DISTRIBUTION AND TRANSPORTATION ANALYSIS OF KANSAS SLAUGHTERED BEEF IN 1985

by

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CHAPTER I

INTRODUCTION

Kansas has a long history and tradition in the cattle and beef industry. The lush prairie grass provided the earliest settlers with the means to start their own cattle enterprises. The cattle drives of the mid-1800s established Kansas as a significant participant in the industry. From these early beginnings, Kansas has become one of the nation's leaders in cattle feeding.

Cattle marketings accounted for nearly half of the cash receipts from farm marketings in 1985. Much of the feed grain produced in the state is utilized for cattle feeding.Kansas led the nation in commercial cattle slaughter in 1985 with 6.2 million head and liveweight slaughter of 6910 million pounds (Table 1). This was 17.3 percent of the U.S. commercial beef slaughter in 1985 (Livestock Slaughter Annual Summary). Also illustrated in Table 1 is the growth of the industry in Kansas in terms of absolute slaughter, percent of U.S. slaughter, and accompanying rank among states. Since 1960, liveweight beef slaughter in Kansas has increased nearly 500 percent from 1159 million pounds to 6910 million pounds while the U.S. total increased only 57 percent. Kansas has accordingly increased its share of U.S. slaughter from 4.6 percent to 17.3 percent while moving from eighth to first place among states.

Kansas ranked third among all states in fed-cattle marketings

TABLE 1

Commercial Liveweight Beef Slaughter
Kansas and U.S. for Selected Years

YEAR	LIVEWEIGHT SLAUGHTER (million pounds) KANSAS	U.S.	KANSAS AS A % OF U.S.	KANSAS RANK AMONG STATES
1960	1,159	25,331	4.6	8
1965	1,480	32,364	4.6	7
1970	2,140	36,319	5.9	5
1975	2,935	40,733	7.2	5
1980	3,216	36,229	8.9	4
1981	3,951	37,565	10.4	3
1982	4,652	38,128	12.2	3
1983	5,122	39,248	13.1	3
1984	5,833	40,085	14.6	2
1985	6,910	39,841	17.3	1

Sources: United States Department of Agriculture Agricultural Statistics, various issues, Statistical Reporting Service, Washington, D.C.

United States Department of Agriculture Livestock Slaughter: Annual Summary, various issues, Statistical Reporting Service, Washington, D.C.

in 1985 with 3.865 million head, or 16.9 percent of the total of 13 leading states reported by the USDA. While Kansas had only 4.2 percent (270) of the total number of feedlots (6371) in the thirteen cattle-feeding states in 1983, it had 79 of 393 or 20.1 percent of the feedlots that supported 8000 head of cattle or more (Cattle on Feed).

Cattle marketings, for which the packing plants are the primary receivers, accounted for $3082.5 million in cash receipts of Kansas farmers in 1984 out of total receipts of $6521.4 million, easily the largest subsector. In 1983 an estimated 448.0 million bushels of feedgrains and a portion of the wheat crop, went either directly to farm animals or was sold to in-state feedlots (64th Kansas Annual Report and Farm Facts). Nearly all of the feed grains produced in the southwestern irrigated areas move through local feedlots. Slaughtering plants account for a large portion of salary income in Southwest Kansas, contributing importantly to the economies of several local communities in that area. Transportation conditions contribute importantly to private decisions to locate slaughtering plants.

Objectives of the Study

Surplus beef produced in the state must seek a market outside Kansas. Little is known about the distribution pattern for Kansas beef or about the transportation conditions that affect its interregional competitive position. According to Duewer, (p. 14) transport costs range from approximately 4¢ to 8¢ per retail

pound of beef in the U.S., depending upon distance and method of transport. Even though unit costs are small, volume is so large that small savings per unit accumulate to impressive totals.

Dependability and quality characteristics of transport are also very significant to shippers in the highly competitive marketing of beef. Hence, the impacts of transport conditions also extend beyond cost differences among regions, although cost, per se, is an important factor.

The specific objectives of this study are:

(1) to determine the geographic distribution and volume of beef and beef products shipped from the major Kansas slaughtering and fabricating plants to non-Kansas processor or retail outlets,

(2) to determine carrier rate structures from representative Kansas and non-Kansas origins to major deficit areas and to determine Kansas transport cost advantages/disadvantages in a competitive environment,

(3) to determine the impacts of institutional and cost changes in transportation on transport rate structures and geographic distribution patterns for beef, and

(4) to identify transportation factors relating to efficient transportation of Kansas beef.

CHAPTER II

IMPACTS OF TRANSPORTATION ON HISTORICAL DEVELOPMENTS IN BEEF CATTLE PRODUCTION AND SLAUGHTER

Historical Perspectives[1]

In mobile economies, cattle slaughtering plants tend to locate in areas of surplus cattle production. In less mobile economies, slaughtering plants locate near consumer markets. A typical steer will yield about 62 percent of its total liveweight as carcass. If shipped as boxed beef, shipping weight is reduced to a normal minimum of 45 percent of slaughter weight. Other things equal, transport cost is reduced as shipping weight declines. Improvements in transportation of beef thus reduces marketing costs and impacts both location and industry structure. Major shifts in the slaughtering industry in the United States in the past have paralleled changes in transport conditions.

In colonial times, markets were local and the transportation of beef was accomplished by driving the live animal to its point of slaughter. Raising or slaughtering of livestock was generally a one-man or family enterprise, with the meat consumed locally. By the 1700s, "butcher shops" had established themselves in many small towns as markets for livestock from the farming community and as suppliers of meat to non-farmers. Movement of livestock consisted of driving a few head of cattle into town for sale to the butcher.

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[1]Much of the historical discussion is drawn from Williams/Stout, pp. 3-24 and McCoy, pp. 16-24.

In the early 1700s, Virginia and the Carolinas supplied cattle to growing Colonial population centers of the Northeast. Later, surplus livestock production developed on the new and favorable rangeland of the Ohio Valley. In both cases, cattle production was located away from the major population centers on the Northeastern Seaboard. Commercial packing developed initially at the Brighton Market outside of Boston. Droving became a popular means of delivering live cattle to an expanding slaughtering industry. A common practice was for the drover to purchase cattle from producers and market them at the slaughtering plant. In doing this, the professional drovers performed a specialized economic function by providing marketing and transportation services. Drovers assumed the price risks and risks of physical losses inherent in the marketing and transportation process.

As production continued to spread westward, distances made droving prohibitive. New England was becoming increasingly industrialized and could no longer compete in fattening animals for slaughter. The South was becoming more and more specialized in cotton production, to the exclusion of cattle and other livestock. The lower Mississippi River area became the preferred destination for Ohio Valley production as the river systems (Ohio and Mississippi) provided easy transport. This combination of factors lead to reduced shipments and higher beef prices in the Northeast and provided the stimulus for improved transportation

modes and facilities from the Corn Belt to the East.

The first road connecting the East Coast with the territory west of the Appalachian Mountains was begun in 1811. It eventually reached as far as Vandalia, Illinois in 1852, but was a major thoroughfare for livestock and many other commodities long before its completion. It also allowed a fledgling meat packing industry in Ohio to begin winter-time shipments of meat to eastern markets.

Completion of the Erie Canal in 1825 marked the debut of canals as a form of extensive interstate transportation. Canals linked the Great Lakes and the Ohio River to the East Coast. But, railroad building began shortly after completion of major canal systems, quickly replacing the canals.

Railroads expanded rapidly after 1850. The first livestock hauled by rail were Kentucky cattle, driven in 1852 from Lexington to Cincinnati and there loaded into boxcars and shipped to Cleveland. Soon livestock rail shipments to the East Coast were commonplace. The railroads ushered in the era of terminal markets. Five railroads converged at Chicago funneling in cattle from to the west and south. Rail and water transportation facilitated shipments to eastern markets. The establishment of the Chicago stockyards in 1865 was an immediate success and set the pattern for stockyard developments at other terminal sites.

Droving once again became an important means of transporting for a short time after 1865. The Civil War cut Texas off from its

traditional markets in the South while at the same time demand for beef was increasing dramatically in the North and East. The best method of transporting cattle to supply this demand was to drive them northward to the nearest railhead. Kansas was an integral link as Abilene, and later Ellsworth and Dodge City, was the end of the rail lines and therefore the destination of the cattle drives from the south. The first delivery of Texas cattle reached Abilene in 1867. The drives lasted until about 1880 and it was estimated that over four million head of cattle were moved north.

Mechanical refrigeration changed the location of the slaughtering industry in the 1880s. With refrigeration, fresh meat could be shipped long distances on a year-round basis. As a result, major investments in the packing industry occurred in the Midwest with emphasis on Chicago. The pattern of transporting of livestock by rail to a central point for slaughter and also transporting meat by rail to its consuming point remained unchanged from about 1880 to 1920. After 1920 the industry went through a phase of decentralization, evolving away from the centrally located terminals and packing plants. Motor transport and the growth of all weather roads contributed to this change.

