, \$3.95-\$4.30 for breaking and cooler men
Small	\$4.00 approx. minimum, goes to at least \$6.00 plus fringes; each job has brackets and work is on incentive plan
Medium	\$3.60 to \$4.30 plus fringes
Large	\$4.74 for cutters, \$4.44 for handlers, \$4.29 for grinders \$4.57 for receiving and shippers, \$4.85 for truck drivers \$4.69 for kill floor, \$200/week for supervisors, and \$15,000/yr for sales

Exhibit 13. *Shifts worked in packing plants*

Packer size	Shifts
Small	Cattle slaughter: night; hog slaughter: day; beef cooler: day; shipping: night; boning: day
Small	3 shifts—1 shipping and fabricating, 1 shipping only, and 1 cleaning
Small	6:30 a.m.—4:30 p.m.: kill; 2:30 a.m.—10.30 a.m.: cooler
Small	1: kill; 2: shipping (8 hr./day, 40 hr./wk.)
Medium	1: 8-hr. shift, 6 days/wk.
Medium	2: kill, 1: fabricating, 1: cleanup (8-hr. shift plus 4-hr./wk. overtime)
Medium	10 hr./day, 6 days/wk.
Large	Usually 40 hr./wk.
Large	1 shift: 5 days/wk. plus overtime and some 6th-day overtime
Large	1 shift: 8 hr./day

operate more total hours than handlers. This seems to indicate no serious over-capacity problems and perhaps better utilization of capital equipment.

Nature of the Product Handled

Opinions and practices about the amount of fabrication varied among several of the packers. Some felt they should sell only carcass beef, whereas others fabricated beef all the way to portioned cuts (table 40). Certain packers felt their primary function and expertise was in slaughtering and therefore sold only carcass meat, letting other specialists do the breaking and fabricating. Some of this group felt that the packaging expenses of fabrication would more than offset any advantages. Other firms thought that fabricating provided them with an area for expansion, a possibility to develop brand loyalty, and a method of stabilizing supply and demand in different segments of the market.

Another aspect of product form is fresh versus frozen. All firms sold most of their beef in fresh form, however, 4 sold some frozen beef, generally portioned cuts. Offals were customarily sold in frozen form, since it took quite a while to accumulate a full load of these products.

Several different types of packaging material were used by the packers (table 41). Some, using the vacuum-packed and/or the CO₂ pellets, relied heavily on the advantages of this kind of packaging to help promote

Table 40. *Types of beef sold by interviewed packer*

Types of beef	Number of packers
Carcass or quarters only	3
Carcass, primals, and subprimals	2
All forms, including portion-controlled	5

Table 41. *Types of packaging used by interviewed packers*

Packaging	Number of firms*
Quarters	
Naked	5
Stockinette	2
Krinkle-bag when stacked	1
Paper & stockinette	1
Not reported and/or none sold	3
Primals	
Naked	1
Stockinette	3
Poly-bag	1
Paper or other oxygen permeable wrap	1
Vacuum-packed plus box	3
Boxed plus CO ₂ pellets	1
Paper and stockinette	1
Soft film and box	1
Not reported and/or none sold	4
Subprimals	
Individual wrap (paper) and box	1
Vacuum-packed	6
Boxed and CO ₂ pellets	1
Shrink film and other oxygen nonpermeable wrap	1
Not reported and/or none sold	4
Portion-controlled cuts	
Individually wrapped and boxed	2
Layered in boxes	2
Vacuum packed	1
Tray packed and overwrapped	1
Not reported and/or none sold	6
Ground beef and/or trim	
Poly-bags	1
Tubs	1
Keeper casing	1
Boxes	2
Combo-bins	1
Not reported and/or none sold	6

*Most firms used several packaging materials.

their product. Other firms followed customer specifications, and still others had traditionally used a particular method (or no package) and saw no reason to change.

Selling Procedures

All packers had several types of outlets for their beef (table 42). Even those who specialized in providing particular cuts for the food-service industry retailed substantial amounts of their product. A number of packers sold their beef to independent wholesalers, who in turn sold part to retail and part to the HRI market. Overall, only a small proportion moved directly from the slaughtering facility to HRI firms.

Four packers did not sell beef directly to HRI firms, citing the following reasons: Don't want to cut into the business of their purveyor customers; HRI cannot pay

Table 42. *Number of packers selling to specific clientele*

Type of clientele	Number of packers
Chain stores, usually warehouse	8
Retail stores, direct	7
Wholesalers	6
Purveyors	5
Direct to HRI firms (through separate division in some cases)	4
Manufacturers or processors	4
Government (military)	2
Kosher job houses	1

fast enough; sell only carcasses, and HRI's don't use carcasses anymore; and don't want to get into breaking business because costs would outweigh freight savings. Four other packers had established special divisions to deal with the food-service industry. These somewhat autonomous divisions usually acted like independent handlers, even to purchasing some beef from other packers. The other two sold some of their beef directly to HRI through regular sales personnel and through special contract arrangements. One of these firms said it would sell directly to HRI only if the purchaser would buy a half truckload or more.

The actual sales methods varied from company to company, but most firms relied heavily on telephone sales (exhibit 14). As with the handler, several packers had employees they called salesmen, but in several cases these persons generated new business, called on customers to render services and increase sales, but did not actually take orders. Some firms also used brokers instead of, or in addition to, their own salesmen.

Most packers were well aware of the disadvantages of small orders and thus specified minimum order quantities (exhibit 15). Several firms set a minimum of a full truckload except through their food-service division,

Exhibit 14. *Packer beef-selling methods*

Packer size	Selling procedures
Small	6 salesmen generate approx. 5% of sales; 5 telephoners selling other 95%
Small	2 East Coast salesmen, but nearly 100% sold by 5 telephoners
Small	40% sold through brokers, 50% sold by 3 telephoners, and 10% picked up at plant
Medium	5 telephoners sell almost 100%; occasionally use brokers
Medium	6 salesmen
Large	Mostly by phone: use salesmen for personal contacts
Large	8 telephoners sell almost 100%; have local distributors and are building more
Large	63 salesmen selling primarily retail, but who generate about 75% of sales to HRI and purveyors; other 25% sold by 20 phone salesmen

Exhibit 15. *Minimum-order quantities of interviewed packers*

Packer size	Minimum-order requirements
Small	100 lb.
Small	No set minimum, but try to encourage at least 200 lb.
Small	Full truck (35,000 lb.); might split load to 2 clients in same area
Small	Truck load (35,000 to 42,000 lb.) except 200 lb. on local route; no minimum if picked up
Medium	Full load (35-38,000 lb.); occasionally half load each to 2 clients in same area
Medium	Normal minimum 10,000 lb.; might ship 5,000 lb. to a good customer (one who ordered 40,000 last week)
Medium	40,000 lb. except might ship half truck to good customer
Large	100 lb. is normal minimum, but sometimes ship less
Large	Prefer no less than half load, but will if customer has potential
Large	50 lb. minimum on routes; graduated scale for freight charge

and some firms shipped smaller amounts directly from the slaughter plant.

Most companies with food-service divisions and the one doing some fabricating offered a fairly large range of special services (exhibit 16). However, those firms that could be basically classified as kill-and-chill operations provided few, if any, services.

One service almost always provided by packers is delivery. Of the 10 interviewed packers, 6 operated at least some of the vehicles delivering their beef, whereas the other 4 relied entirely on common carriers. Most of the firms operating their own trucks felt they could provide better service than common carriers but because they are allowed to back-haul only products owned by

Exhibit 16. *Special services provided by interviewed packers*

Packer size	Services provided
Small	Just about anything
Small	Special trim and special cuts for any good customer
Small	No services provided
Small	Delivery only
Medium	No services provided
Medium	Trade shows; advertising; new items; service on request although most buyers hesitate to request
Medium	No services provided
Large	Provide complete line of meat and meat products, delivery service within reason, special trim, research, even pre-cooking—just about anything
Large	Trim to <i>NAMP</i> * specifications and do about anything on request of good customers
Large	Cutting demonstrations, research, some special trim

**NAMP*=National Association of Meat Purveyors.

Exhibit 17. *Price-establishing procedures of interviewed packers*

<i>Packer size</i>	<i>Pricing procedures</i>
Small	Fixed cents over sheet
Small	Yellow Sheet as basis; add freight, labor, overhead and profit; run tests continually to get labor charge; will change prices once or twice a week
Small	Yellow Sheet
Small	Freight over Yellow Sheet of previous day
Medium	Yellow Sheet + or - percent, although big chains won't go with Yellow Sheet—they negotiate; bid on a day-to-day basis for military business
Medium	No set pattern; use costs and yield as guide, then get what they can; send out weekly bids that follow general market trend
Medium	Usually Yellow Sheet + cents markup + freight
Large	Cost + a fixed factor, based on time-and-motion studies, yields, cost structure, and profit margin; corporation headquarters sets guidelines, but each plant sets actual prices; use Yellow Sheet as guide
Large	Yellow Sheet as guide, taking into account yields, labor, return on investment, and overhead
Large	Yellow Sheet as a guide only; stay away from the Yellow Sheet for formula sales; instead, try to use cost + profit; don't make weekly quotes or many long-term contracts

the company, they could not compete economically for long-distance deliveries.

Price is an important factor in choosing a supplier. Although many packers rely heavily on The National Provisioner's Yellow Sheet, the methods for determining price vary (exhibit 17). The packers roughly classified as the larger, more-progressive firms tended to minimize the role of the Yellow Sheet, whereas the smaller or the less-progressive firms typically use it as the primary price determinant. However, at least one firm using the Yellow Sheet was aware that they had been contacted by the National Provisioner with regard to determining the price quotation to use on the Yellow Sheet.

Packers' Relationship to the Rest of the Industry

Several packers were questioned about advantages they held over purveyors in providing the needs of the HRI industry (exhibit 18). Because of generated volume, some packers felt they could do a more efficient fabricating job, had better outlets for the by-products, and could sell to a larger variety of clientele. They also felt that by having geographically widespread facilities they could distribute their products more efficiently.

Exhibit 18. *Packers' answers to: "What areas do you feel you are more (less) efficient in than purveyors?"*

<i>Packer size</i>	<i>Answer</i>
Small	Do more volume of breaking and boning, hence more efficient; better outlets for by-products and retail cuts than purveyors
Medium	Produce more efficiently, better outlet for by-products, quality more consistent and probably cheaper overall
Large	Has large product line and team of persons doing things independent 1-man operation can't do. However, independents have better access to social contacts
Large	As good as, if not better than, purveyors; better able to distribute over wide area with less freight charge

Each packer was also asked how his operation compared with those of other packers (exhibit 19). Most of the answers were divided into two distinct attitudes about whether to fabricate or not. That is, the packers who did so pointed out a particular aspect of their operation as being superior to that offered by others, whereas those who operated as kill-and-chill plants felt that this function alone was a major advantage.

Exhibit 19. *Packers answers to: "How are you more (less) efficient than other packers?"*

<i>Packer size</i>	<i>Answer</i>
Small	Slaughtering operation is inefficient, since they still use bed system
Small	More efficient delivery; better quality product; better handling in plant and on truck; better dressing
Small	Entire kill is kosher style
Small	Carcass operation only; don't want to develop fabrication because of limited finances, limited experience, and belief in a market for carcass beef
Medium	Plants are older and less efficient but offer quality product and kosher products
Medium	Unique packaging and own feed lots
Medium	Feel packers who fabricate spend more in vacuum-packing machinery, bags, boxes, etc. than they save in freight. Happy with kill-and-chill operation giving same quality
Large	Not much difference
Large	Use only grain-fed animals; have good quality control and uniformity; have consistent quality, trim, and handling; have same labor advantage
Large	Middle of the road, better overall than old plants, but not as good as modern plants

Future Direction of the Packers

Overall, the packing industry does not seem to be changing as rapidly as the handler or the food-service industries. Firms are increasingly automating various

operations, but only gradually, since the capital requirements are great.

The major change in the packing industry has been and will most likely continue to be the increase in selling of noncarcass beef. The idea of shipping primals, sub-primals, and even portioned meats is a fairly recent phenomenon and has been adopted rather slowly. However, there are many indications that the acceptance of pre-fabricated beef will continue to accelerate, especially in the food-service industry. Undoubtedly many packers will not switch to a fabrication type operation, but they are sure to diminish in number and importance. One firm expressed the belief that many retailers are setting up their own centralized fabricating operations, which require carcass beef, and therefore the market for carcasses will continue. However, the packers who elect to supply the retail central fabrication plants might find a markedly reduced market for their beef in the food-service industry, since the firms that are doing more fabricating are capturing an increasingly larger share of this rapidly expanding industry.