The historical trends since 1920 in concentration of the meat packing industry in larger firms based on the combined sales of 4 and the 12 largest firms can be observed in Table 2. Initial high concentration in livestock slaughter in five firms occurred

TABLE 2

Concentration Ratios, Cattle Slaughter, 1920-1930

	4 LARGEST FIRMS*	4 LARGEST FIRMS**	12 LARGEST FIRMS**
1920	49.0		
1930	48.5		
1940	43.1		
1950	36.4		
1960	23.5		
1970	21.3		
1971	21.4		
1972	22.3	24.5	43.2
1973	22.8	24.5	43.0
1974	20.9	23.8	42.3
1975	19.3	22.2	41.0
1976	19.6	22.1	38.8
1977	20.2	21.9	39.4
1978	22.9	24.3	40.4
1979		29.3	46.7
1980		31.3	51.1
1981		34.2	54.0
1982		35.4	54.8
1983		39.4	54.8

* Source: Faminow, M.D. and Sarhan, M.E., Economic Analysis of the Location of Federal Cattle Slaughtering and Processing in the United States, Agricultural Economics Research Report No. 189, University of Illinois at Urbana-Champaign: August, 1983.

**Source: American Meat Institute, Annual Financial Review of the Meat Packing Industry, 1982, Washington, D.C.: September, 1983.

in the early part of the 20th century. The "Big Five" in cattle slaughter--Armour, Cudahy, Swift, Wilson and Morris--accounted for as much as seventy-five percent of federally inspected slaughter. A study by the Federal Trade Commission in 1919 reported monopolistic control of the American meat industry by the "Big Five." To avoid monopoly prosecution under the Sherman Antitrust Act, the packers agreed to the Consent Decree of 1920. The decree effectively limited the vertical integration that had allowed the large packers to dominate the industry.

While the decree curbed the abuses of the largest firms and concentration ratios declined, the restrictive provisions of the decree did not account for all of the decrease. The traditional packers had older, multi-species plants that were located at terminal sites and often had high labor costs. While new smaller plants were beginning to develop in the countryside at points closer to the cattle sources, the established packers were hesitant to abandon existing plants with high fixed investment. With improvements in the 1950s and 1960s in slaughter and processing technology, improved transportation and the use of federal grading standards, establishment of new firms and plants accelerated and the concentration ratios fell rapidly.

Concentration ratios in the slaughtering industry that appeared to have bottomed out in the mid-1970s have increased again in the last 10 years. New plants in the 1980s are the largest and most efficient the industry has seen.

At the state level, concentration is increasing at a faster rate than is occurring nationally (Table 3). Ratios by state are higher than national ratios. While the national concentration ratio for the four ranking firms increased 10.19 percent between 1972 and 1982, (Table 2) the average increase for the top ten slaughtering states was 20.7 percent (Table 3). Concern has been raised that there may be some tendency toward monopolistic price making and an undue dominance by one or two firms in areas where concentrations are high.

Trucks were initially used to supplement rail service. Motor carriers were used to deliver livestock to railheads and to transport meat from rail distribution points to local markets. Cost advantages remained with the railroad on long-haul, large volume movements. By the 1960s, rail cost advantages had narrowed, even on longer distance movements. Speed, convenience and flexibility of trucking became a dominant factor in choice of transport mode both in transport of livestock and in movement of meat. Improvements in trucks, trailers (especially in refrigeration), in roads, and the interstate highway system, have contributed to increased use of trucks for transport of livestock and meat in the current marketing system.

Livestock slaughtering began to decentralize after 1920 as older plants became worn out or obsolete. New, smaller plants were located closer to the source of livestock for slaughter. These locations reduced the total weight transported, improved

TABLE 3

State Four-Plant Concentration Ratios, Steer and Heifer Slaughter in Ten States for Selected Years

	1969	1972	1974	1982	CHANGE FROM 1969 TO 1982
			(PERCENT)		
California	20.5	19.1	19.7	41.4	+20.9
Colorado	63.3	66.4	64.5	99.2	+35.9
Illinois	63.1	61.5	68.1	84.8	+21.7
Iowa	53.4	66.6	65.1	85.1	+31.7
Kansas	54.3	72.9	76.2	92.4	+38.1
Minnesota	59.7	72.9	78.3	97.3	+37.6
Nebraska	51.1	43.5	52.6	62.1	+11.0
Pennsylvania	73.6	77.5	82.2	86.9	+13.3
Texas	43.2	52.2	59.5	81.9	+38.7
Wisconsin	79.6	90.1	93.0	98.5	+18.9
Average	56.2	62.3	65.9	83.0	+26.8

Sources: Nelson, Kenneth E., Issues and Developments in the Meatpacking Industry, United States Department of Agriculture, Economic Research Service, Washington, D.C., August 1985.

Petritz, David C., Erickson, Steven P., Armstrong, Jack H., The Cattle and Beef Industry in the United States: Buying, Selling, Pricing, Cooperative Extension Service, Purdue University, West Lafayette, Indiana, Paper 93.

loading characteristics and reduced transport cost. The phenomena of cross-hauling (moving the raw product in one direction and the finished product back) was greatly reduced. Damage and shrinkage loss in transit, normally greater with live cattle than with meat, was reduced.

Regulation of Transportation

While technology provided the major sweeps of transportation related change, institutional arrangements also have affected transportation services. A major factor has been government regulation. Economic regulation involves entry and exit of firms and surveillance of rates and services of carriers. Safety and load-limit rules have also affected transport.

Specific economic regulation of carriers was non-existent before 1870, although reported abuses in the early system were frequent and many. Excessive and discriminatory rates; the endorsement of monopolies through preferential rates; discourteous and insolent treatment of shippers; and insufficient facilities were some of the grievances claimed against the railroads. State regulations after 1870 were largely ineffective in regulating railroad rates and services but they helped to form the foundation for subsequent Federal regulations. The first Federal legislation providing economic regulation of transportation was the Interstate Commerce Act of 1887.

During the late 1920s and early 1930s, motor carrier transport came to play an increasingly important role in the movement

of meat products. The early depression years fostered an extreme form of competition as small truckers without employment alternatives were willing to work for low pay. Entry into the industry was relatively easy.

The Motor Carrier Act of 1935 defined and classified four types of motor transport agencies. They were: 1)common carriers 2)contract carriers 3)private carriers and 4)transportation brokers. The Act stipulated that each classification remain distinct and separate. Common carriers must obtain certificates of public convenience and necessity before they are allowed to carry regulated commodities. They must also publish their rates, which were subject to ICC approval. Contract carriers were required to obtain permits showing that their operations were "consistent with the public interest," a less stringent requirement than was applied to common carriers. The ICC was given the power to prescribe only minimum rates for contract carriers. Exemptions from ICC scrutiny were made for livestock (not including meat), fish or other agricultural commodities not manufactured.

The regulatory environment for motor carriers remained essentially the same as in 1935 until passage of the Motor Carrier Act of 1980. With the 1980 legislation, entry into the industry is simplified. The ICC now issues an operating permit to any applicant who meets the "fit, willing and able" test and who will provide a useful public service. A general commodities authority

was created. This replaced a more strict commodity classifications of carrier authority.

A carrier may now raise or lower his rates by ten percent per year without ICC approval. Although this is still not complete rate freedom, it greatly enhances the rate making flexibility of each carrier.

Intercorporate hauling for wholly-owned subsidiaries is now permitted. This allows a parent company with a large private fleet to haul for a fully-owned subsidiary. This offers added efficiency through an ability to adjust to rapidly changing distribution needs and through fuller utilization of transport capacity. The Act also allows greater use of trip leasing. Trip leasing entails obtaining both truck and driver from a single source on a trip-by-trip lease basis. This allows private carriers to trip-lease equipment to for-hire trucking firms to obtain backhauls and decrease "deadhead" miles. A trucker may operate as both a contract and a common carrier (Hutchinson, 1983, p. 13).

Several changes were made under the heading of operating restrictions. The Act authorized the removal of all gateway and intermediate point restrictions and circuitous routing. Round-trip authority is provided on routes where only one-way authority existed before 1980. Unreasonable or excessively narrow territorial limitations were eliminated.

Deregulation of trucking along with similar deregulation of

railroads, also in 1980, provided opportunity for improved transport conditions for the livestock slaughtering industry. Greater flexibility in management of transport functions holds out a possibility of reduced costs and expanded options available to shippers. Major changes in rules governing transportation markets occurred simultaneously with the beginning of rapid, growth in livestock slaughter in Kansas in the 1980s.

CHAPTER III

RELEVANT THEORY OF
TRANSPORTATION IMPACTS ON LOCATION AND MARKET AREA

Overall impacts of transportation on industry location have been previously cited. Transportation is one of many factors guiding industry location and market area competition.

The history of the packing industry has been one of continued relocation. The history includes the establishment of the centralized industry in Chicago to the decentralization through the building of smaller plants throughout the Corn Belt to the continued growth of large plants in the southern Great Plains. In each of these cases, transportation has been a prime factor in location decisions. This chapter will review the application of theoretical concepts to location and market area competition as affected by transportation factors.

Transportation is but one of numerous factors involved in location decisions. Other relevant factors include: quantity, quality and cost of labor; climate; tax advantages; local government and political climate and availability of raw materials. Important transportation factors in a location decision are availability, adequacy, and cost of transporting raw materials and finished products. Cost differences are influenced by weight-loss in processing and relative loading and transport characteristics of raw materials and processed products.

Location Theory

An analysis of the location of industry by Alfred Weber in 1909 (Daggett, pp. 434-438) is a standard reference for location and market area theory and continues to be the basic theoretical framework in regional science studies (Isard, pp. 86-100). For analysis of transportation impacts on location of manufacturing or processing plants, Weber assumed a uniform plane with transportation, labor, amenities and other resources equally available throughout. He then analyzed the impacts of raw material characteristics, manufacturing processes and raw material location(s) on locations of processing plants relative to raw material sources and consuming centers.

From this analysis, Weber formulated several conclusions about location of processing plants. The first simplified case presented by Weber is "one market and one source of raw materials." In this case, Weber stated that processing will occur at the consumption point if the raw material is ubiquitous. An ubiquitous raw material is one that can be found at the same cost everywhere or over large geographic areas.

Case two assumes a single localized, pure raw material located other than at the consuming center. A pure material loses none of its weight in manufacturing. Thread to be woven into cloth is an example. In this case processing may occur at any point between the raw material supply and the market.

Case three states that if there are both pure and ubiquitous

materials used, processing will occur at the consumption point. The ubiquitous material will influence plant location while the pure material will not.

In case four, Weber assumes one weight-losing material (or gross material) used in processing. In this case processing will occur at the point of raw material supply as less weight would be transported.

However, Weber's strict assumptions used in the preceding cases very rarely reflect actual circumstances. Factors such as loading and unloading costs, decreasing distance rates, differing transportation characteristics between raw materials and products and by-products, back hauls, geographical differences in cost of labor, and others all alter the assumptions. Most of these factors have the affect of increasing or decreasing the cost of the raw materials or finished products. The resulting change could effectively cause a reversal in any one of the previously mentioned cases. Labor costs are a prime example. Given a large enough differential in labor costs, an industry that uses a ubiquitous material will locate in the area of lower labor costs rather than at the market, especially if it is a highly labor intensive industry. Specific transportation characteristics of the product versus the raw material may also greatly affect location. As an example, the process of manufacturing wood furniture is certainly a weight loss process in both material and fuel, but the particular problems of shipping the extra bulk of

furniture versus wood and its fragility may be cause for reversal of case four.

Transportation charges that increase at a decreasing rate with distance were ignored by Weber but are generally standard in the transportation industry. This would have a particular influence on case two in which one pure material is used. Processing would be located either at the raw material site or at the market, excluding all intermediate possibilities. The through rate for either raw material or processed product would be less than that of a combined rate for transport of the raw material to an intermediate processing point and transport of the product to the market. It should be noted that the exclusion of intermediate processing plants would also exclude an extra loading and unloading that such a plant would require.

In the case of beef, cattle are a gross product (as described by Weber) with weight-loss in slaughter. Transport and loading characteristics also favor transport of meat rather than cattle. Technology continues to improve transport conditions for meat relative to cattle and hence, the slaughter industry has maintained a steady migration, following the cattle feeding industry, for many years.

Market Area Theory

Weber also developed an analysis of the probable market area within a framework of geographically separated competing plants. Market area analysis permits investors to better determine the

location of a new plant. The following cases illustrated by Weber depict simplified examples of basic market division theory to demonstrate how markets are divided by transportation costs.

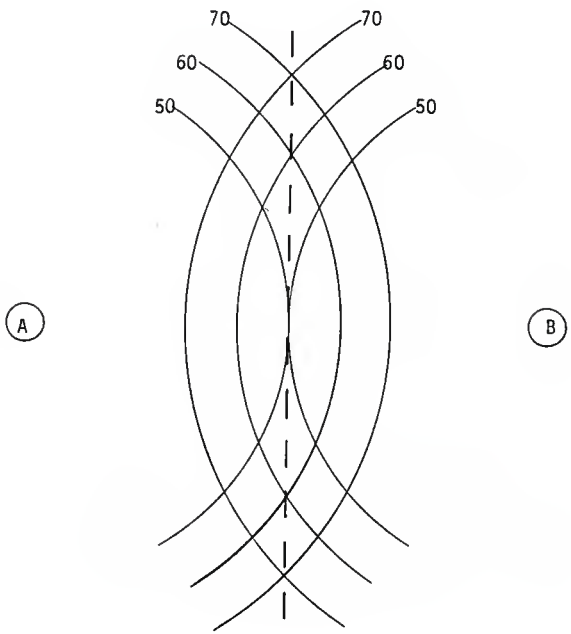
Case I. Equal Manufacturing Costs--Figure A illustrates the market division between two manufacturing plants, A and B. Each plant has an equal manufacturing cost per unit processed and the transportation rate for each is the same per ton per mile from each point and in either direction. The arcs shown are a given distance from the respective manufacturing plant and reflect transportation costs that are proportional per ton mile. The intersection of any two arcs of respective identical costs fix an equal-cost point for the two manufacturing plants. If the points are all joined together by a line, denoted by the dashed line in Figure A, the line will fix all the points for which it would be equally expensive to reach from plants A and B. This line marks the boundary for each plant's market area. To cross the line would mean a higher total delivered cost.

Case II. Unequal Manufacturing Costs--In Figure B it is assumed that production costs of the two plants are not equal. Plant A has a higher production cost such that the cost at plant B is X, the cost at plant A is X plus 40. This allows plant B to extend its market area up to a point where its transportation costs are 40 above that of plant A and still have equal production costs. Therefore, the new intersection points would be where the arc lines of B equal the arc lines of A plus 40. The line

FIGURE A

CASE I: MARKET DIVISION WITH

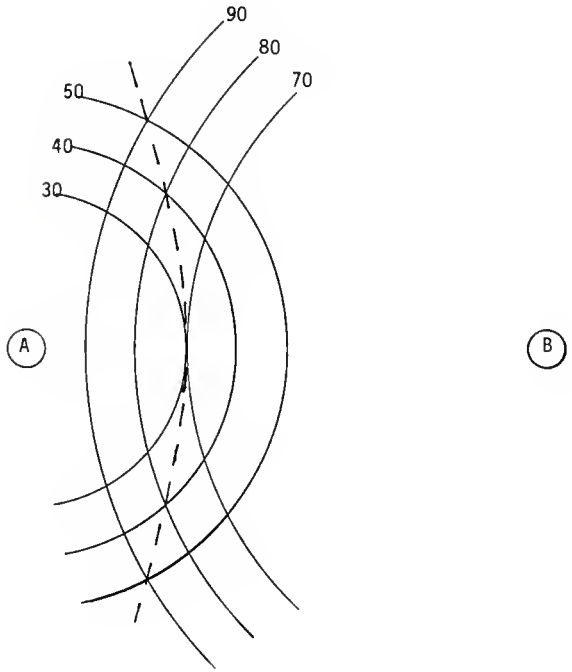
EQUAL MANUFACTURING COSTS



Source: Daggett, Stuart Principles of Inland Transportation, 4th ed. Harper and Brothers, New York: 1955 pp. 446.

FIGURE B

CASE II: MARKET DIVISION WITH UNEQUAL MANUFACTURING COSTS



Source: Daggett, Stuart Principles of Inland Transportation, 4th ed. Harper and Brothers, New York: 1955 pp. 446.

connecting the points set the market boundaries for each plant, which will be a hyperbola around plant A.

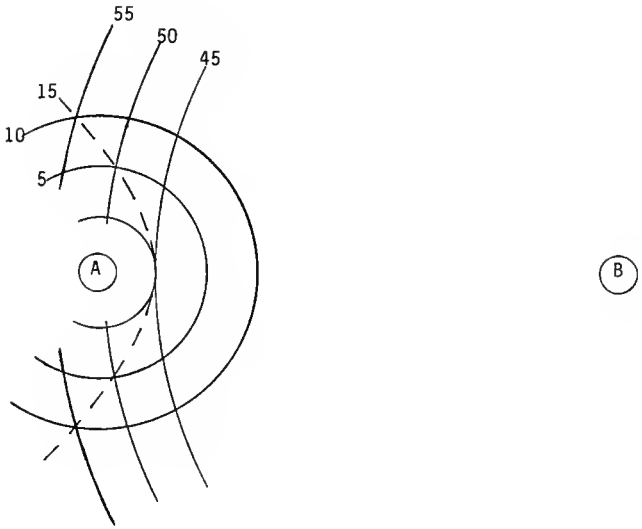
Case III. Change in Transportation Cost With Unequal Manufacturing Costs--Assume that the cost of transportation per ton per mile is halved for all shipments. How will this change affect the market division? If Case I is used, where production costs are equal, there will be no change in the division of markets. But if the transportation cost is cut in half in Case II, a change in the market division will occur as illustrated by Figure C.

Before the cost decrease, the market boundary line existed where costs for B equaled costs for A minus 40. With a one half decrease in the cost, the old line no longer defines the border where A's cost is minus 40 of B's cost. The old boundary now shows a difference of 20 (35 to 15, 40 to 20, etc.) Therefore, a new boundary is sought where the transportation cost for A will be 40 minus the transportation cost for B. The dashed line on Figure C denotes this boundary. The minus 40 criteria is again in effect (45 to 5, 50 to 10, etc.)