Along with fabrication, packaging is also changing through research for improved forms and materials and general cost reduction. It is impossible to predict any major changes in this field, but it seems safe to assume that advances will be made in materials and packaging automation that will make fabricating even more economically advantageous to packers.

There is no clear indication of how the industry might improve distribution. Some firms are establishing distributors that are more widely separated geographically, especially for the HRI market, whereas other packers are closing down branch houses that have serviced some of the HRI markets and are going to independent firms for distribution.

Summary and Conclusions

Most beef served in the food-service industry originates in federally inspected packing plants. The packing industry is highly complex and is involved in making the most out of the many products and by-products of live animals. This section examined only that small segment of the slaughterer's business that is involved in the distribution of beef through food-service channels.

The major variations in packer operations found were in the degree of automation and amount of fabrication. All packers had similar physical flow-through of products except for fabrication; 3 packers of the 10 interviewed did none beyond quarters, whereas the other 7 disassembled the product into smaller cuts. Those who did fabricating employed similar, although technically different, methods and used various types of packaging materials, which generally were chosen to preserve freshness.

Most of the packers sold their food-service beef either to independent handlers or through their own distributors who operated much like independent handlers. Four of the packers who had separate divisions to handle food-service beef also purchased extra cuts to meet their customers' needs. Nearly all of the packers required fairly large minimum order quantities, except from their separate specialized outlets, which indicates that the packers are aware of, and willing to do something about the high cost of small deliveries.

The major advantages most packers felt they have over independent handlers are related to volume; being able to maintain larger staffs, they could provide more technical and educational services than could the handlers. Others believed that economies of size were involved in fabricating, which would make them more efficient than handlers. This was not proved, and several packers disputed the idea by not doing any fabricating.

The packing industry is evolving at a slower rate than other segments of the food-service industry. There seems to be a definite trend for packers to do more fabricating, use better packaging, and increase automation.

A general conclusion about the packers is that, as vast and complex business organizations, they are much more aware of problems faced by the industry than are the smaller handlers and food-service firms.

A CONCEPTUALIZED COST MODEL OF THE PHYSICAL DISTRIBUTION SUBSYSTEM

A highly complex distribution system is required to move beef from the chill cooler of a packer to the point in a food-service operation where it is ready to be cooked. This system involves the interaction of many firms performing a variety of functions in several different ways. Because each operates in a unique manner with a distinct, but changing, product mix, it is essentially impossible to examine all the combinations and interactions within the physical distribution system. Yet increasing the efficiency of distribution, appears to have such great potential for improving the efficiency of the entire beef-marketing system that this subsystem should not be ignored.

Given the extremely heterogeneous nature of the food-service industry, a channel that is efficient for one type of operation might not be as effective for another. For instance, a restaurant that serves large quantities of lower-quality, chemically tenderized steaks might require a distribution system quite different from that of a university, which serves a large variety of items and often combines student training with the service of providing meals. With the variations from private companies to public agencies, specialized outlets to multiple-

product outlets, and large to small firms all being included in the industry, no doubt many institutional arrangements for efficient physical distribution will always exist.

To find the major areas where efficiency of physical distribution could be improved, the decision was made to examine a limited number of alternative methods. Because the firms in the industry perform many functions with a wide variety of products, a conceptualized model with a synthetic cost approach was the logical device for examining these alternative methods of distribution.

Most studies that use synthetic cost procedures have dealt with economies of size. The theory for this approach is well developed and the studies generally provide very useful data; however, because the beef-distribution system involves many types of firms, a complete economies-of-size study is beyond the scope of this project. Instead, the synthetic or building-block approach is used to estimate costs for firms that were assumed to be of sufficient size to operate toward the low part of the long-run, average, total cost curve. Though it has limitations, this conceptualized model should generate useful information.

Using this synthetic approach, 9 theoretical channels of distribution were studied (figure 1). For each, the direct cost is determined for physically moving and fabricating a fixed product mix from the chill cooler of a packer to the point before cooking at the hotel, restaurant, or institutional firm. The total direct costs of the

theoretical channels are then compared to determine the most efficient channel of distribution from a total subsystem point of view.

The 9 theoretical channels included in this study were selected because they represent those most commonly used, to at least some extent, by firms currently in the industry. Therefore, even though the theoretical channels do not represent the exact way the industry operates, the model should be useful in determining directions of change for improving the physical distribution subsystem.

The Model

Each conceptual channel of distribution consists of 1 packer, 6 purveyors, and 300 hotels, restaurants, or institutional-type firms. Each packer starts with an identical number of carcasses in the chill cooler and, in the end, each HRI firm has exactly the same products ready to cook. Because physical handling is the variable of interest, each firm is assumed to operate with identical labor rates and efficiencies and to have identical capital equipment, power, and other costs. The only variation from one channel to another is the fabricated form of the product at each firm. That is, the variations in costs reflect expenses associated with transporting different forms of products, various packaging requirements, and the amount of labor and capital goods required by the dissimilar form of products handled.

Figure 1. *Nine theoretical channels of beef distribution*

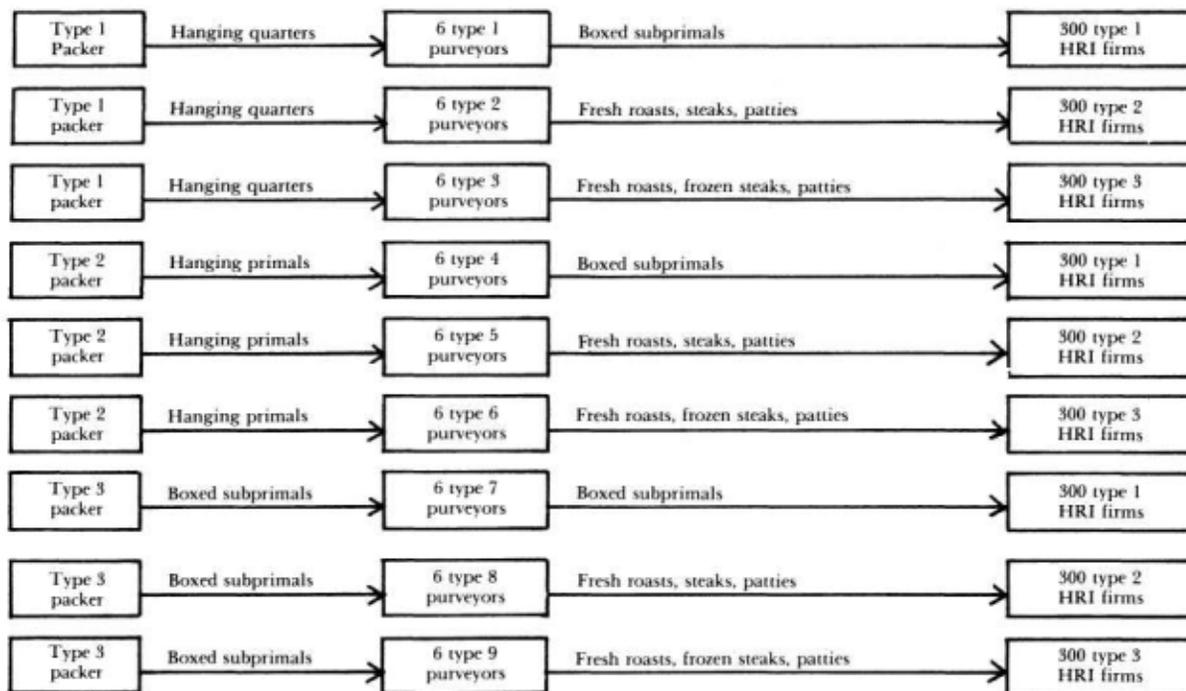


Table 43. *End-product mix of model HRI firm*

NAMP* number	Product name	Average weight	Units per year	Weight per year	Percent of total weight
		lb.	no.	lb.	%
1168R	Inside round roast	20.00	310	6,200.0	12.4
1189	Tenderloin steaks	.50	4,296	2,148.0	4.3
1180	Boneless strip loin steaks	.75	2,868	2,151.0	4.3
1184	Top sirloin butt steaks	.50	7,005	3,502.5	7.0
1173	Porterhouse steaks and				
1173A	T-bone steaks	1.00	4,400	4,400.0	8.8
1112	Rib-eye roll steaks	.50	3,995	1,997.5	4.0
1112R	Rib-eye roll roast	8.70	66	574.2	1.1
1109R	Roast-ready rib roast	18.90	65	1,228.5	2.5
1136	Ground beef patties	.25	111,200	27,800.0	55.6
	Total			50,001.7	100.0

*NAMP=National Association of Meat Purveyors.

End products at the HRI firms consist of 9 items that were determined by the food-service manager of a co-operating firm and Dr. Jeremiah J. Wanderstock (professor, School of Hotel Administration, Cornell University) as being representative of the major types of cuts and comprising the greater part of the products served in most restaurants.³ The proportion of each item used by a representative HRI firm was based on the purchase patterns of the food-service industry as reported by Van Dress (34:53-56). The exact amount of product used by an HRI firm was chosen to represent a fairly large, efficient firm (table 43).

The size of the purveyor selected for the model was also chosen to represent a fairly large, efficient house as determined from the descriptive interviews of the project. The size selected was to be just large enough to supply the needs of 50 HRI firms. Size of the model packer was set at the equivalent of a packer slaughtering approximately 60 head of cattle per hour per 8-hour day. This was determined by Franzmann and Kuntz to be the most efficient slaughtering plant size (15:26). With the packer slaughtering 121,800 head of cattle per year, 6 purveyors supplying a total of 300 HRI firms were then required to handle the output of each packer.

The exact number of products handled by each firm was based on the estimated yield from a 700-pound carcass, yield grade 2, as estimated with the aid of Dr. James R. Stouffer, (professor of animal science, Cornell University) and a variety of reports and cutting tests. Because the model required a large amount of ground beef, an additional 3,850,230 pounds of boneless beef per channel was assumed to come from sources other than the 121,800 head of cattle slaughtered. Thus each

channel represents approximately 49.7 million meals of beef served yearly, or 3186 meals per week per HRI firm.⁴

Since the products needed by the HRI firms did not include the entire carcass, the value of products not used within the model was credited to the cost of a channel wherever the product was produced. The value of these "extra" items was based on F.O.B. prices at the co-operating firm on a given day (table 44).

Table 44. *F.O.B. value of selected products**

Product	Average weight	Value per pound	Value per product
	pounds	dollars	
Sides	350.0	.585	204.750
Forequarters	182.0	.505	91.910
Primal rounds	80.5	.710	57.155
Arm chucks	105.0	.525	55.125
Knuckles	11.0	1.020	11.220
Outside rounds	13.0	1.060	13.780
Boneless strip loins	13.6	1.750	23.800
Bottom sirloin butts	7.5	.790	5.925
Sirloin butts	18.8	.950	17.860
Sirloin	29.8	.890	26.522
Tenderloin kabob meat	1.5	2.075	3.113
Kidney knob & fat	13.5	.065	.904
Flanks, untrimmed	15.8	.330	5.214
Short plates (bone-in)	28.0	.370	10.360
Briskets (bone-in)	17.5	.410	7.175
Fat	Various	.05	Various
Bone	Various	.02	Various

*Based on prices beginning 10/31/72.

The total annual direct cost of each channel includes the cost of the starting products (naked, hanging sides of beef and extra boneless beef) plus all of the costs incurred by each firm within the channel for handling, fabricating, and transporting, less a credit for the products and by-products not needed within the model. The annual cost of each theoretical channel of distribution can be represented in equation form as follows:

³Information obtained from personal interviews with the food-service manager of the cooperating firm and Professor J. J. Wanderstock, summer 1971.

⁴Based on a meal being ¼ pound of a roast, 1 steak, or 1 patty.

$$\text{TDC} = \text{VC} + \text{VB} + \text{CS} - \text{VES} + \text{TS} + 6(\text{CP} - \text{VEP} + \text{TP}) + 300(\text{CH} - \text{VEH}) \text{ where:}$$

TDC = total annual direct cost.

VC = value of 121,800 naked, hanging carcasses of beef in the chill cooler of the packer.

VB = value of 3,850,230 pounds of boneless beef suitable for grinding.

CS = cost incurred by the slaughterer to handle and fabricate the beef.

VES = value of the extra products produced at the slaughterer.

TS = transportation costs for moving the products from slaughterer to purveyors.

CP = costs incurred by the purveyor to handle and fabricate the beef.

VEP = value of the extra products produced at the purveyor.

TP = transportation costs for moving the products from purveyor to HRI firms.

CH = costs incurred by the HRI firms to handle and fabricate the beef.

VEH = value of the extra products produced at the HRI firms.

Cost Components

The costs of each channel can be viewed as consisting of 3 types of expenses: firm operating expenses, firm capital expenses, and transportation expenses between firms. In this model, each of these expenses is estimated for only that part of the firm directly involved in the physical distribution process; that is, costs involved in administration, sales, slaughtering, rendering, and so forth are excluded.