As is illustrated by Figure C, the boundary line has collapsed into a tighter hyperbola around plant A, leaving a larger market area for plant B and a correspondingly smaller market area for plant A. Under normal conditions, a decline in the general level of transportation cost will increase the market area dominated by the manufacturer with the cost of production advant-

FIGURE C

CASE II: MARKET DIVISION INCORPORATING A CHANGE IN TRANSPORTATION COST WITH UNEQUAL MANUFACTURING COSTS



Source: Daggett, Stuart Principles of Inland Transportation, 4th ed. Harper and Brothers, New York: 1955 pp. 446.

age.

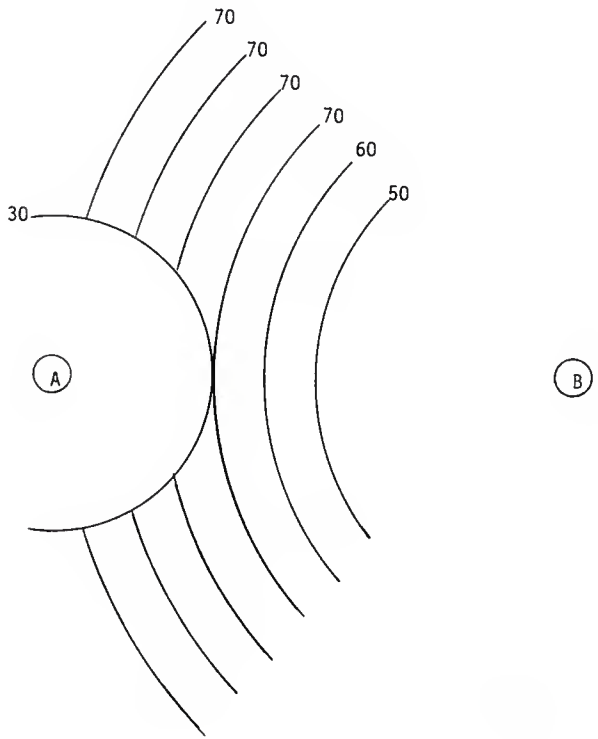
To a certain extent, this occurred in the meat packing industry with decentralization of plants. New and changing economies of scale dictated smaller and more scattered plants in the 1950s and 1960s that could run at a lower production cost than the large terminal plants. With improvement of trucks and highways, hauling costs were also reduced. Since the smaller plants held the production costs advantage, it served to increase their market area at the expense of the larger terminal markets.

Case IV. Transportation Rates That Are Not Proportional to Distance--If the transportation rates are not proportional to distance, a change in the shape of the market areas will result. Such a situation is illustrated in Figure D. Here it is assumed that transportation rates are established which progress regularly and proportionally up to a specific distance, but do not increase after that point. If the rate is proportional up to 70, but holds constant after that point, then that becomes the maximum rate charged. With the minus 40 production cost advantage enjoyed by plant B, the market areas are as shown. The initial boundary line is again at the point where transportation costs for B equal transportation costs for A plus 40 (70 to 30). But since rates do not increase after 70, plant B may extend its market area further at no extra cost. Plant A is locked into a market bounded by a circle denoting a transportation cost of 30, for if it were to expand, its costs would continue to increase and would then be

FIGURE D

CASE IV: MARKET DIVISION INCORPORATING

TRANSPORTATION RATES NOT PROPORTIONAL TO DISTANCE



Source: Daggett, Stuart Principles of Inland Transportation, 4th ed. Harper and Brothers, New York: 1955 pp. 448.

over the minus 40 limit imposed by production costs.

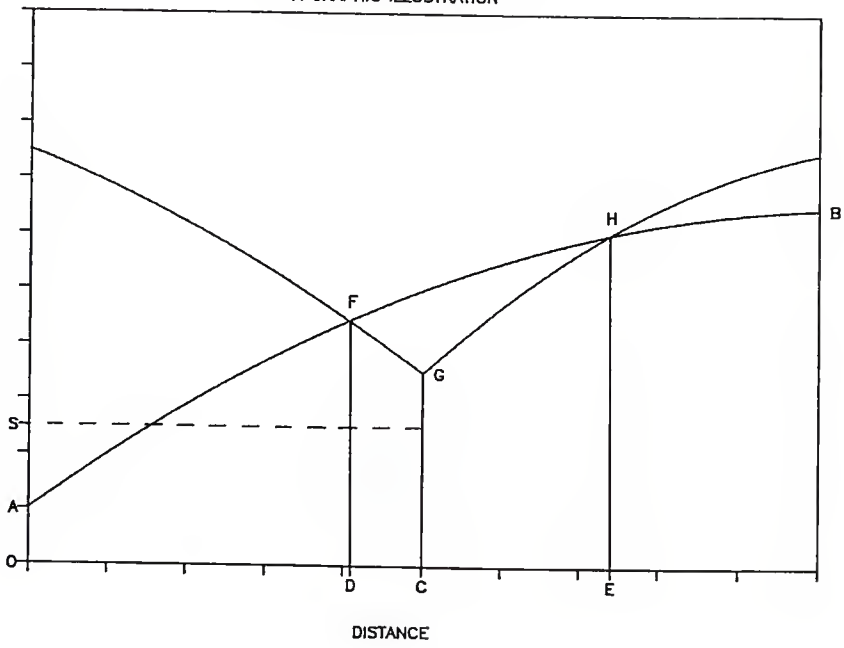
Pocket Markets

The general phenomena of shipping rates increasing at a decreasing rate and the existence of small secondary suppliers at intermediate points between major suppliers and their market allows creation of pocket markets. The system can be illustrated by the diagram in Figure E. The cost of the product to the buyer is depicted by the rate scale shown. The cost includes the manufacturing, processing, and/or production costs of the product (represented by "0" on the cost axis) plus the increasing rate of transport on a distance scale (represented by the curve AB). Demand exists at numerous points along the curve. Suppose, however, that there exists a supply or manufacturing area at an intermediate point C. The intermediate supply point possesses a higher production cost than the primary source of supply (represented by S on the cost scale). Using S as a base line as 0 was used originally, the same rate curve that originates from A may be drawn originating from S at distance point C and fanning in both directions. Therefore, points between D and E are as cheaply supplied by producers at F as from producers at A. However, producers at E find themselves unable to provide their product at distances past H even though they are closer than producers at A. They find themselves unable to extend their market area past points D or E and thus possess a pocket market. For producers at A to intrude upon this pocket market, they would be required to

FIGURE E

POCKET MARKETS

A GRAPHIC ILLUSTRATION



lower their transportation rates to reflect the "notch" created by the intermediate producer, represented by the curve AFGHB. Similarly, intermediate producers must lower their transportation rates that extend beyond the AB cost curve (represented by the dashed curves) to capture a share of the market beyond distance E.

The packing industry tends to follow the general organization described for pocket markets. It has a central producing area generally removed from its principal market areas but also with intermediate distance producers. Smaller, higher cost production areas exist over much of the country as intermediate supply points. Transportation costs are a small percentage of total costs (Duewer, pp. 14). As a result, pocket markets appear to exist in the packing industry as intermediate plants may supply local or regional demand, but the Midwest still supplies a large portion of the demand in high population areas of the East Coast.

Geographic Product Pricing Strategies

Product pricing strategies are used under certain conditions to overcome market area limitations of transportation costs. Basing-point pricing systems tend to equalize delivered price at a given destination regardless of plant origin of the product. Basing-point pricing is the system of establishing prices to points away from the base point (usually large, centralized manufacturing areas) as price plus transportation costs to the market area. If another manufacturer located away from the base point were to meet the same prices established by the basing-point

system, the phenomena of freight absorbtion and phantom freight are encountered. Referring to Figure F, phantom freight would occur when manufacturer B could charge the higher price established by the base point A although its costs, particularly transportation costs, would permit a lower price. Freight absorption occurs when manufacturer B attempts to enter the "natural territory" of manufacturer A. He may only charge the same low price of his competitor and absorb the higher freight cost that he incurs.

Zone pricing systems involve uniform delivered prices within geographic zones when shipped from a common origin. In this case, delivered product prices may reflect true transport costs only at a single central point within a designated zone. At all other destinations within each zone, shippers would absorb freight (if the destination lay at a point further than the central true point) or collect phantom freight (if the destination lay at a point closer than the central true point).