The firm's operating expenses include the costs of labor, supplies, and utilities. Its capital expenses include costs associated with buildings and with the equipment required for the functions of physical distribution. Transportation expenses between firms are based on the per pound charges of a common carrier.

Labor cost is determined by 2 variables: the cost per man-hour and the number of man-hours. To standardize the model, each firm was assumed to have common wage rates of \$4.75 per hour for workers who do any cutting, sanitation work, or repair and maintenance work and \$4.50 per hour for all other workers. Although these wage rates are not the exact rates for any particular firm, they fall in the range of firms interviewed and reflect some of the differences in types of workers. Likewise, the time to perform each particular job was assumed to be constant from firm to firm (table 45). This time was estimated from time-and-motion studies with the help of an outstandingly capable engineering department of a cooperating firm and their food-service supervisor. This particular company operated primarily as a job-shop or custom-service-type operation within the fabrication phase of the process. Thus the labor-hour requirements are probably biased somewhat higher than

production-line, inventory-type methods of operating. However, the labor requirements were estimated for direct labor only; that is, supervisory time and unproductive time were not taken into account, thus the labor requirements are somewhat understated. To reiterate, the labor requirements used in this model should not be construed to include the total labor of a firm, rather, they are for the sole purpose of reflecting the magnitude of differences between the firms within the model (tables 46, 47, and 48.)

Supply costs consist primarily of costs of packaging materials, which in the model are based on estimated costs supplied by two types of manufacturers plus the costs of certain items used by the cooperating firm. To insure anonymity, only aggregate costs of packaging for the selected individual products are summarized (tables 49, 50, and 51). Each group of packaging materials consists of several items such as a vacuum bag, clip, netting, and box or overwrap film, poly-liner and box, and so forth. The items shipped hanging (quarters and primals) are assumed to be shipped naked, thus no packaging costs are incurred. The total annual costs of packaging materials for each firm within the model is a fairly large expense item (table 52). The other supply items, such as plastic gloves, knives, and clothing, were considered negligible or were provided by the employees; thus they were not included as a supply cost.

Expenses associated with operating the equipment include power, sanitation, repair, and maintenance (table 53). These costs were all based on the estimates made by the cooperating firm's engineering department, with the cost of water assumed to be at the rate the city of Ithaca, New York, charges for water outside the city limits.

The firms' capital costs associated with the ownership of buildings and equipment were based on the physical requirements for an assumed peak-volume day, determined by the following assumptions: (1) packers handle, fabricate, and sell approximately 1 day's kill (or 1/250th of yearly volume) on a peak day; (2) purveyors fabricate and sell approximately 25 percent of a week's volume (or 1/200th of yearly volume) on a peak day, and each receives 1 load of 6 combo-bins of boneless beef plus 1 load of approximately 35,000 pounds of other products, except that the type 1, 2, and 3 purveyors receive two 35,000-pound loads of other product; (3) type 1 HRI units each receive an average of 3 loads per week or, on a peak-volume day, a load of 460.8 pounds of product, and each fabricates approximately 33 percent of a week's volume (1/150th of yearly volume) on the peak day; (4) type 2 HRI units each receive an average of 3 loads per week or, on a peak-volume day, a load of 450 pounds of products; and (5) type 3 HRI units each receive an average of 1 load per week or, on a peak day, a load of 1114.0 pounds of product, and tempers or thaws approximately 33 percent of a week's volume (1/150th yearly volume) on peak day.

Table 45. *Labor-hour requirements for specific tasks*

<i>Operation or task</i>	<i>Labor hours required</i>	<i>Operation or task</i>	<i>Labor hours required</i>
1. Move sides of beef from chill cooler to holding cooler	.0133/side		
2. Rib the sides	.0039/side		
3. Select, break sides into fore- and hind quarters; move quarters to shipping, weigh, and load on rail-equipped trucks	.0882/side		
4. Select, break sides into fore- and hind quarters; move fore-quarter to shipping, weigh, and load on rail-equipped trucks; move hindquarter to primal breaking area	.0552/side		
5. Select, break sides into quarters, move both quarters to primal breaking area	.0276/side		
6. Move quarters from holding cooler to primal breaking area	.0111/quarter		
7. Break hindquarters into primals; put rounds and loins on 2-hook-trolleys and kidney knob, fat, and untrimmed flanks in combo-bins	.0501/hind		
8. Break forequarters into primals; put ribs on 12-hook-trolleys, armbone chucks on 2-hook-trolleys, untrimmed (bone-in) short plates and briskets in combo-bins	.0393/fore		
9. Move hanging primals to shipping, weigh, and load on rail-equipped trucks	.0776/trolley		
10. Move combo-bins of product to shipping and/or to further processing	.1000/combo-bin		
11. Move primals to subprimal breaking area	.0198/trolley		
12. Break rounds into subprimals; put knuckles and inside and outside rounds in vacuum or poly-bags and boxes; put trim, fat, and bones in combo-bins	.3000/round		
13. Break full loins into full tenders, bns. strips, top butts, bottom butts, trim, fat, and bone; put subprimals in vacuum or poly-bags and boxes or lay aside for steaking; put trim, fat, and bones in combo-bins	.3333/loin		
14. Break full loins into full tenders, bns. strips, sirloin butts, trim, fat, and bone; put subprimals in vacuum or poly-bags and boxes or lay aside for steaking; put trim, fat, and bones in combo-bins	.2000/loin		
15. Break full loins into short loins and sirloins; put subprimals in vacuum or poly-bags and boxes or lay aside for steaking	.0500/loin		
16. Break primal ribs into rib-eye rolls, trim, fat, and bone; put rolls in vacuum or poly-bags and boxes or lay aside for steak-			
		ing; put trim, fat, and bone in combo-bins	.1670/rib
		17. Break primal ribs into roast-ready ribs, trim, fat, and bone; tie and place roast-ready ribs in vacuum or poly-bags and boxes; put trim, fat, and bones in combo-bins	.1670/rib
		18. Vacuum and box subprimals	.0164/bag
		19. Move boxed beef to shipping area and load on trucks	.0077/box
		20. Unload, weigh, and store hanging quarters	.0441/quarter
		21. Unload, weigh, and store combo-bins of boneless beef and trim for grinding	.1000/combo bin
		22. Obtain and fabricate following subprimals into steaks; put steaks in boxes with layers separated by peach paper, or put aside for further wrapping, or, if at HRI level, place on trays; put tenderloin tips and boneless meat from tenderloin in vacuum or poly-bags and boxes; put trim, excess fat, and bones in combo-bins:	
		Full tenderloin	.1250/tender
		Boneless strip loins	.1430/strip
		Top sirloin butts	.1000/top butt
		Short loins	.2500/sh. loin
		Rib-eye roll	.1000/rib-roll
		23. Individually wrap, box, and weigh the following:	
		Tenderloin steak	.0100/steak
		Strip steaks	.0045/steak
		Top butt steaks	.0033/steak
		Porterhouse, T-bone, & club steaks	.0080/steak
		Rib-eye steaks	.0033/steak
		24. Move boxed steaks and ground beef patties to blast freezer	.0125/box
		25. Move previously frozen boxed steaks and ground beef patties from blast freezer to holding freezer	.0125/box
		26. Unload, weigh, and store hanging primals	.0776/trolley
		27. Unload, weigh, and store boxed beef	.0077/box
		28. Grind boneless beef and trim with large grinder into ground beef	.0016/pound
		29. Grind boneless beef and trim with large grinder, form 4-oz. patties, and put in 10-lb. boxes	.0045/pound
		30. Add trim to bulk ground beef, grind and form 4-oz. patties on a hand machine	.0158/pound

Table 46. Annual labor requirements of model packers

<i>Packer type and operation</i>	<i>Labor hours</i>	<i>Labor cost</i>
		dollars
Type 1		
1. Move sides from chill to holding cooler, and rib sides	4,189.9	19,902
2. Select, break sides to quarters, move to shipping, weigh, load on trucks	21,485.6	102,057
Total	25,675.5	121,959
Type 2		
1. Move sides from chill to holding cooler, and rib sides	4,189.9	19,902
2. Select, break sides to quarters; move "extra" forequarters to shipping, weigh, load on nonmodel-bound trucks; move other quarters to primal breaking	10,427.3	49,530
3. Break into primals; put rounds, arm chucks, and loins on 2-hook trolleys, ribs on 12-hook trolleys, all else in combo-bins	16,519.5	78,468
4. Move primals to shipping, weigh, and load trucks	23,873.6	107,432
5. Move combo-bins to shipping or nonmodel processing	611.5	2,752
Total	55,621.8	258,084
Type 3		
1. Move sides from chill to holding cooler, rib sides	4,189.9	19,902
2. Select, break sides to quarters; move "extra" forequarters to shipping, weigh, load on nonmodel-bound trucks; move other quarters to primal breaking	10,427.3	49,530
3. Break into primals; put rounds, arm chucks, and loins on 2-hook trolleys, ribs on 12-hook trolleys, all else in combo-bins	16,519.5	78,468
4. Move "extra" primals to shipping, weigh, and load in nonmodel-bound trucks	10,103.5	45,466
5. Move other primals to subprimal breaking area and break	104,770.4	496,780
6. Vacuum and box subprimals	19,305.9	86,874
7. Move "extra" subprimals to shipping, load on nonmodel-bound trucks	1,315.3	5,920
8. Move other subprimals and suitable grinding trim to shipping, weigh and load in model-bound trucks	1,707.5	7,684
9. Move combo-bins to shipping or nonmodel processing	865.0	3,893
Total	169,204.5	794,517

Table 47. Annual labor requirements of model purveyors

<i>Purveyor type and operation</i>	<i>Labor hours</i>	<i>Labor cost</i>
		dollars
Type 1		
1. Receive hanging quarters and combo-bins of boneless beef	2,629.6	11,833
2. Move and break quarters to primals; place rounds, arm chucks, and loins on 2-hook trolleys, ribs on 12-hook trolleys, all else in combo-bins	3,407.1	16,020
3. Move "extra" primals to shipping, weigh, and load in nonmodel-bound trucks	1,683.9	7,578
4. Move other primals to subprimal breaking; break and put in vacuum bag, non subprimals in combo-bins	17,461.8	82,798
5. Vacuum and clip bags, box subprimals	3,217.5	14,479
6. Move trim and boneless beef to grinding, coarse grind, and pack in 10-lb. tubs	2,051.8	9,232
7. Move "extra" subprimals to shipping, weigh, load on nonmodel-bound trucks	219.2	986
8. Move other subprimals to shipping, weigh, load on model-bound trucks	1,212.1	5,454
9. Move other items to shipping or nonmodel processing	144.1	648
Total	32,027.1	149,028
Type 2		
- Steps 1, 2, and 3 same as purveyor type 1	7,720.6	35,431
4. Move other primals to subprimal breaking; break, put some in vacuum bags, others to steaking, all else in combo-bins	17,461.8	82,798
5. Cut steaks and layer pack; put tenderloin kabob meat in poly-bags, all else in combo-bins	12,012.5	57,059
6. Move trim and boneless beef to grinding, grind, form 4-oz. patties, pack in 10-lb. boxes	6,324.5	28,460
7. Move "extra" subprimals and kabob meat to shipping, weigh, and load on nonmodel-bound trucks	250.2	1,126
8. Move other roasts, steaks, and patties to shipping; weigh, and load on trucks for model firms	1,651.3	7,430
9. Move combo-bins to shipping or nonmodel processing	154.2	693
Total	45,575.1	212,997
Type 3		
- Steps 1, 2, and 3 same as purveyor type 1	7,720.6	35,431
4. Move other primals to subprimal breaking; break, put some in vacuum bags, others to steaking, all else in combo-bins	17,461.8	82,798
5. Cut, wrap each individually, and box steaks; put tenderloin kabob meat in vacuum bags, all else in combo-bins	18,380.8	85,716
6. Move and grind trim and boneless beef, form 4-oz. patties, pack in 10-lb. boxes	6,324.5	28,460
7. Move steaks and patties to blast freezer; move previously frozen from blast to holding freezer	5,113.5	23,011

Table 47. (continued)