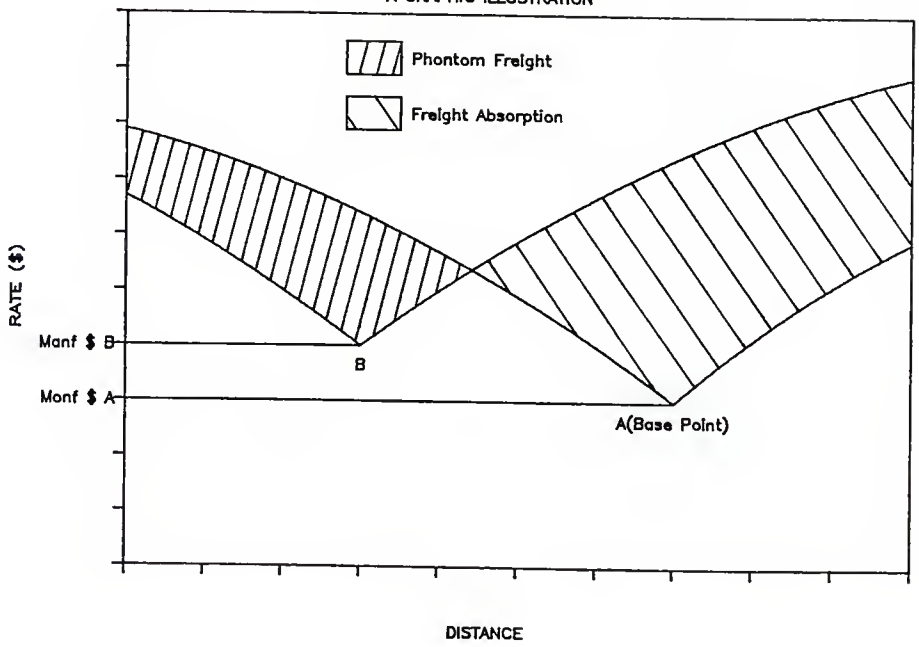
Where shipping costs are a small proportion of delivered product price, shippers may absorb freight if delivered price still exceeds marginal cost of production. Under such conditions, significant cross-hauling may occur.

Any of these strategies may allow expansion of an individual plants' market even though uniform application of transport charges would seem to limit the market area.

FIGURE F

BASE–POINT PRICING SYSTEM

A GRAPHIC ILLUSTRATION



CHAPTER IV

DISTRIBUTION ANALYSIS

Methodology

Data were obtained that represented a sampling of beef shipments from the eight largest beef packing plants in Kansas through personal, on-site interviews. Interview plants accounted for the slaughter of approximately 6.1 million head or over 95 percent of the total 6.2 million head of cattle commercially slaughtered in 1985 in Kansas. The average kill per plant was about 2900 head per day.

The interviews were on-site interviews conducted with the plant traffic and/or distribution manager or someone with similar authority. Information sought included destination of meat shipments, amount shipped, type of meat shipped, mode of transport, related plant data, and problems and other factors associated with the transportation of beef products. Data obtained were for the calendar year 1985.

Varying methods of recordkeeping necessitated different sampling techniques at different plants. For those plants that had their shipments summarized by total pounds shipped per destination state on a monthly or quarterly basis, sampling was unnecessary. Other plants maintained weekly summary sheets of the number of loads distributed to each state destination. In these cases, an estimating procedure was developed to convert loads to pounds. A sample of every fifth weekly summary starting

with the first full week of 1985 was drawn from the total. This method insured that different weeks of the month would be chosen and any bias consisting of undue emphasis by the first, second, third or fourth week was avoided. The number of shipping days included in these specific weeks was taken as a percentage of the total shipping days during the year. Using this method, 64 of a total 306 possible shipping days were obtained. The 306 is 365 minus 52 Sundays and 7 holidays. The 64 included 11 weeks sampled (77 total days) minus 11 Sundays and 2 holidays that fell during those weeks sampled.

Sample days were 20.915 percent of all shipping days. This percentage was used to expand the sample number of loads to estimate an annual total. The number of loads shipped to each destination state expanded by an average load weight was to arrive at the number of pounds shipped to each state for each of the plants for which this sampling procedure was used. The managers estimates of average weight per load whether carcass or boxed beef was used to determine pounds shipped. These estimates ranged from 41,000 to 42,500 pounds per load. The range between these two numbers is less than 3.7 percent and was deemed acceptable for the study. These weight estimates compared favorably with recorded plant data on weight per load that were available from some of the plants.

A slightly different sampling method was used in one plant with only daily shipping records available. In this case, every

seventh shipping day was selected, or 44 out of a possible 306. This method allowed a continuing rotation of different days of the week to be selected as certain days are normally heavier or lighter shipping days. Sample days represented 14.379 percent of the total shipping days for 1985. Combined with the twenty percent sample of shipments taken for each sample day, this translates into a sampling percentage of 2.876 percent of annual shipments.

Estimates of shipments of beef from Kansas plants exceeded estimated yield of Kansas slaughter because Kansas plants fabricate carcasses from non-Kansas slaughtering plants in addition to Kansas slaughter. Shipment estimates indicate that approximately 87 percent of the total beef shipments from Kansas plants interviewed exits Kansas as boxed beef. All but two of the interviewed plants fabricated carcasses. Some plants had a greater fabrication capacity than they did kill capacity and therefore imported carcasses from other plants. Certain packing houses which had killing capacities equal to or in excess of their fabricating capacity, nevertheless, imported specific carcass grades at times in order to increase efficiencies in their production line. Boxed beef from imported carcasses show up in the plant's distribution data with no way of identifying the imports apart from the on-site carcasses, with the imports having originated from both in-state and out-of-state. It was assumed that no differences in distribution by Kansas plants of in-state or out-of-state slaught-

ered carcass existed for the very reason that the two products could not be differentiated.

To allow combining of data on a uniform basis and comparisons with data reported for other states, the Kansas shipment data were reported as carcass weights. This also allowed for convenience of comparison with a similar 1972 study (Bittel). An analysis based upon fabrication levels, at which most of the meat is shipped today, would be extremely difficult if not impossible due to the variance in degree of fabrication of each plant and in each area. Lastly, consumption data is available in terms of carcass weight.

Kansas Beef Distribution

Percentage distribution of beef shipments by state destination from the eight major Kansas commercial beef slaughtering plants is indicated in Table 4. An analysis of the survey data of the Kansas beef packing plant shipments illustrates a wide and varied dispersion of the products. There were, in 1985, direct shipments to every state in the U.S. and the District of Columbia except for Alaska, Hawaii and Wyoming.

Table 4 shows the expansion of the survey sample data to represent the total shipments of the plants surveyed. Expanded data were then converted to percentages and were applied against the total carcass weight produced from Kansas slaughtered beef to estimate the amount of beef on a carcass basis supplied by Kansas to the U.S. by state and region.

TABLE 4

Destinations of Kansas Beef Shipments
by State and Region, 1985

STATE AND REGION	SURVEY EXPANSION	% OF TOTAL	KANSAS CARCASS WEIGHT	% OF INTERSTATE SHIPMENTS
	(1000 lbs)		(1000 lbs)	
ME	8,406	0.29	12,063	0.33
NH	11,998	0.42	17,218	0.47
VT	4,043	0.14	5,802	0.16
MA	81,700	2.84	117,244	3.22
RI	22,750	0.79	32,648	0.90
CT	65,876	2.29	94,536	2.60
NEW ENGLAND	194,773	6.77	279,511	7.68
NY	130,013	4.52	186,576	5.13
NJ	93,524	3.25	134,212	3.69
PA	140,791	4.90	202,043	5.55
MID ATLANTIC	364,328	12.67	522,831	14.37
OH	119,737	4.16	171,829	4.72
IN	40,686	1.41	58,387	1.60
IL	111,629	3.88	160,194	4.40
MI	83,011	2.89	119,125	3.27
WI	56,927	1.98	81,693	2.25
EAST NORTH CENTRAL	411,990	14.32	591,228	16.24
MN	33,836	1.18	48,557	1.33
IA	156,650	5.45	224,801	6.18
MO	92,304	3.21	132,461	3.65
ND	8,742	0.30	12,545	0.34
SD	4,063	0.14	5,831	0.16
NE	88,527	3.08	127,041	3.49
KS	340,666	11.84	488,875	---
WEST NORTH CENTRAL	724,788	25.20	1,040,111	15.15
DE	259	0.01	372	0.01
MD	52,500	1.81	74,910	2.06
DC	3,150	0.11	4,520	0.12
VA	42,152	1.47	60,490	1.66
WV	4,652	0.16	6,676	0.18
NC	87,233	3.03	125,184	3.44
SC	36,837	1.28	52,863	1.45
GA	89,868	3.12	128,966	3.55
FL	116,910	4.07	167,772	4.61
SOUTH ATLANTIC	433,261	15.06	621,753	17.08

TABLE 4
(continued)
Destinations of Kansas Beef Shipments
by State and Region, 1985

STATE AND REGION	SURVEY EXPANSION	% OF TOTAL	KANSAS CARCASS WEIGHT	% OF INTERSTATE SHIPMENTS
	(1000 lbs)		(1000 lbs)	
KY	29,169	1.01	41,859	1.15
TN	60,136	2.09	86,298	2.37
AL	35,103	1.22	50,735	1.39
MS	23,168	0.81	33,247	0.91
EAST SOUTH CENTRAL	147,576	5.13	211,779	5.82
AR	16,921	0.59	24,283	0.67
LA	45,677	1.59	65,549	1.80
OK	53,569	1.86	76,874	2.11
TX	242,457	8.43	347,939	9.56
WEST SOUTH CENTRAL	358,624	12.47	514,645	14.14
MT	1,519	0.05	2,180	0.06
ID	212	0.01	304	0.01
WY	---	---	---	---
CO	41,793	1.45	59,975	1.65
NM	4,257	0.15	6,109	0.17
AZ	10,765	0.69	28,364	0.78
UT	7,885	0.27	11,315	0.31
NV	8,129	0.28	11,666	0.32
MOUNTAIN	83,560	2.90	119,913	3.30
WA	11,638	0.40	16,701	0.46
OR	6,778	0.24	9,727	0.27
CA	139,306	4.84	199,912	5.49
AK	---	---	---	---
HI	---	---	---	---
PACIFIC	157,722	5.48	226,380	6.22
U.S.	2,876,622	100.00	4,128,112	100.00

Distribution from Kansas origins represents both shipments for consumption in destination states and shipments for further processing, fabrication and subsequent interstate transhipment. Hence, significant intra-state shipment in Kansas occurs as well as interstate shipment to other surplus producing states.