<i>Purveyor type and operation</i>	<i>Labor hours</i>	<i>Labor cost</i>	<i>Purveyor type and operation</i>	<i>Labor hours</i>	<i>Labor cost</i>
		dollars			dollars
8. Vacuum and box subprimals and kabob meat	1,846.3	8,308	5. Move steaks and patties to blast freezer, move previously frozen from blast to holding freezer	5,113.5	23,011
9. Move "extra" subprimals and kabob meat to shipping; load model-bound trucks	250.2	1,126	6. Vacuum and box remaining subprimals and tenderloin kabob meat	1,846.3	8,308
10. Move other roasts, steaks, and patties to shipping; load model-bound trucks	1,651.4	7,430	7. Move "extra" subprimals and kabob meat to shipping, load on nonmodel-bound trucks	250.2	1,126
11. Move combo-bins to shipping or nonmodel processing	154.2	693	8. Move other roasts, steaks, and patties to shipping, load on model-bound trucks	1,651.4	7,430
Total	58,903.3	272,973	9. Move combo-bins to shipping or nonmodel processing	52.3	235
Type 4			Total	53,407.9	247,556
1. Receive hanging primals and combo-bins of boneless beef	2,327.1	10,471	Type 7		
2. Move primals to subprimal breaking area, break and place in vacuum bags, all else in combo-bins	17,461.8	82,798	1. Receive vacuum-packed, boxed subprimals and combo-bins of boneless beef and suitable grinding trim	316.8	1,424
3. Vacuum and box subprimals	3,217.5	14,479	2. Move and coarse grind trim and boneless beef, pack in 10-lb. tubs	2,051.8	9,233
4. Move trim and boneless beef to grinding, coarse grind, pack in 10-lb. tubs	2,051.8	9,232	3. Move subprimals and ground beef to shipping, load on model-bound trucks	3,580.7	16,111
5. Move "extra" subprimals to shipping, load on nonmodel-bound trucks	219.2	986	Total	5,949.3	27,768
6. Move other subprimals and ground beef to shipping, load on model-bound trucks	1,212.1	5,454	Type 8		
7. Move combo-bins to shipping or nonmodel processing	42.2	190	1. Receive vacuum-packed, boxed subprimals and combo-bins of boneless beef and suitable grinding trim	316.8	1,424
Total	26,531.7	123,610	2. Cut some steaks and layer pack; put tenderloin kabob meat in poly-bags, all else in combo-bins	12,012.5	57,059
Type 5			3. Move and grind fabrication trim and purchased boneless beef and trim, form 4-oz. patties, pack in 10-lb. boxes	6,324.6	28,461
1. Receive hanging primals and combo-bins of boneless beef	2,327.1	10,472	4. Move roasts, steaks, and patties to shipping; load on model-bound trucks	1,651.3	7,430
2. Move primals to subprimal breaking, break, some to steaking; put some in poly-bags and boxes, all else in combo-bins	17,461.8	82,798	5. Move combo-bins and tenderloin kabob meat to shipping or nonmodel processing	41.1	185
3. Cut steaks and layer pack; put tenderloin kabob meat in poly-bags, all else in combo-bins	12,012.5	57,059	Total	20,346.3	94,559
4. Move and grind trim and boneless beef, form 4-oz. patties, pack in 10-lb. boxes	6,324.5	28,460	Type 9		
5. Move "extra" subprimals and kabob meat to shipping, load on nonmodel-bound trucks	250.2	1,126	1. Receive vacuum-packed, boxed subprimals and combo-bins of boneless beef and suitable grinding trim	316.8	1,424
6. Move other roasts, steaks, and patties to shipping, load on model-bound trucks	1,651.4	7,430	2. Cut some steaks wrap each, and box; put tenderloin meat in poly-bags, all else in combo-bins	18,380.8	85,716
7. Move combo-bins to shipping or nonmodel processing	52.3	235	3. Move fabrication trim and boneless beef and trim, form 4-oz. patties, put in 10-lb. boxes	6,324.6	28,461
Total	40,079.8	187,580	4. Move steaks and patties to blast freezer; move previously frozen from blast to holding freezer	5,113.5	23,011
Type 6			5. Move and load roasts, steaks, and patties to model-bound trucks; move combo-bins to nonmodel trucks or processing	1,692.5	7,615
1. Receive hanging primals and combo-bins of boneless beef	2,327.1	10,472	Total	31,828.2	146,227
2. Move primals to subprimal breaking; break, some to steaking, others in vacuum bags, all else in combo-bins	17,461.8	82,798			
3. Cut, wrap individually, and box steaks; put tenderloin kabob meat in vacuum bags, all else in combo-bins	18,380.8	85,716			
4. Move and grind trim and boneless beef, form 4-oz. patties, pack in 10-lb. boxes	6,324.5	28,460			

Table 48. Annual labor requirements of model HRI firms

HRI firm type and operation	Labor hours	Labor cost
dollars		
Type 1		
1. Receive vacuum-packed, boxed subprimals and bulk coarse-ground beef	24.2	109
2. Cut some steaks and reserve for cooking; put tenderloin kabob meat in poly-bags and boxes, all else in barrels	240.2	1,141
3. Move and grind fabrication trim and bulk ground beef, form 4-oz. patties	459.4	2,067
4. Move excess fat, bone, and tenderloin kabob meat to shipping	2.0	9
Total	725.8	3,326
Type 2		
1. Receive fresh roasts, steaks, and ground beef patties	33.2	149
Total	33.2	149
Type 3		
1. Receive fresh roasts, frozen steaks, and ground beef patties	33.2	149
2. Move steaks and patties from freezer to tempering (or thawing) area	51.4	231
Total	84.6	380

Table 50. Cost and weight of packaging materials for steaks and patties

Product	Average weight	Number per box	Layer-pack		Individual overwrap	
			Cost	Total weight	Cost	Total weight
	oz.	units	\$	lb.	\$	lb.
Tenderloin steaks	8	20	.23618	11.3792	.27218	11.4112
Strip steaks	12	16	.23618	13.3792	.29138	13.4252
Top butt steaks	8	20	.23618	11.3792	.27218	11.4112
Porterhouse & T-bone steaks	16	12	.23618	13.3792	.28218	13.4192
Rib-eye steaks	8	20	.23618	11.3792	.27218	11.4112
Ground beef patties	4	40	.27969	11.4087	N.A.*	N.A.*

*N.A. = not applicable.

Table 49. Cost and weight of packaging materials for roasts and subprimals

Product	Average weight	Number per box	Vacuum pack + box		Poly-bag + box	
			Cost	Total weight	Cost	Total weight
	lb.	units	\$	lb.	\$	lb.
Roast-ready rib	18.9	2	1.37842	39.593	.24432	39.503
Rib-eye roll	8.7	6	.64890	54.073	.31896	54.235
Knuckle	11.0	4	.54480	46.253	.35164	46.389
Inside round	20.0	2	1.53978	42.287	.31432	42.223
Outside round	13.0	3	.61405	41.306	.33298	41.306
Short loin	28.0	2	1.37754	60.431	.58332	60.223
Bnls. strip loin	13.6	3	.63305	42.714	.27398	42.672
Sirloin	29.8	2	.74402	61.745	.29232	61.663
Sirloin butt	18.8	2	.53250	39.415	.25232	39.361
Top butt	11.3	4	.67200	47.135	.28964	47.127
Bottom butt	7.5	4	.58360	32.149	.32964	32.229
Full tenderloin	6.9	6	.70790	43.373	.32696	43.493
Tenderloin kabob meat	10.0	1	.16155	10.738	.11366	10.786

Table 51. Cost and weight of packaging materials for ground and boneless beef

Product	Average weight	Package type	Package cost	Total weight
				lb.
Bulk ground beef	10	Tub & lid	.20685	10.06
Boneless beef suitable for grinding	2000	Combo-bins	1.75000	2008.5

Table 52. Annual cost of packaging materials for model firms

Type of firm	Costs
Packers	\$
1	3,369
2	14,070
3	338,257
Purveyors	
1	81,010
2	69,340
3	92,832
4	79,227
5	67,557
6	91,048
7	25,722
8	54,990
9	57,898

Table 53. Annual equipment operating expenses of model firms

Type of firm	Power	Sanitation	Repair/ maintenance	Total
costs in dollars				
Packers				
1	719,550	21,099	34,760	775,409
2	776,100	21,099	34,760	831,959
3	848,250	21,099	34,760	904,109
Purveyors				
1	171,600	10,601	14,880	197,081
2	171,600	10,601	14,880	197,081
3	280,800	10,601	14,880	306,281
4	106,800	10,601	14,880	132,281
5	106,800	10,601	14,880	132,281
6	215,280	10,601	14,880	240,761
7	62,400	5,354	972	68,726
8	86,580	5,354	14,880	106,814
9	195,780	5,354	14,880	216,014
HRI firms				
1	10,725	2,685	388	13,798
2	2,925	1,349	0	4,274
3	4,312	1,349	0	5,661

Table 54. Capital goods required by model packers

Building and equipment	Cost per unit	Total cost		
		Type 1 packers	Type 2 packers	Type 3 packers
dollars				
Building area (cost/sq. ft.)				
Holding cooler	28	336,000	341,600	344,400
Breaking quarters into primals	28	0	2,800	2,800
Breaking primals into subprimals	28	0	0	33,600
Packaging	28	0	0	8,400
Packaging materials storage	28	0	0	2,800
Order assembly	28	12,600	42,000	44,800
Loading dock and apron	28	2,800	2,800	2,800
Power plant	28	70,000	70,000	70,000
Total building		421,400	459,200	509,600
Equipment				
Refrigeration unit	50,000	50,000	50,000	50,000
Doors for loading dock	2,000	4,000	4,000	4,000
Power breaking saws	365	365	365	365
Band saws (large)	4,000	0	4,000	4,000
Rail-type scales	1,800	1,800	3,600	3,600
Floor scales	3,600	0	3,600	3,600
Platform or bench scales	1,200	0	0	1,200
Rails (cost per foot)	4	10,800	10,800	10,800
Single-hook trolleys	8	26,040	15,120	15,120
Two-hook trolleys	10	0	22,430	18,200
Twelve-hook trolleys	30	0	2,100	1,380
Wood pallets	4	0	0	400
Hand pallet jacks	325	0	0	325
Walk-type fork lifts	5,000	0	5,000	5,000
Stainless tubs	400	0	8,000	16,000
Shelf trucks	400	0	0	4,000
Barrels (stainless)	100	0	0	2,000
Boning table (moving belt—4' x 20')	5,000	0	0	5,000
Bagging table	1,400	0	0	1,400
Vacuumizing & clipping machine	1,610	0	0	1,610
Shrink tunnel	3,890	0	0	3,890
Packaging table (4' x 4')	200	0	0	200
Strapping machine for closing cartons	1,200	0	0	1,200
Loading chute for netting subprimals	60	0	0	120
Total equipment		93,005	129,015	153,410
Total capital goods		514,405	588,215	663,010