The major packers from whom distribution data were obtained shipped 11.8 percent of their total shipments to Kansas destinations. The intrastate shipments in 1985 were 177.4 percent of Kansas' estimated beef consumption. A substantial part of the intrastate shipment was apparently transshipped. Processing plants locate near the source of supply (i.e. packing plants) to take advantage of the differences in transportation costs between raw material and end product. Fabricating facilities also affect intrastate distribution. Some plants have a larger fabrication capacity, necessitating the importation of carcasses, many of which come from other Kansas packing plants. A plant may also import carcasses for its fabrication even if killing and fabrication capacity are matched. This is done to better the fabrication line efficiencies with similar grade carcasses or to better fill orders for certain grades.

Interstate shipments to Iowa and Nebraska, were nearly 70 percent of estimated consumption in those states even though they are surplus producing states. These states possess large fabricating and processing facilities and must import carcasses to fill out their production lines. The same circumstances that prompt

Kansas plants to import also are present in these two states. This phenomena may also be occurring in other states to a limited degree (Texas and Colorado are possibilities) but were not as easily identified. Estimates for more distant states may also understate their consumption demand for Kansas beef if regional distribution centers assemble the direct shipments.

For destination states other than Kansas, Nebraska and Iowa, the largest volume of Kansas' shipment went to Texas in 1985 with 348 million pounds of carcass weight equivalent, or 9.56 percent of total Kansas interstate shipments. Texas undoubtedly draws some Kansas beef for fabrication, processing and redistribution. However, consumption demand of a huge urban population base located primarily in central and eastern Texas also draws heavily on the nearest sources of supply, the Texas Panhandle and Kansas. This accounts for the large shipments to Texas reported in Table 4. Other states receiving 4 percent or more of Kansas shipments were: Pennsylvania, 5.55 percent; California, 5.49 percent; New York, 5.13 percent; Ohio, 4.72 percent; Florida, 4.61 percent; and Illinois, 4.40 percent. These six states along with Nebraska, Iowa and Texas, account for 49.13 percent of the interstate beef shipments from Kansas origins.

Geographic Patterns of Beef Consumption

Patterns of beef consumption and production by states in the U.S. results in surplus and deficit regions and surplus and deficit states. Data on consumption of beef by state were

developed by multiplying state population data by estimated per capita consumption reported on a regional basis.

To calculate these estimates, state population statistics were obtained from the Statistical Abstract of the United States, 1986 (p. 12) representing the 1984 average populations. Per capita consumption figures were derived from the USDA report, Consumer Demand for Red Meats, Poultry and Fish and from USDA consumption data. The report details a study of per capita consumption of red meats and red meat substitutes for the years 1976 and 1977 delineated by different demographic and socio-economic factors. One of these factors was per capita consumption by region. Four regions were designated as follows: Northeast, North Central, South, and West.[2] Ratios of regional to national consumption rates were calculated and applied to the 1985 U.S. per capita beef consumption of 106.88 pounds (Livestock and Poultry Situation and Outlook, p. 41) to determine regional consumption rates in 1985. The original weekly consumption figures by region for 1976 and 1977 and the calculated regional consumption figures for 1985 are presented in Table 5. Also shown are weekly beef consumption totals by region for 1965.

Beef production by state was estimated by multiplying liveweight slaughter by state in 1985 (Livestock Slaughter Annual Summary, 1985) by a calculated national average carcass yield

[2]These four regions represent combinations of regions for which beef distribution is reported in subsequent tables in this chapter.

TABLE 5

Per Capita and Total Beef Consumption by U.S. Regions

1965, 1976-77, 1985 (pounds of carcass weight)

Region	1965 weekly	1976-77 weekly	1985 annual	1985 population	1985 total consumption
	(pounds, carcass weight equivalent)			(thousands)	(million lbs.)
Northeast	1.57	1.67	105.45	49728	5244
Northcentral	1.81	1.77	113.02	59118	1682
South	1.33	1.63	107.09	80577	8629
West	1.85	1.67	105.45	46738	4929
U.S.			106.88	236158	25484

Sources: Consumer Demand for Red Meats, Poultry and Fish.

1986 Statistical Abstract of the U.S.

USDA Livestock and Poultry Situation and Outlook Report.

percentage. This yield percentage was determined by dividing national average carcass weight (656 pounds) by national average liveweight per slaughter animal (1098 pounds). Calculated yield was 59.745 percent in 1985. If production estimates for a state or region exceeded consumption estimates, that state or region has a surplus to be marketed outside its area. Deficit areas have the opposite condition. Surplus and deficit percentages were calculated with deficits indicated as a percentage of consumption and surplus calculated as a percent of carcass production for each state. Surplus and deficit states are detailed in Table 6. A special note; beef production in the New England states is reported by the USDA on a regional basis only.

The data clearly indicate the areas and states in which beef consumption exceeds or falls short of beef production. A total of 37 states show deficit production in relation to consumption. Of this number, most are located in the eastern half of the U.S. with only one state east of the Mississippi River (Wisconsin) showing surplus production. The state with the largest deficit is New York as it has the second largest state population but relatively small beef production. California ranks second, although it maintains the largest population it also has a substantial beef industry. The largest deficit region in absolute terms is the South Atlantic region and the second largest is the Middle Atlantic region.

When the deficit is recorded as a percent of consumption, the

TABLE 6

U.S. Beef Consumption and Production
by State and Region, 1985

STATE AND REGION	BEEF CONSUMPTION: 1984 POPULATION (1000)	BEEF CONSUMPTION: CARCASS WEIGHT CONSUMPTION	BEEF PRODUCTION: TOTAL LIVEWEIGHT (1000 pounds)	BEEF PRODUCTION: TOTAL CARCASS WEIGHT	SURPLUS OR DEFICIT[1]: TOTAL CARCASS WEIGHT	SURPLUS OR DEFICIT[1]: PERCENT OF PRODUCTION
ME	1,156	121,900	N.A.	N.A.	N.A.	N.A.
NH	977	103,025	N.A.	N.A.	N.A.	N.A.
VT	530	55,889	N.A.	N.A.	N.A.	N.A.
MA	5,798	611,399	N.A.	N.A.	N.A.	N.A.
RI	962	101,443	N.A.	N.A.	N.A.	N.A.
CT	3,154	332,589	N.A.	N.A.	N.A.	N.A.
NEW ENGLAND	12,577	1,326,245	97,526	58,267	(1,267,978)	95.6
NY	17,735	1,870,156	244,444	146,043	(1,724,113)	92.2
NJ	7,515	792,457	137,120	81,922	(710,535)	89.7
PA	11,901	1,254,960	1,157,847	691,756	(563,204)	44.9
MID ATLANTIC	37,151	3,917,573	1,539,411	919,721	(2,997,852)	76.5
OH	10,752	1,215,191	639,843	382,274	(832,917)	68.5
IN	5,498	621,384	208,492	124,564	(496,820)	80.0
IL	11,511	1,300,973	1,420,206	848,502	(452,471)	34.8
MI	9,075	1,025,657	519,738	310,517	(715,140)	69.7
WI	4,766	539,653	1,556,536	929,952	391,299	42.1
EAST NORTH CENTRAL	41,602	4,701,858	4,344,815	2,595,809	(2,106,049)	44.8
MN	4,162	470,389	1,202,777	718,599	248,210	34.5
IA	2,910	328,888	2,234,365	1,334,921	1,006,003	75.4
MO	5,008	566,004	431,018	257,512	(308,753)	54.5
ND	686	77,532	175,479	104,840	27,308	26.0
SD	706	79,792	744,545	444,828	365,036	82.1
NE	1,606	181,510	6,308,677	3,769,118	3,587,608	95.2
KS	2,438	275,543	6,909,554	4,128,112	3,852,569	93.3
WEST NORTH CENTRAL	17,516	1,979,658	18,006,415	10,757,930	8,778,272	81.6

[1]Deficits as a percentage of consumption. Surpluses as a percentage of carcass production.