Table 55. *Capital goods required for model purveyors*

Building and equipment	Cost per unit	Total cost for purveyors of:								
		Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7	Type 8	Type 9
dollars										
Building area: (cost sq. ft.)										
Receiving dock, including unloading	28	2,800	2,800	2,800	1,400	1,400	1,400	1,400	1,400	1,400
Holding cooler for incoming beef	28	22,400	22,400	22,400	16,800	16,800	16,800	11,200	11,200	11,200
Breaking quarters into primals	28	8,400	8,400	8,400	0	0	0	0	0	0
Breaking primals into subprimals & subprimals into steaks	28	11,760	11,760	11,760	11,760	11,760	11,760	0	11,760	11,760
Packaging subprimals and steaks	28	5,600	5,600	5,600	5,600	5,600	5,600	0	5,600	5,600
Making and packaging ground beef	28	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600
Blast freezer	75	0	0	15,000	0	0	15,000	0	0	15,000
Storage freezer	28	0	0	25,200	0	0	25,200	0	0	25,200
Outgoing product storage	28	41,440	41,440	41,440	11,200	11,200	11,200	8,400	8,400	8,400
Order assembly	28	16,800	16,800	16,800	16,800	16,800	16,800	14,000	14,000	14,000
Loading dock and apron	28	2,800	2,800	2,800	2,800	2,800	2,800	2,800	2,800	2,800
Packaging materials storage	28	8,400	8,400	8,400	5,600	5,600	5,600	1,400	2,800	2,800
Total building		126,000	126,000	166,200	77,560	77,560	117,760	44,800	63,560	103,760
Equipment required:										
Refrigeration units	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
Receiving doors	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
Power breaking saws	365	730	730	730	0	0	0	0	0	0
Large band saws	4,000	4,000	4,000	4,000	4,000	4,000	4,000	0	0	0
Small band saws	2,000	2,000	2,000	2,000	2,000	2,000	2,000	0	2,000	2,000
Rail scales	1,800	5,400	5,400	5,400	3,600	3,600	3,600	0	0	0
Floor scales	3,600	3,600	3,600	3,600	3,600	3,600	3,600	3,600	3,600	3,600
Platform or bench scales	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200
Portion-control scales, over-under type	250	0	500	500	0	500	500	0	500	500
Rails, including switches (cost ft.)	4	7,600	7,600	7,600	4,000	4,000	4,000	0	0	0
Single-hook trolleys	8	6,080	6,080	6,080	0	0	0	0	0	0
Two-hook trolleys	10	3,830	3,830	3,830	4,710	4,710	4,710	0	0	0
Twelve-hook trolleys	30	60	60	60	540	540	540	0	0	0
Wood pallets	4	80	80	80	80	80	80	80	80	80
Hand pallet jacks	325	325	325	325	325	325	325	325	325	325
Walk-type fork lift	5,000	5,000	5,000	5,000	0	0	0	0	0	0
Hand barrel trucks	300	600	600	600	300	300	300	0	300	300
Stainless tubs (4 wheel) (2½'x5')	400	6,000	6,000	6,000	4,000	4,000	4,000	0	0	0
Shell trucks	100	100	1,200	1,200	100	1,200	1,200	0	800	800
Barrels (stainless)	100	2,000	2,000	2,000	2,000	2,000	2,000	0	1,000	1,000
Vacuum and clipping machine	1,610	1,610	0	1,610	1,610	0	1,610	0	0	0
Shrink tunnel	3,890	3,890	0	3,890	3,890	0	3,890	0	0	0
Bagging table	1,400	1,400	1,400	1,400	1,400	1,400	1,400	0	1,400	1,400
Loading chute for netting roasts	60	60	60	60	60	60	60	0	0	0
Heat sealer for packaging steaks (rented)	3,600	0	0	3,600	0	0	3,600	0	0	3,600
Strapping machine for closing cartons	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200
Grinder	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700
Patty maker & conveyor from grinder to patty machine	8,000	0	8,000	8,000	0	8,000	8,000	0	8,000	8,000
Boning table (moving S.S. belt, 4'x20')	5,000	5,000	5,000	5,000	5,000	5,000	5,000	0	0	0
Cutting table (8'x36" with 1" cutting board)	300	0	0	0	0	0	0	0	1,200	1,200
Packaging table (4'x4')	200	200	200	200	200	200	200	200	200	200
Storage racks for in-storage freezer	2,000	0	0	2,000	0	0	2,000	0	0	2,000
Doors for loading out	2,000	4,000	4,000	4,000	2,000	2,000	2,000	2,000	2,000	2,000
Total equipment		99,965	103,765	114,865	79,815	83,615	94,715	42,305	57,505	63,105
Total capital goods		225,965	229,765	281,065	157,375	161,175	212,475	87,105	121,065	166,865

Table 56. *Capital goods required for model HRI firms*

Building and equipment	Cost per unit	Total cost		
		Type 1 firms	Type 2 firms	Type 3 firms
dollars				
Building areas: (cost/sq. ft.)				
Receiving, including unloading dock	28	1,120	1,120	1,120
Holding cooler for incoming fresh beef	28	1,400	1,400	1,400
Holding freezer for incoming frozen beef	28	0	0	560
Cutting subprimals into steaks	28	2,800	0	0
Grinding and forming patties	28	2,800	0	0
Tempering or thawing the steaks and patties	28	0	0	560
Total building for beef		8,120	2,520	3,640
Equipment:				
Band saw (small)	2,000	2,000	0	0
Platform or bench scale	1,200	1,200	1,200	1,200
Portion-control scales (over-under)	250	250	0	0
Shelf truck	400	400	400	400
Stainless barrels	100	300	0	0
Hand barrel truck	300	300	0	0
Grinder	600	600	0	0
Patty maker (hand operated)	250	250	0	0
Cutting table	200	200	0	0
Refrigeration unit	15,000	15,000	15,000	15,000
Total equipment		20,500	16,600	16,600
Total capital goods		28,620	19,120	20,240

A firm's physical requirements were estimated by the cooperating firm's engineers and then the costs were determined for new equipment or construction to satisfy these physical requirements (tables 54, 55, and 56).

Table 57. *Annual capital goods costs of model firms*

Type of firm	Depreciation	Property tax	Insurance	Total
dollars				
Packers				
1	30,370	15,169	782	46,321
2	35,861	17,595	894	54,350
3	40,820	19,920	1,008	61,748
Purveyors				
1	16,296	7,314	343	23,953
2	16,676	7,460	349	24,485
3	25,036	8,993	427	32,456
4	11,859	5,206	239	17,304
5	12,239	5,352	245	17,836
6	18,599	6,885	323	25,807
7	6,470	2,861	132	9,463
8	8,928	3,962	184	13,074
9	14,738	5,283	254	20,275
HRI firms				
1	2,456	1,013	43	3,512
2	1,786	708	29	2,523
3	1,842	739	31	2,612

To put these costs on a yearly basis, fixed depreciation rates of 5 percent for the building and 10 percent for the equipment, fixed property tax rates, and fixed insurance rates were assumed (table 57).

The expenses for transportation between firms were based on the simplifying assumption that the packers were located in Wichita, Kansas, the purveyors in New York City, and the HRI firms within a 50-mile radius of the purveyors.⁵ This cost was based on the estimated rate a common carrier would charge to make the deliveries, using a 35,000-pound-capacity truck for the longdistance hauls and smaller trucks for the short ones (tables 58 and 59).⁶ The number of pounds shipped is not divisible into exact, full truck loads, but since this model is an annual model, the error in assuming the rate for a full truck load was not significant.

⁵This study financed under a cooperative agreement with Transportation and Facilities Branch, ARS, USDA, which had similar agreements with Kansas State Univ. and Texas A&M Univ. to do research in beef distribution to the retail market. Therefore, where possible, common assumptions are made; such as packers located in Wichita and final destination in New York.

⁶Wichita to New York rates based on information to author from Richard S. Harland, Traffic Mgr.-Adm., Eastern Express, Inc., Terre Haute, Ind., Sept. 7, 1972. Short-haul rates estimated by transportation division of cooperating firm.

Table 58. Annual transportation costs: packers to purveyors

Packer and products	Product weight	Total weight*	Shipping rate	Total cost
	pounds		\$/cwt.	dollars
Type 1 packers:				
Quarters, naked, hanging	60,908,400	60,908,400	2.88	1,754,162
Boneless beef in combo-bins	3,850,230	3,866,592	2.71	104,785
Total	64,758,630	64,774,992		1,858,947
Type 2 packers:				
Primals, naked, hanging	25,025,280	25,025,280	2.88	720,728
Boneless beef in combo-bins	3,850,230	3,866,592	2.71	104,785
Total	28,875,510	28,891,872		825,513
Type 3 packers:				
Subprimals boxed & trim in combo-bins	12,604,890	13,121,520	2.71	355,593
Boneless beef in combo-bins	3,850,230	3,866,592	2.71	104,785
Total	16,455,120	16,988,112		460,378

*Includes packaging.

Table 59. Annual transportation costs: purveyors to HRI firms

Purveyor type	Product weight	Total weight*	Shipping rate	Total costs
	pounds		\$/cwt.	dollars
1	2,742,526	2,833,843	3.60	102,018
2	2,500,085	2,807,399	3.60	101,066
3	2,500,085	2,810,322	3.60	101,172
4	2,742,526	2,833,843	3.60	102,018
5	2,500,085	2,807,399	3.60	101,066
6	2,500,085	2,810,322	3.60	101,172
7	2,742,526	2,833,843	3.60	102,018
8	2,500,085	2,807,952	3.60	101,086
9	2,500,085	2,810,322	3.60	101,172

*Includes packaging for boxed beef.

Product Mix

Each of the 3 types of packers in the model start with the same number of carcasses and extra boneless beef but, since they do different amounts of fabricating, the mix of products they sell is dissimilar. Because of the nature of the products, some items are sold to firms within the model (table 60) and the remaining, or by-products, are sold to nonmodel firms such as retailers, processors, and Tenderers (table 61).

Likewise, the purveyors each sell a different product mix. Types 1, 4, and 7 sell the same product mix to model firms. Types 2, 5, and 8 all sell the same, and types 3, 6, and 9 sell identical items to model firms (table 62). However, because types 1, 2, and 3 purveyors receive quarters and boneless beef, types 4, 5, and 6 purveyors receive primals and boneless beef, and types 7, 8, and 9 purveyors receive subprimals, trim, and

Table 60. Product mix sold annually by packers to model purveyors

Packer and products	Product units	Product weight
	number	pounds
Type 1 packers		
Hindquarters, hanging	243,600	40,924,800
Forequarters, hanging	109,800	19,983,600
Boneless beef, in combo-bins	1,925	3,850,230
Total		64,758,630
Type 2 packers		
Primal rounds, hanging	93,000	7,486,500
Full loins, hanging	243,600	14,080,080
Primal ribs, hanging	109,800	3,458,700
Boneless beef, in combo-bins	1,925	3,850,230
Total		28,875,510
Type 3 packers		
Inside rounds, boxed	93,000	1,860,000
Full tenderloins, boxed	161,100	1,111,590
Boneless strip loins, boxed	71,700	975,120
Top sirloin butts, boxed	140,100	1,583,130
Short loins, boxed	82,500	2,310,000
Rib-eye rolls, boxed	90,300	785,610
Roast-ready ribs, boxed	19,500	368,550
Trim suitable for grinding, in combo-bins	1,805	3,610,890
Boneless beef, in combo-bins	1,925	3,850,230
Total		16,455,120

boneless beef, each of the 9 types of purveyors has different "by-products" to sell to nonmodel firms (table 63).

The only HRI companies that do any fabricating and thus have "by-products" are the type 1 firms. Each of these has 805.5 pounds of tenderloin kabob meat and 4,043.2 pounds of fat and bone per year to dispose of to non-HRI markets.

Table 61. "By-products" sold annually by model packers

Packer and products	Product units	Product weight
	number	pounds
Type 1 packers		
Forequarters	133,800	24,351,600
Total by-products		24,351,600
Type 2 packers		
Forequarters	133,800	24,351,600
Primal rounds	150,600	12,123,300
Armbone chucks	109,800	11,529,000
Kidney knob and fat	1,693	3,386,040
Flanks (untrimmed)	1,924	3,848,880
Short plates (untrimmed, bone-in)	1,537	3,074,400
Briskets (untrimmed, bone-in)	961	1,921,500
Total by-products		60,234,720
Type 3 packers		
Forequarters	133,800	24,351,600
Primal rounds	150,600	12,123,300
Armbone chucks	109,800	11,529,000
Knuckles	93,000	1,023,000
Outside rounds	93,000	1,209,000
Boneless strip loins	89,400	1,215,840
Bottom sirloin butts	140,100	1,050,750
Sirloin butts	21,000	394,800
Sirloin	82,500	2,458,500
Kidney knob and fat	1,693	3,386,040
Flanks (untrimmed)	1,924	3,848,880
Short plates (untrimmed, bone-in)	1,537	3,074,400
Briskets (untrimmed, bone-in)	961	1,921,500
Excess fat	1,202	2,403,510
Bone	1,333	2,664,990
Total by-products		72,655,110

Table 62. Product mix sold annually by model purveyors to model HRI firms

Purveyors and products	Product units	Product weight
	number	pounds
Type 1, 4, and 7 purveyors		
Inside rounds, boxed	15,500	310,000
Full tenderloins, boxed	26,850	185,265
Boneless strip loins, boxed	11,950	162,520
Top sirloin butts, boxed	23,350	263,855
Short loins, boxed	13,750	385,000
Rib-eye rolls, boxed	15,050	130,935
Roast-ready ribs, boxed	3,250	61,425
Coarse ground beef, boxed	124,352	1,243,520
Total		2,742,520
Type 2, 5, and 8 purveyors		
Inside rounds, boxed	15,500	310,000
Rib-eye rolls, boxed	3,300	28,710
Roast-ready ribs, boxed	3,250	61,425
Tenderloin steaks, boxed	214,800	107,400
Boneless strip loin steaks, boxed	143,400	107,550
Top sirloin butt steaks, boxed	350,250	175,125
Porterhouse, T-bone & club steaks, boxed	220,000	220,000
Rib-eye steaks, boxed	199,750	99,875
Ground beef patties, boxed	5,560,000	1,390,000
Total		2,500,085
Type 3, 6, and 9 purveyors		
Inside rounds, boxed	15,500	310,000
Rib-eye rolls, boxed	3,300	28,710
Roast-ready ribs, boxed	3,250	61,425
Tenderloin steaks, frozen, boxed	214,800	107,400
Boneless strip loin steaks, frozen, boxed	143,400	107,550
Top sirloin butt steaks, frozen, boxed	350,250	175,125
Porterhouse, T-bone, & club steaks, frozen, boxed	220,000	220,000
Rib-eye steaks, frozen, boxed	199,750	99,875
Ground beef patties, frozen, boxed	5,560,000	1,390,000
Total		2,500,085

Table 63. By-products sold annually by model purveyors

By-products	Number and weight of product units for purveyors of:											
	Type 1		Types 2 and 3		Type 4		Types 5 and 6		Type 7		Types 8 and 9	
	no.	lb.	no.	lb.	no.	lb.	no.	lb.	no.	lb.	no.	lb.
Primal rounds	25,100	2,020,550	25,100	2,020,550	0	0	0	0	0	0	0	0
Armbone chucks	18,300	1,921,500	18,300	1,921,500	0	0	0	0	0	0	0	0
Knuckles	15,500	170,500	15,500	170,500	15,500	170,500	15,500	170,500	0	0	0	0
Outside rounds	15,500	201,500	15,500	201,500	15,500	201,500	15,500	201,500	0	0	0	0
Boneless strip loins	14,900	202,640	14,900	202,640	14,900	202,640	14,900	202,640	0	0	0	0
Bottom sirloin butts	23,350	175,125	23,350	175,125	23,350	175,125	23,350	175,125	0	0	0	0
Sirloin butts	3,500	65,800	3,500	65,800	3,500	65,800	3,500	65,800	0	0	0	0
Sirloin	13,750	409,750	13,750	409,750	13,750	409,750	13,750	409,750	0	0	0	0
Tenderloin kabob meat	0	0	4,028	40,275	0	0	4,028	40,275	0	0	4,028	40,275
Kidney knob & fat	282	564,340	282	564,340	0	0	0	0	0	0	0	0
Flanks (untrimmed)	321	641,480	321	641,480	0	0	0	0	0	0	0	0
Short plates (untrimmed, bone-in)	256	512,400	256	512,400	0	0	0	0	0	0	0	0
Briskets (untrimmed, bone-in)	160	320,250	160	320,250	0	0	0	0	0	0	0	0
Excess fat	200	400,585	292	584,870	200	400,585	292	584,870	0	0	92	184,285
Bone	222	444,165	231	462,040	222	444,165	231	462,040	0	0	9	17,875
Total		8,050,585		8,293,020		2,070,065		2,312,500		0		242,435

Because each of the firm's costs includes the expense of producing the products that are not needed in the model, a credit is given for these by-products. The credit is based on the F.O.B. prices of a cooperating firm for a given day (table 64). For type 1 HRI firms, the fat and bones produced were considered more of a liability than a value, thus no credit was given for them. The tenderloin kabob meat produced at the type 1 HRI firms was credited to the channel cost, even though they would probably use it themselves.

Total Direct Cost

The total direct cost of each channel is determined as in the equation given previously (page 28). Each channel starts with the same 121,800 carcasses of beef at a cost of 58.5 cents per pound (equation code VC) and 3,850,230 pounds of boneless beef at 75 cents per pound (VB). The annual costs incurred by the model firms to handle and fabricate the beef (CS, CP, and CH) consist of labor requirements (tables 46, 47, and 48), plus packaging materials costs (table 52), plus equipment operating expenses (table 53), plus cost of capital goods (table 57). Because each channel produces extra products not needed at the HRI firm, the value of these products (VES, VEP and VEH—table 64) is subtracted from the total direct cost. The other cost incurred in each channel is that of transporting the products from the packer (TS—table 58) to the end user (TP—table 59). That is, each of the previously determined cost components are combined to give a total annual direct cost of physical distribution for each of the nine theoretical channels (table 65).

Comparison of the total direct costs clearly shows that channel 8, where purveyors receive subprimals, trim, and boneless beef and HRI firms receive fresh roasts, steaks

Table 64. "By-product" credit of model firms

Firm	Total weight	Credit
	pounds	dollars
Packers		
1	24,351,600	12,297,558
2	60,234,720	30,373,392
3	72,655,110	38,392,805
Purveyors		
1	8,050,585	4,349,208
2	8,293,020	4,442,350
3	8,293,020	4,442,350
4	2,070,065	1,336,569
5	2,312,500	1,429,711
6	2,312,500	1,429,711
7	0	0
8	242,435	93,142
9	242,435	93,142
HRI firms		
1	805.5	1,671
2	0	0
3	0	0

and patties, is economically the best, whereas the economically least desirable is channel 1, where purveyors receive quarters and boneless beef and HRI firms receive subprimals and bulk ground beef (table 66). Further comparisons of the total direct costs indicate that the less expensive channels are those that include delivering portion-controlled cuts to the food-service firms and that the more fabricating the packer performs, the more economical is the total channel. The channels with packers shipping subprimals (channels 7, 8, and 9) are more economical than comparable channels with packers shipping primals (channels 4, 5, and 6), which are less expensive than their counterparts who ship quarters (channels 1, 2, and 3), even though the costs incurred by the packers are in exactly the opposite relationship.

Table 65. Annual dollar cost of nine theoretical channels of distribution

Cost component*	Channel number								
	1	2	3	4	5	6	7	8	9
VC	49,877,100	49,877,100	49,877,100	49,877,100	49,877,100	49,877,100	49,877,100	49,877,100	49,877,100
VB	2,887,672	2,887,672	2,887,672	2,887,672	2,887,672	2,887,672	2,887,672	2,887,672	2,887,672
CS	947,058	947,058	947,058	1,158,463	1,158,463	1,158,463	2,098,631	2,098,631	2,098,631
-VES	-12,297,558	-12,297,558	-12,297,558	-30,373,392	-30,373,392	-30,373,392	-38,392,805	-38,392,805	-38,392,805
TS	1,858,947	1,858,947	1,858,947	825,513	825,513	825,513	460,378	460,378	460,378
6(CP)	2,706,432	3,023,418	4,227,252	2,114,532	2,431,518	3,631,032	720,132	1,616,622	2,642,484
-6(VEP)	-26,095,248	-26,654,100	-26,654,100	-8,019,414	-8,578,266	-8,578,266	0	-558,852	-558,852
6(TP)	612,108	606,396	607,032	612,108	606,396	607,032	612,108	606,516	607,032
300(CH)	6,190,800	2,083,800	2,596,200	6,190,800	2,083,800	2,596,200	6,190,800	2,083,800	2,596,200
-300(VEH)	-501,300	0	0	-501,300	0	0	-501,300	0	0
TDC	26,186,011	22,332,733	24,490,603	24,772,082	20,918,804	22,631,354	23,952,716	20,679,062	22,217,840

* VC = value of carcasses

VB = value of boneless beef

CS = costs incurred at slaughter

VES = value of extra products at slaughter

TS = transportation costs from slaughter

CP = costs incurred at purveyors

VEP = value of extra products at purveyors

TP = transportation costs from purveyors

CH = costs incurred at HRI

VEH = value of extra products at HRI

TDC = total direct cost

Table 66. *Nine theoretical channels of distribution ranked by total direct cost*

Channel number	Primary type of products shipped		Total direct cost of channel
	By packer	By purveyors	
million dollars			
8	Subprimals	Fresh roasts, steaks, & patties	20.7
5	Primals	Fresh roasts, steaks, & patties	20.9
9	Subprimals	Fresh roasts, frozen steaks, & patties	22.2
2	Quarters	Fresh roasts, steaks, & patties	22.3
6	Primals	Fresh roasts, frozen steaks, & patties	22.6
7	Subprimals	Subprimals	23.9
3	Quarters	Fresh roasts, frozen steaks, & patties	24.0
4	Primals	Subprimals	24.8
1	Quarters	Subprimals	26.2

Table 67. *Nine theoretical channels of distribution ranked by total transportation cost*

Channel number	Primary type of products shipped:		Total annual transportation costs
	By packers	By purveyors	
1000 \$			
8	Subprimals	Fresh roasts, steaks, & patties	1,067
9	Subprimals	Fresh roasts, frozen steaks, & patties	1,067
7	Subprimals	Subprimals	1,072
5	Primals	Fresh roasts, steaks, & patties	1,432
6	Primals	Fresh roasts, frozen steaks, & patties	1,433
4	Primals	Subprimals	1,438
2	Quarters	Fresh roasts, steaks, & patties	2,465
3	Quarters	Fresh roasts, frozen steaks, & patties	2,466
1	Quarters	Subprimals	2,471

Table 68. *Nine theoretical channels of distribution ranked by total cost of labor and equipment operation and of capital goods*

Channel number	Primary type of products shipped:		Annual cost of:	
	By packer	By purveyors	Labor-equipment operations	Capital goods
thousand dollars				
8	Subprimals	Fresh roasts, steaks, & patties	1,407	3,724
5	Primals	Fresh roasts, steaks, & patties	1,428	3,726
2	Quarters	Fresh roasts, steaks, & patties	1,445	4,190
9	Subprimals	Fresh roasts, frozen steaks, & patties	1,786	4,865
6	Primals	Fresh roasts, frozen steaks, & patties	1,858	4,968
3	Quarters	Fresh roasts, frozen steaks, & patties	1,874	5,336
7	Subprimals	Subprimals	1,889	6,628
4	Primals	Subprimals	1,998	6,877
1	Quarters	Subprimals	2,014	7,341

To draw conclusions from the components of the total direct cost, the like components have to be added. That is, to see the implications of transportation requires the adding of TS and 6TP. When this is done the ordering of channels is changed considerably (table 67). This implies that the best way to minimize total transportation cost is for packers to ship subprimals, which are least expensive, or primals, either of which are shipped more economically than quarters.

Adding the labor components or the equipment operations and capital expense components results in still a different ranking of channels (table 68). This ranking indicates that the best way to minimize these costs is to have fresh roasts, steaks, and patties delivered to the restaurants. Having fresh roasts and frozen steaks and patties delivered is more expensive, and the most costly form is for the restaurants to receive subprimals.

Adding the packaging materials components gives another ranking (table 69). The implications of packaging comparisons are not distinct, although the costs

Table 69. *Nine theoretical channels of distribution ranked by total cost of packaging materials*

Channel number	Primary type of products shipped:		Annual cost of packaging materials
	By packers	By purveyors	
1000 \$			
2	Quarters	Fresh roasts, steaks, & patties	419
5	Primals	Fresh roasts, steaks, & patties	419
1	Quarters	Subprimals	489
4	Primals	Subprimals	489
7	Subprimals	Subprimals	493
3	Quarters	Fresh roasts, frozen steaks, & patties	557
6	Primals	Fresh roasts, frozen steaks, & patties	560
8	Subprimals	Fresh roasts, steaks, & patties	668
9	Subprimals	Fresh roasts, frozen steaks, & patties	686

seem to indicate that the most economical packaging is for quarters, then primals, and lastly subprimals, with the purveyors shipping fresh poly-bag roasts, layer-packed steaks and patties, followed by vacuum-packed subprimals, and lastly, vacuum-packed roasts, individually wrapped steaks, and layer-packed patties.

Examination of these components shows that minimizing one component will not necessarily minimize the total direct cost of the physical distribution subsystem. Of course, reducing the cost of a particular component will reduce the cost to the entire system if the rest of the system is not affected, but the model implies that in many instances the rest of the system is indeed affected.

Limitations and Sensitivity of the Model

Even though the total direct costs of the theoretical channels show an economic advantage for a system in which packers break beef into subprimals and purveyors do the steaking and grinding, these figures must be carefully interpreted.

The costs of actually making the product sales have been excluded from the model. Some argue that packers have difficulty selling boxed subprimals rather than quarters or primals. Although it may cost a packer more to sell boxed beef than to hang it, it is not clearly evident that it costs more than a purveyor must pay who is forced to buy and sell items he does not need. However, several packers are proving that boxed beef can be marketed very effectively.

Another aspect not taken into account in the model is services. Service is an important variable, and many firms felt present packer services were inadequate. However, there seems to be no inherent reason for service to be different in any particular channel in this model.

Related to service is product mix. The model necessarily kept product mix small and constant, whereas in reality, it is much greater and is constantly changing. This modification means that the model plants would probably have to add equipment, enlarge buildings, and increase labor to provide greater flexibility and room for the additional products. However, a change in overall costs associated with different product mixes should not alter the basic implications of this model.

Also ignored in this model is product quality. It could be argued that the farther cutting is removed from the user, the more the quality of workmanship and physical characteristics of the meat are likely to suffer. This may sometimes be true, but there is no inherent reason for it. Packer employees should be able to cut a roast as well as, if not better than, a restaurant employee and, given the correct handling techniques and proper packaging or preserving, product quality should remain high. Related to this process is freezing various cuts. The model indicates that freezing adds cost to a product. However,

some of the extra might be more than offset by preservation of quality and increased flexibility. The cost of freezing used in the model was for conventional blast-freezing, but with more modern cryogenic freezing perhaps the cost and quality disadvantages of freezing could be further reduced, thus making it an even more advantageous method.

Correlated to the concept of freezing are delivery costs. The assumption used in this model, based on extensive evidence, was that of a constant cost per pound for making deliveries. If fewer and larger deliveries of frozen than of fresh products can be made, the cost for the channels using frozen would be reduced. The magnitude of change in cost would require further research.