TABLE 6

U.S. Beef Consumption and Production
by State and Region, 1985

STATE AND REGION	BEEF CONSUMPTION 1984 POPULATION (1000)	BEEF CONSUMPTION CARCASS WEIGHT CONSUMPTION	BEEF PRODUCTION TOTAL LIVEWEIGHT (1000 pounds)	BEEF PRODUCTION TOTAL CARCASS WEIGHT	SURPLUS OR DEFICIT[1] TOTAL CARCASS WEIGHT	SURPLUS OR DEFICIT[1] PERCENT OF PRODUCTION
DE*	613	63,807	68,705	41,048	(475,446)	92.1
MD*	4,349	452,687	---	---	---	---
DC#	623	64,848	---	---	---	---
VA#	5,636	586,651	99,444	59,413	(592,086)	90.0
WV	1,952	203,184	29,974	17,908	(185,276)	91.2
NC	6,165	641,715	129,703	77,491	(564,224)	87.8
SC	3,300	343,497	103,073	61,581	(281,916)	82.1
GA	5,937	607,573	222,024	132,648	(474,925)	78.2
FL	10.976	1,142,492	313,404	187,243	(955,249)	86.5
SOUTH ATLANTIC	39,451	4,106,454	966,327	577,332	(3,529,122)	85.9
KY	3,723	387,527	133,353	79,672	(307,855)	79.4
TN	4,717	490,993	265,526	158,638	(332,355)	67.7
AL	3,990	415,319	262,116	168,550	(246,769)	59.4
MS	2,598	270,426	219,606	131,204	(139,222)	51.5
EAST SOUTH CENTRAL	15,028	1,564,265	900,601	538,064	(1,026,210)	65.6
AR	2,349	244,507	64,695	38,652	(205,855)	84.2
LA	4,462	464,450	48,829	29,173	(435,277)	93.7
OK	3,298	343,289	596,496	356,377	13,088	3.7
TX	5,989	1,664,295	6,348,864	3,793,128	2,128,833	56.1
WEST SOUTH CENTRAL	26,098	2,716,541	7,058,884	4,217,330	1,500,789	35.6
MT	824	86,891	41,413	24,742	(62,149)	71.5
ID	1,001	105,555	944,203	564,114	458,859	81.3
WY	511	53,885	9,372	5,599	(48,286)	89.6
CO	3,178	335,120	1,902,330	1,136,547	801,427	70.5
NM	1,424	150,161	136,221	81,385	(68,776)	45.8
AZ	3,053	321,939	427,013	255,119	(66,820)	20.8
UT	1,652	174,203	399,389	238,615	64,412	27.0
NV	911	96,065	6,870	4,105	(91,960)	95.7
MOUNTAIN	12,554	1,323,819	3,866,811	2,310,226	986,407	42.7
WA	4,349	458,602	1,095,063	654,245	195,643	29.9
OR	2,674	281,973	110,883	66,247	(215,726)	76.5
CA	25,622	2,701,840	1,793,378	1,071,454	(1,630,386)	60.3
AK	500	52,725	---	---	(52,725)	100.0
HI	1,039	109,563	60,949	36,414	(73,149)	66.8
PACIFIC	34,184	3,604,703	3,060,273	1,828,360	(1,776,343)	49.3
U.S.	236,158	25,241,116	39,841,063	23,803,039	(1,438,072)	5.7

* OE and MD are combined in certain categories and reported under OE.
\# OC and VA are combined in certain categories and reported under VA.

New England states are at the highest level while the South Atlantic and Middle Atlantic regions rank behind New England in respective order. In percentage deficit, Nevada ranks the highest among individual states listed, followed closely by Louisiana and New York, although various New England states may have deficit percentages greater than Nevada if their base statistics were available.

Only three of the designated regions; West North Central, West South Central and Mountain, have surplus beef production. The region with the largest surplus in both absolute terms and as a percent of production is the West North Central region. Kansas ranks as the largest individual interstate supplier followed by Nebraska. Surplus beef production of the top five states (Kansas, Nebraska, Texas, Iowa and Colorado) accounted for 11.4 billion pounds of carcass beef, an amount equal to 45.1 percent of total U.S. consumption in 1985.

Reported U.S. beef consumption exceeded U.S. production in 1985 by 1438 million pounds of carcass weight beef. However, the USDA (Livestock and Poultry Situation and Outlook Report, May, 1986, pp. 41) reports a net U.S. importation of beef in 1985 of 1740 million pounds, more than making up for the shortfall. The difference between the net imports and the U.S. deficit is 302 million pounds which nearly equals the 317 million pounds of ending stocks for 1985 reported by the USDA.

A study of the Kansas beef shipments as a percent of consump-

TABLE 7

Kansas Beef Distribution as a Percent of Consumption

in the Destination State or Region, 1985

State and Region	%	State and Region	%
ME	9.90	KY	10.80
NH	16.71	TN	17.58
VT	10.68	AL	12.13
MA	19.18	MS	12.29
RI	32.18	East South Central	13.54
CT	28.42		
New England	21.08	AR	9.93
		LA	14.11
NY	9.98	OK	22.39
NJ	16.94	TX	20.91
PA	16.10	West South Central	18.94
Mid Atlantic	13.35		
		MT	2.51
OH	14.14	ID	0.29
IN	9.40	WY	--
IL	12.31	CO	7.90
MI	11.61	NM	4.07
WI	15.17	AZ	8.81
East North Central	12.57	UT	6.50
		NV	12.14
MN	10.32	Mountain	9.06
IA	68.35		
MD	23.40	WA	3.64
ND	16.18	OR	3.15
SD	7.31	CA	7.40
NE	69.99	AK	--
KS	177.42	HI	--
West North Central	52.54	Pacific	6.28
DE	0.58	U.S.	16.35
MD	16.55		
DC	6.97		
VA	10.31		
WV	3.29		
NC	19.51		
SC	15.39		
GA	21.23		
FL	14.68		
South Atlantic	15.14		

tion in destination states in Table 7 shows that Kansas supplied amounts equal to 16.35 percent of the nations consumption of beef in 1985. On a regional basis, the West North Central region was the most dependent upon Kansas origins with amounts equal to 52.54 percent of the consumption. These data include meat for processing and further fabrication as well as for consumption in the destination area. The New England region ranks second, receiving amounts equal to 21.08 percent of consumption followed by the West South Central and South Atlantic regions at 18.94 and 15.14 percents respectively. The Pacific and Mountain regions received shipments from Kansas equal to 6.28 and 9.06 percent of their respective annual consumption of beef. These regions also include the three states, Alaska, Hawaii and Wyoming, to which no shipments of Kansas beef were recorded in 1985.

Data on the distribution pattern for Kansas beef was obtained for 1972 in a comparable survey of Kansas slaughtering plants. Distributions are compared in Table 8.

The most prominent shifts in distribution pattern are a decrease in relative volume of shipment to the Mid Atlantic states (-12.64) and a relative increase in West North Central volume (+8.60). The relative decline in shipments to Mid Atlantic states results from a sharp decline in New York destinations from 15.53 percent of total Kansas interstate shipments in 1972 to 5.15 percent and a decline from 7.91 percent to 3.69 percent going to New Jersey. In the West North Central region, percent

TABLE 8

Distribution of Kansas Beef by Destination Regions

1972 and 1985

Destination Region	Interstate Shipments 1972* (Percent)	Interstate Shipments 1985** (Percent)	Change
New England	11.02	7.68	-3.34
Mid Atlantic	26.43	14.37	-12.06
East North Central	13.60	16.24	+2.64
West North Central	6.55	15.15	+8.60
South Atlantic	17.60	17.08	-0.52
East South Central	6.28	5.82	-0.46
West South Central	12.37	14.14	+1.77
Mountain	1.50	3.30	+1.80
Pacific	4.67	6.22	+1.55

* Source: Bittel, Table V, p. 32.

**Source: Table 4.

of Kansas interstate shipments to Iowa and Nebraska combined increased from 0.69 percent in 1972 to 9.67 percent in 1985.

Packing Industry Developments

Shipment data and surplus/deficit data reflect packing industry developments in recent years. Three major developments have occurred. First, geographic shifts in the industry have occurred resulting in greater production in the Great Plains with an accompanying increase in industry efficiency. Second, firms have become larger and concentration ratios have increased. Third, there has been increased fabrication of carcasses at packing plants and resulting shipment of boxed beef.

The U.S. saw continued growth in the total commercial liveweight slaughter of beef until the mid 1970s. Since then, total slaughter has fluctuated between 36 and 40 billion pounds of liveweight equivalent. A reported lack of demand due to increased competition from poultry and fish and a decrease in the per capita consumption of red meats have led to this relative stabilization of slaughter. However, the Kansas slaughter industry has continued to grow throughout this period (Table 9).