Another major idea not taken into account in the model is that of economy of size. As the size of any of the firms changes, different equipment and perhaps also methods of operation become more or less economically feasible. With these changes, the cost of a channel would certainly be altered, but they might not make any substantial differences in the model.

As previously mentioned, the labor and capital expenses were based on the knowledge and experiences of one cooperating firm. This could imply that costs might be quite different for another type of operation. However, channel 8 (purveyors receiving subprimals and boneless beef and shipping fresh roasts, steaks, and patties) remains economically the best channel, even if labor costs or the equipment-operating and capital-goods expenses are completely ignored, or if these costs are increased by an infinite percentage in each channel. That is, the only cost component that is not the lowest in channel 8 is for package materials, which is a relatively small portion of the total direct costs. The order of economic desirability of the other channels is changed slightly if the labor expenses are either over or underestimated in this study (table 70). Likewise the order of the channels is changed only slightly with relatively large changes in the cost of operating the equipment and owning the capital goods (table 71). The stability of the model over this wide range indicates that, even though the cost estimates may not be exact, the implications of the model remain valid.

Relaxing the restricting assumptions of constant labor productivity and constant labor rates for each firm in the

Table 70. Total direct cost rank of 9 theoretical channels of distribution, when labor costs are changed by more than given percentage

Change from original value	Ranking, lowest to highest cost, by channel number									
percent										
0	8	5	9	2	6	7	3	4	1	
+34	8	5	2	9	6	7	3	4	1	
+651	8	5	2	9	6	3	7	4	1	
-72	8	5	9	6	2	7	3	4	1	

Table 71. Total direct cost rank of 9 theoretical channels of distribution when equipment operating and capital goods expenses are changed by more than given percentage

Change from original value		Ranking, lowest to highest costs, by channel number								
percent										
0	8	5	9	2	6	7	3	4	1	1
+7	8	5	9	2	6	3	7	4	1	1
+17	8	5	2	9	6	3	7	4	1	1
-38	8	5	9	6	2	7	3	4	1	1
-47	8	5	9	6	2	7	4	3	1	1
-66	8	5	9	6	7	2	4	3	1	1
-80	8	5	9	7	6	2	4	3	1	1
-91	8	5	9	7	6	4	2	3	1	1
-98	8	5	7	9	6	4	2	3	1	1

model could significantly change the results of the model. Specialization of labor usually leads to increased efficiencies, therefore the purveyors and packers probably have better labor productivity in fabricating beef than do most food-service operations, since the larger operation could have more specialized and perhaps more skilled labor than could the small HRI operation. This would be especially true for the very small restaurant where the cook cuts meat on only a part-time basis. If labor productivity is indeed greater at the purveyors and packers, then the conclusions of the model become even stronger. That is, labor productivity gives another reason for moving beef fabrication as far back in the distribution channel as possible.

Labor rates do vary considerably. The firms located in larger cities typically had higher wage rates than did those in smaller or rural communities, and since most food-service firms are concentrated in these larger cities, they are likely to have higher wage rates than the packers, who tend to be situated in a suburban environment. Thus, if the wage rates are higher at the HRI than at the packer level, there is an added reason for doing more of the fabricating at the packer level. However, since the packers are large employers and thus more vulnerable to unionization, they may not have as much labor-rate advantage as might be expected. One aspect of labor rates that might make fabricating at the food-service operation more economically feasible is the possibility of fixed and/or family (owner) labor. That is, if a food-service operator has "free" labor available, then the incentive is great to use it for fabricating. Thus, variable wage rates have unclear implications for the model results.

Model Summary

Each channel started with the same products and finished with like products. The total cost of the model was determined by taking the value of the starting products,

adding all the costs incurred in a channel for physically handling and fabricating the products, and subtracting the value of by-products produced in the channel.

The major differences in each theoretical channel were the degree of fabrication and whether the products were fresh or frozen when moved from one firm to the next within each channel. To isolate the effects of variations in form, the following major restrictions were assumed for the model:

1. Each channel consisted of 1 packer, 6 purveyors, 300 HRI firms, and ready markets for "by-products" not in use at the HRI units.
2. Each channel started with identical carcasses and boneless beef, each had identical yields, and each HRI firm ended with the same amount of 9 representative products.
3. Each firm had the same labor rates, and an industrial engineering type of standard time was established for each fabricating and handling operation.
4. Each item of capital goods cost the same, with each firm having the same rates for depreciation, property tax, and insurance.
5. Each firm had the same rates for power, sanitation, and repairs and maintenance.
6. Each firm received the same price for products sold outside the channel.
7. Like packaging materials cost the same throughout each channel.
8. The transportation rates were constant, with packers assumed to be located in Wichita, Kansas, purveyors in New York City, and the HRI firms within a 50-mile radius of the purveyors.

Even with all these restricting assumptions, the model showed that the point of fabrication and whether the product was fresh or frozen are the major variables in determining the most efficient channels of beef distribution to the food-service industry.

The results of the model indicated that, among the 9 alternative channels considered, the most economical was where packers fabricated carcasses into subprimals, vacuum-packed them, and shipped them, along with trim and boneless beef, to the purveyors; the purveyors then cut the subprimals into steaks, made ground beef patties, and shipped the product in fresh form to the HRI firms. This channel was the least expensive of the nine in terms of transportation expenses and costs for direct labor, equipment operation, and capital goods, although it was next to the most expensive channel in terms of packaging material costs. A reasonable generalization of the model results that might be applied to the many alternative systems of distribution not studied is that the closer to origin fabricating can be done, the smaller the direct costs of the beef distribution systems should be.

There are reasons to believe that if the constant productivity assumption were relaxed, the conclusions of

the model would be even more convincing. The model indicated such an obvious advantage for a system that removes beef fabricating from the food-service operation that there must be reasons, not accounted for in the model, for firms to operate in a different manner. One reason for not operating as described in the model is tradition. Many firms appear to be unwilling to change from what they have done in the past, especially if this means abandoning a fixed investment in fabricating machinery.

Related to this is the idea of quality of product. Many food-service operators believe the best quality beef should not be cut until it is ready to be cooked, and it definitely should not be frozen; thus they are reluctant to buy portion-controlled steaks. Additional reasoning for operating as in the past is related to service. The reputation, the services performed, and in some cases, the under-the-table deals of the suppliers make changes in the industry rather slow. Another major barrier to change is the possibility of having "free" or cheap labor available at the HRI firm for fabricating. That is, many food-service firms have family labor or fixed labor that has little opportunity cost so they feel they can justify cutting their own beef. Another factor not examined in the model that could make an alternative channel somewhat more advantageous is that of total cost. That is, the cost of selling, administration, profits, and so forth were not included in the model and could conceivably make some difference in results.

Even with these limitations, the model shows the direction the beef distribution system should be taking to achieve greater economic efficiency. Although the derived model costs are neither exact nor necessarily representative of the costs incurred in actually getting beef to the food-service firms, the relative costs within the model validate the conclusion that beef should be fabricated into final form before it reaches the food-service establishment.

SUMMARY AND CONCLUSIONS

A large proportion of the beef consumed in the United States is prepared by the vast, diverse, and rapidly growing food-away-from-home industry. Though the single most costly food item for this industry is beef, little research has been done to describe, analyze, or suggest means of improving the efficiency of getting beef to the establishments within the industry. This project was initiated to help eliminate this void in public information.

The specific objectives of this study were as follows: •

To describe and analyze the functions performed by representative firms within the present systems of beef distribution to the food-away-from-home market.

- To formulate a conceptualized cost model of physical distribution of beef to the food-service industry for the purpose of suggesting possible areas to improve distribution efficiency.
- To identify additional areas needing further research in regard to improving the efficiency of distributing beef to the food-service industry.

The first objective was accomplished by interviewing the managements of 85 different establishments that represent the major segments of the industry. The interviewees were selected to give a cross section of the various types of firms within each level of the system, with a conscious bias toward the more progressive firms. Because of the void in information on this distribution system, these interviews were rather informal and exploratory in nature, with minimal structure provided by interview guides. This interviewing strategy allowed maximum flexibility, depth, and the expression of personal opinions by knowledgeable industry personnel.

The second objective was achieved by using the synthetic cost approach, by case study, to determine the individual cost components for nine theoretical channels of distribution. The cost components were then combined and compared to determine the most economical method of distribution among the theoretical possibilities.

The third objective was attained by observing the problem areas that appeared during the interviewing and the case study stages of the project.

The first group of establishments examined were the actual food-service establishments. Although this group is generally referred to as an industry, the establishments are extremely heterogeneous, with the similarity being the preparation of food for on-premise or immediate consumption. Taken as a group, these firms buy and serve a much greater proportion of higher quality and higher grade cuts of beef than moves through the retail market. These establishments expect and generally receive many services along with the products including the following: cutting meat to exact portion sizes, with rigid trim, thickness, and weight specifications; frequent, small deliveries, with the subsequent necessity of inventory maintenance; beef aging; technical help with cutting, merchandising, meal planning, and mechanical problems; and in general, much personal attention. Many of the food-service firms were tending to buy more of their meat needs in pre-portioned, and frozen form and in subprimal form, enabling them to maintain a smaller, or no, butchering staff. Although many firms had switched away from buying carcass and primal cuts, the switch has been slowed somewhat by restrictive union clauses and tradition. Most of the firms relied on a limited number of suppliers, with product quality and service being the main determinants in choosing a

supplier. The amount of products ordered at any one time tended to be small and somewhat arbitrary. With a continuing need for innovation and research, the food-service industry appears to be changing rapidly. The second group of firms examined were the primary suppliers of beef to the food-service establishments. These firms, referred to as handlers in this study, included purveyors, breakers, central commissaries, and food-service distribution branches of packers. Their primary functions included purchasing cuts of beef and other products, fabricating the beef into items desired by their customers, and selling these products in combination with their many services to their clientele. The breakers primarily purchased carcass beef, broke it into primals or subprimals, sold the standardized primals, subprimals, and by-products to other handlers, retailers, and processors, and performed very few specialized services. The purveyors, central commissaries, and packer HRI divisions all purchased a larger variety of items (including many non-beef items), did more specialized fabricating, and offered a large range of services to their primary clientele, the food-service establishments. Two basic methods of operating were observed: custom service and cutting for inventory, with the latter growing at a faster rate than the former. Along with the increase in fabricating for inventory, was an increase in the sale of frozen products.

Most of the handlers purchased beef directly from packers, although a few went through brokers and other handlers. Price was usually subservient to quality and product availability in selecting a supplier. Most of the handlers were buying much less of their beef needs in carcass or primal forms than in previous years, indicating a desire to use modern technology and to reduce unwanted or extra products. The handlers purchased a substantial amount of imported beef, especially for making ground beef, and were tending toward more customer specialization and product diversification. This trend toward customer specialization seems economically sound, since certain types of customers (hospitals or universities) require a different set of services and products than do other types of customers (hamburger carry-outs or "high-class" restaurants). With the market segmentation, the suppliers also seem to be trying to provide more of their customers' product needs, thus reducing the per unit costs of delivery, servicing, and administration.

The largest and most complex component of the system, the federally inspected packers, was the final group of firms examined. The investigation included only that portion of the packer operations involved with fresh beef distribution. Many packers felt that the requirements of the food-service industry were not different from those of the retail industry, although some firms specialized in fabricating cuts and providing

services that were especially useful to the HRI trade. In general, these two distinct attitudes were correlated to the two major variations in operating procedures: the carcass (or kill-and-chill) operation versus the fabricating operation. The packers also had diverse theories on the most advantageous selling procedures. Some preferred to sell through independent handlers, whereas others created their own distributors who functioned much like independent handlers. The packers who did some fabricating perceived their major advantage over independent handlers as being that of volume.

The cost model was restricted to 9 theoretical channels of the physical distribution subsystem. Although the industry's operation is not typified by any one of these channels, collectively they represent the major variations in product form employed by most of the food-service beef distribution industry. Each theoretical channel consisted of 1 packer, 6 purveyors, and 300 hotel, restaurant, or institutional firms. Each of the packers started with identical amounts of product, and each HRI firm ended up with identical amounts of usable product. The major variations between each channel occurred where fabrication took place, with subsequent packaging differences and also differences in utilization of fresh and/or frozen products. Each cost component was estimated from a combination of the following: time-and-motion study of actual operations, cost of new equipment and construction, cost of packaging material, cost of common carrier transportation, and/or cost assumptions used in previous studies. The total direct cost of each channel was then the value of the starting products, plus the aggregated cost components for the operations incurred by the firms within a channel, less the value of products not needed at the HRI firms.

Comparisons of the total direct costs of the 9 theoretical channels showed that the most economical form of distribution was for the packers to break the carcasses into subprimals, vacuum-pack them, and ship them to the purveyors who fabricate the steaks and patties and then deliver them, in fresh form, to the HRI firms. The conclusions of the model remained the same, even with a large change in the total labor cost or the costs of operating the equipment and owning the capital goods. The cost of packaging materials was relatively high for this particular channel but they were more than offset by savings in all other cost components. The general conclusion of the conceptual model is that, to have an efficient physical distribution system, the final fabricating of products should be performed as close to the origin as possible.

To isolate the effects of where the products should be fabricated and to establish some of the costs associated with freezing them, several restricting assumptions were made in the model. The assumptions of

given firm size, fixed mix of products, location of the packers in Wichita and other firms in New York, same quality and services throughout the model, and ignoring various administrative and selling costs should have a minimal effect on the basic conclusions of the model. The possibilities of economies of size and greater productivity of labor through the specialization possible in larger firms tend to make an even stronger case for moving the fabricating function back from the food-service establishments to the larger purveyors and packers. Relaxation of the unrealistic assumption of a constant wage rate for all firms could clearly make a great difference in the relative advantage of one channel or firm over another. Since many food-service firms do fabricate their own beef, there must be a substantial amount of inexpensive labor (*in terms of opportunity cost*) and/or other reasons for not buying beef in portion-controlled form as suggested by the model. Some of these other reasons, as seen in the interview stage of the study, could include union opposition, the perceived quality of beef cut on premises versus that cut before delivery, real or "under-the-table" services received from certain suppliers, and tradition or unwillingness to change from past procedures.

This study showed that there are several areas needing more research to help improve the efficiency of the food-service beef-distribution system. Some that need more detailed research include the following:

- *A determination of the costs associated with various operating techniques.* This study indicated divergent opinions on the advantages and disadvantages of both custom-service purveyors and those producing for inventory. If the specific cost differences were isolated, it could help the industry turn in a more economical direction. There is also a constant need to know the costs associated with various means of automating operations.
- *A determination of the costs of alternative delivery sizes.* The interviews illustrated that little is known about the cost of making deliveries of various sizes. Information on the costs and benefits for suppliers who expand into nonmeat items in order to make larger deliveries to their customers is totally lacking. Also unknown are the inventory holding costs at various levels in a channel of distribution associated with alternative delivery policies. If all the costs of small and large deliveries were known, perhaps delivery policies would change to increase the efficiency of the system.
- *An analysis of the costs and savings associated with alternative freezing techniques.* The theoretical cost model in this study indicates that freezing involves additional costs, although some

possible savings were not adequately handled in the model. There are obvious advantages to freezing a perishable product such as beef, and more economic studies are needed to show the relative advantages of freezing, as well as to examine the best methods of freezing.

- *An examination of the advantages and disadvantages of packer-owned distribution facilities versus independent handlers.* The interviews with packers indicated that some prefer to distribute beef to food-service firms through their own facilities whereas others favor independent distributors. A cost analysis of these alternatives might help the packers make the best economic decision for the whole system.
- *A study of the role of retail chains in distributing beef and other products to the HRI trade from their retail warehouses.* The interviews indicated that a few such chains had added institutional-size provisions to their warehouse stock and were supplying the food-service industry. The economies of such a procedure should be examined to determine if a more efficient system of distributing beef and other food items could be incorporated into the existing complex of retail food chains.
- *An exploration of the effect that precooked or further processed meats are likely to make on the system.* Since this study dealt with only fresh nonprocessed beef, there is still little or no information available on the economics of precooked and further processed meats and how they relate to the system.
- *A study of the specific or unique needs of certain segments of the food-service industry, such as hospitals, institutions, and hotels with large banquet facilities.* Because of the extreme heterogeneity of the food-service industry, many segments could be singled out for determination of needs, and perhaps a more efficient method of providing goods and services could be ascertained.
- *A technical and economic study of the advantages and disadvantages of alternative packaging processes.* The interviews conducted for this study showed a manifold variety of packaging materials in use by the industry. Their costs differ widely, not only as materials, but also in terms of handling or storage costs and by having diverse protecting or preserving capabilities. Because of the many available alternatives, a thorough study is needed to enable the users to make the most economic decision about them.
- *An examination of the costs and benefits associated with various services.* Although the food-

service industry is extremely service oriented, little is known about the costs and benefits of the many types of services and at which points in the chain they should be performed.

• *An economies-of-size study of the various levels of the industry.* As indicated in the cost model phase of this study, there are economies in larger scale operations for packers, purveyors, and the food-service industry. Yet no specific information is available on their nature. A study of the economies of size at various levels after slaughter may help the industry build plants of the most efficient size.

BIBLIOGRAPHY

1. Anonymous
1959. Use of prefabricated meat will eliminate meat shrinkage. *Institutions* 44(5):58. May.
2. 1960. Portion-controlled meats. *Hotel Gazette* 86(15):12,21. Apr.
3. 1960. Portion-cut, cost controlled meats are the best money-makers. *Hotel Gazette* 86(14):11. Mar.
4. 1969. Food away from home. *Fortune* 74(7):39. June.
5. 1971. News and views. *Natl. Provisioner* 165(26):5. Dec.
6. 1972. Michigan State slates food marketing forum. *Natl. Provisioner* 166(14):17. Apr.
7. Anthony, Willis E., and Motes, William C.
1966. Livestock marketing. *In Agricultural markets in change* (Chap. 10), pp. 258-295. MED, ERS, USDA. Agr. Econ. Rept. 95. July.
8. Baligh, Helmy H., and Richartz, Leon E.
1967. Vertical market structures. Allyn and Bacon, Inc., Boston, Mass. 260 pp.
9. Bernatsky, Matthew
1964. Care, storage and preparation of frozen meat. *Texas and Southwest Hotel-Motel Rev.* 27(9):24. Sept.
10. Black, Guy
1955. Synthetic method of cost analysis in agricultural marketing firms. *J. Farm Econ.* 37(2):270-279. May.
11. Brasington, Clayton F., Jr.
1966. Hotel and restaurant meat purveyors—improved methods and facilities for custom service houses. TFRD, ARS, USDA. Mktg. Res. Rept. 747. 45 pp. July.
12. Cundiff, Edward W., and Still, Richard R.
1964. Basic marketing: concepts, environment and decisions. Prentice-Hall, Inc., Englewood Cliffs, N.J.
13. Eshbach, Charles E.; Wrisley, Albert L.; and Lukowski, Robert F.
1960-1963. Organization and development of extension service educational programs with the food service industry educational materials, and sources of subject matter. *In Conducting educational work with operators of food service establishments.* Coop. Ext. Serv. and Coll. Agr., Univ. of Mass. Food Mgmt. Manual 1. 47 pp.
14. Fowler, Stewart H.
1961. Marketing of livestock and meat (2nd ed.). The Interstate Printers & Publishers, Inc., Danville, Ill. 740 pp.
15. Franzmann, John R., and Kuntz, B. T.
1966. Economies of size in southwestern beef slaughter plants. Oklahoma State Univ. Exp. Sta. and USDA. Bul. B-648. 35 pp.
16. French, B. E.; Sammet, L. L.; and Bressler, R. G.
1956. Economic efficiency in plant operations with special reference to the marketing of California pears. *Hilgardia* 24(19):543-721.
17. Kearney, A. T., and Co., Inc.
1969. Feasibility of a physical distribution systems model for evaluating improvements in the cattle and fresh beef industry. TFRD, ARS, USDA. ARS 52-36. 63 pp. Nov.
18. Kotschevar, Lendal H., and Terrell, Margaret E.
1961. Food service planning: layout and equipment. John Wiley & Sons, Inc., New York. 449 pp.
19. Levie, Albert
1968. Convenience meats. *Cornell Hotel and Rest. Admin. Quart.* 9(3):91.
20. 1970. The meat handbook (3rd ed.). Avi Pub. Co., Inc., Westport, Conn. 332 pp.
21. Martin, Sam
1971. Further processed, precooked frozen meats growing at better than 20% annually. *Quick Frozen Foods* 34(3):41.
22. 1972. \$1.7 billion institutional frozen foods projected gain 1975 over 1970. *Quick Frozen Foods* 34(10):41.
23. McMullin, Vivian
1964. Think profit, think beef. *Hospitality* 3(11):159.
24. National Association of Meat Purveyors
1967. Meat buyer's guide to portion control meat cuts. Natl. Assn. Meat Purv., Chicago, Ill. 68 pp. April.

25. 1966. Meat buyer's guide to standardized meat cuts. Natl. Assn. Meat Purv., Chicago, Ill. 84 pp. Oct.
26. National Restaurant Association
1970. Facts about the food service industry: 1970. Natl. Rest. Assn., Chicago, Ill.
27. Parker, Donald D.
1962. Improved efficiency and reduced cost in marketing. *J. Market.* 26(2):19.
28. Pfaelzer, Leonard
1959. Built-in cost control in meat sales. *Cooking for Profit* 28(4):30.
29. Stanton, William J.
1967. *Fundamentals of marketing* (2nd ed.). McGraw-Hill, Inc., New York.
30. Stern, Louis W., and Brown, Jay W.
1969. Distribution channels: a social systems approach. *In* *Distribution channels: behavioral dimensions* (Louis W. Stern, ed.), pp. 6-7. Houghton Mifflin Co., Boston, Mass.
31. Ullensvang, Leon P.
1959. The hotel-restaurant meat purveyor: An analysis of the growth, operation, and future development of a specialized type of meat wholesaler. Thesis for degree of Ph.D., Northwestern Univ., Evanston, Ill. 350 pp. June.
32. United States Department of Agriculture
1972. *Livestock and meat statistics*. ERS, SRS, AMS. 1971 Suppl. to Stat. Bul. 333, pp. 73, 142.
33. United States National Commission on Food Marketing
1966. *Organization and competition in the livestock and meat industry*. Technical study 1. G.P.O., Wash. 189 pp. June.
34. Van Dress, Michael G.
1971. The food service industry: Type, quantity, and value of foods used. MED, ERS, USDA. Stat. Bul. 476. 451 pp. Nov.
35. Van Dress, Michael G., and Freund, William H.
1968. *Food service industry: Its structure and characteristics, 1966*. MED, ERS, USDA. Stat. Bul. 416. 370 pp. Feb.
36. Wanderstock, J. J.
1970. Meat purchasing. *Cornell Hotel and Rest. Admin. Quart.* 11(3):60.
37. Waxman, Louis E.
1967. Trends in portion control. *Club Management* 46(12):54.
38. Williams, Willard F., and Stout, Thomas T.
1964. *Economics of the livestock-meat industry*. The MacMillan Company, New York. 802 pp.
39. Wingerden, James
1964. Primal meats vs. prefabricated cuts. *In-plant Food Mgmt.* 11 (10):32-38.
40. Yaworski, George
1961. Comparison tests on buying beef. *Hotel Bul.* 81(3):38-39.
41. Ziemba, John V.
1959. Whether frozen meats? *Food Engineering* 31(4):62-64.

ACKNOWLEDGEMENTS

The author wishes to express his gratitude to Dr. Max E. Brunk for his supervision and guidance in carrying out this project. He is indebted to Professors L. Joseph Thomas and Earl H. Brown, who served on his special graduate committee, for their service and help throughout the project. Also acknowledged is the guidance of Dr. Sanford A. Belden and the late Professor Jeremiah J. Wanderstock, of the Cornell School of Hotel Administration. The author also thanks Dr. James R. Stouffer, Dr. Donald S. Erickson, Dr. Sykes E. Trieb, and the many persons of the cooperating firms and, in particular, the industrial engineer and other personnel of the case study firm. Field data collection was greatly facilitated by the work of Frank Santa-Donato, editing and proofreading by Anne Johnson, and typing by Laura Low.

Especially appreciated for her understanding and assistance is the author's wife, Nancy.

Contents

Introduction	1
Objectives	2
Definitions and theoretical background	2
An overview of the system	3
Methodology	3
Description and analysis of food-service establishments	3
Types of establishments included in the food-service industry ...	3
Procurement	4
Preparation	8
Direction of change	9
Conclusions	9
Description and analysis of beef handlers	10
Types of handlers	10
Products handled	11
Operating procedures	13
Selling procedures	15
Relationship to the rest of the industry	18
Direction of change	19
Summary and conclusions	19
Description and analysis of the packers ,	20
Types of firms included in this study	20
Operating procedures	21
Nature of the product handled	22
Selling procedures	22
Packers' relationship to the rest of the industry	24
Future direction of the packers	24
Summary and conclusions	25
Conceptualized cost model of physical distribution subsystem	25
The model	26
Cost components	28
Product mix	36
Total direct cost	38
Limitations and sensitivity of the model	40
Model summary	41
Summary and conclusions	42
Bibliography	45