The beef slaughtering industry has shifted over the past twenty years from almost exclusively producing and shipping carcasses to shipping primal and subprimal cuts fabricated at or near production sites. While information is incomplete, Nelson indicates that 58 percent of the total steer and heifer carcasses

TABLE 9

Ranking Top Ten States in Commercial Cattle Slaughter (selected years, million pounds)

1960		1965		1970	
STATE	TOTAL LIVEWEIGHT SLAUGHTER	STATE	TOTAL LIVEWEIGHT SLAUGHTER	STATE	TOTAL LIVEWEIGHT SLAUGHTER
IA	2,668	IA	4,152	NE	4,650
CA	2,541	CA	3,058	IA	4,616
NE	2,205	NE	2,961	CA	2,939
MN	1,493	TX	2,111	TX	2,875
IL	1,483	MN	1,691	KS	2,140
TX	1,315	IL	1,550	CO	2,108
OH	1,165	KS	1,480	MN	1,801
KS	1,159	CO	1,454	IL	1,380
MO	1,105	WI	1,320	MO	1,302
CO	1,080	OH	1,233	WI	1,296
10 STATE	16,217		21,012		25,017
% OF U.S.	64.0		64.9		68.9

1975		1980		1985	
STATE	TOTAL LIVEWEIGHT SLAUGHTER	STATE	TOTAL LIVEWEIGHT SLAUGHTER	STATE	TOTAL LIVEWEIGHT SLAUGHTER
NE	5,043	NE	6,189	KS	6,910
TX	4,717	TX	5,922	TX	6,349
IA	4,299	IA	3,285	NE	6,309
CA	3,016	KS	3,216	IA	2,234
KS	2,935	CA	2,144	CO	1,902
CO	2,110	CO	1,785	CA	1,793
MN	1,640	IL	1,426	WI	1,557
WI	1,531	WI	1,360	IL	1,420
IL	1,427	MN	1,027	MN	1,203
OH	1,130	ID	889	PA	1,159
10 STATE	27,847		27,243		30,836
% OF U.S.	68.4		75.2		77.4

Source: United States Department of Agriculture Agricultural Statistics, various issues, Statistical Reporting Service, Washington, D.C.

produced in 1982 were further fabricated by the same packer. This is an increase from 43.5 percent in 1979. Guchow estimated that boxed beef now comprises 75 to 80 percent of all beef merchandised at the retail level while Duewer states that over 83 percent of all fed beef is fabricated before arriving at a local store. Several plants in this study indicated that they fabricated well over 90 percent of their output.

The fabrication of carcasses at the slaughtering plants results in several efficiencies for the total marketing chain. Fabricating a carcass into primal cuts results in approximately an 86 percent primal yield (Lawrence). Further fabricating could result in greater weight reduction at origin. Tray-ready or retail cuts average about 45 percent of the total carcass weight. The remainder is fat, bone, blade and cutting loss, tallow, and other trim. These by-products have an economic value, a part of which may be lost when not separated at slaughtering plants.

Transportation of fabricated beef also offers several advantages. The boxed product is easier to handle than carcasses. The boxed product allows better efficiency in packing and loading. Maximum weight limit per trailer is more easily achieved. Unnecessary hauling of by-products is also avoided. Finally, additional handling at intermediate processing points is avoided.

CHAPTER V

TRANSPORTATION ANALYSIS

Truckers are the dominant transporters of Kansas beef. Shippers may employ for-hire carriers or they may use shipper-owned truck fleets. Shipper-owned trucking requires that the shipper seek backhaul loads to minimize empty mileage. If a for-hire carrier is employed, contract carriers and common carriers provide further alternatives. If the selected carrier is a contract carrier, rates and other conditions of carriage are negotiated. Common carriers operate from prescribed tariffs in which conditions of transport, including rates, are specified. In selecting a carrier, the shipper must also consider the quality of service provided by each type of carrier. Major consideration also is given to transport cost.

Analysis of rates provided by contract and common carrier truckers in 1986 from six different origins to important distribution areas is presented in this section. Tariff rates for this analysis were provided by various tariff publications through motor carrier associations representing groups of carriers. Tariff rates are (1) class rates or (2) commodity rates. A class tariff take groups of commodities with similar transportation characteristics and values and classifies them under specific rate schedules. A commodity tariff takes separate or like commodities and lists rate schedules, either on a point-to-point basis or on a milage basis. Commodity tariffs preempt class tariffs and are therefore employed in this analysis. These rates generally

include such fixed charges as terminal costs, administrative costs, and return on value. Since these are fixed costs, the longer the haul the lower the percentages of terminal and associated costs included in the rate. As the fixed costs make up a smaller percentage of the total cost on longer hauls, rates tend to increase at a decreasing rate. The common commodity rates utilized were obtained from the following agencies and their respective tariff publications:

1. Middlewest Motor Freight Bureau, Local, Joint, Proportional, Export and Import, also Distance, Commodity Rates on Meats and Packing House Products Via All Motor and Motor-Rail Routes, (Tariff No. 288-C, I.C.C. MWB 288-C), Kansas City, Missouri: 1985.
2. Motor Carrier's Traffic Association, Inc., Joint and Local Commodity Rates Applying on Fresh Meats and Packing House Products, (Tariff No. 255-A, I.C.C> MCA 255-A), Greenboro, North Carolina: 1985.
3. The Eastern Central Motor Carriers Association, Inc., Local, Joint and Proportional Domestic, Export and Import Commodity Rates Via All Motor and Motor-Rail Routes, (Tariff No. 252-F, I.C.C. ECA 252-F), Akron, Ohio: 1985.
4. Rocky Mountain Motor Tariff Bureau, Inc., Rules, Points of Service, Individual Carriers' Exceptions to General Provisions of Tariffs Governed by This Tariff, (Tariff No. 101-B, I.C.C. RMB 101-B), Denver, Colorado: 1985.

5. Rocky Mountain Motor Tariff Bureau, Inc., Local and Joint Commodity Rates, also Distance Commodity Rates on Interstate and Foreign Commerce Via All Motor or Motor with Rail, (Tariff No. 261-B, I.C.C. RMB 261-B), Denver, Colorado: 1985.

Contract rates also are evaluated in this chapter. These are rates negotiated between carriers and shippers. Contract carriers are not required to publish rates or to meet any specific freight classifications. After the Motor Carrier Act of 1980, it became much easier to qualify as a contract carrier and it is now possible for a carrier to obtain both common and contract authority. Dual authority has greatly increased the number of trucks that can haul under contract. This encouraged some of the larger beef packing firms to negotiate more of their shipments under contract rates in an effort to achieve more favorable rates and to provide for specific service requirements. Several of the larger plants in Kansas currently transport nearly all of their products with carriers operating under contract authority.

Contract rates were obtained from individual carriers located in the Central United States. Names of carriers providing service were obtained from shippers. Each carrier's operation was discussed with the carrier by telephone and each was asked to complete a mailed contract rate matrix. It was specifically requested that carriers not identify either shippers or receiver so that specific rates would remain confidential.

Six specific origin points were chosen to represent shipping areas. These were: Wichita, Kansas; Omaha, Nebraska; Waterloo, Iowa; Garden City, Kansas; Amarillo, Texas; and Denver, Colorado. The first three sites, Wichita, Omaha and Waterloo, were chosen for a similar study in 1972. These origins permit comparison with the earlier study. While Wichita and Omaha are still centers of packing house activity, Waterloo has declined in importance, although there is still one major packing house in the Waterloo area. The other three points (Garden City, Amarillo and Denver) were selected to represent areas in which there is recent growth and significant concentrations of shippers.

The destination points represent population centers throughout the United States. These points were grouped into three destination groups to more closely examine the structure of rates in each major direction from Middlewest origins. The destination groupings represent cities north and east of Kansas (Northeast), south and east of Kansas (Southeast) and west of Kansas (West). Rates are for boxed beef shipments of truckload volume.

Regression analysis is used to describe the rate/distance relationship of the tariff and contract rates in each of the major destination groups. Three regression forms were used to estimate carrier rates. Variables utilized in the analysis consisted of three independent variables and one dependent variable. They are as follows:

Y = carrier rate

X = distance (miles)

X_2 = distance squared (miles)

1/X = reciprocal of distance (miles)

where the carrier rate is expressed on a cents-per-hundredweight basis in the case of tariff rates and in cents-per-mile with contract rates.

Three different functional forms were examined to illustrate the relationship between shipping rates and distance hauled. The first is a linear function expressed as follows:

$$Y_i = a + bX_1 + E_i$$

The data will be represented graphically by a straight line through the data field with a positive or negative slope depending upon the expression of the independent variable.

The second function employed is a quadratic equation and uses two of the independent variables. It is expressed in the following form.

$$Y_i = a + b_1X_1 + b_2X_1^2 + E_i$$

The data will be graphically represented by a curving line through the data field with the curve resulting from the influence of the "X^2" term. The curve, through extrapolation or within the boundaries of the data, will eventually reverse its slope, moving from increasing to decreasing or visa-versa.

The third functional form used in the regression analysis is again curvilinear and described as a hyperbolic function. It is

represented below:

$$Y_i = a + b_1/X_1 + E_i$$

The "b1/X" term may be represented as "b/X" or as "bX^{-1}". This equation results in a graphical representation of the data with a curvilinear line through the data field. However, a hyperbolic equation differs from the quadratic equation in that it uses only one independent variable and that the slope of the graphical curve will remain positive or negative throughout. The curved line, if extended indefinitely towards the Y-axis would approach but never reach the axis. The curve will asymptotically approach the Y-axis. Examining the equation, we find that as we decrease the "X" coefficient, we increase the total "b/X" term. Since we cannot designate "X" as equal to zero ("X" is undefined at zero), "b/X" will always increase as we approach the Y-axis, never allowing the curve to reach the axis.

In a similar fashion, the curve will never meet or fall below the level designated by the "a" coefficient as we move to the right on the graph approaching it asymptotically. As we increase "X" to the point of infinity, we discover that the "b/X" term becomes infinitesimally small as the estimate approaches the value of the "a" coefficient establishing a base to which the curve will be forever approaching but never attaining.

To determine which type of equation to utilize for each analysis, the criteria of best fit was employed. The R-squared statistic of each equation became the determining factor of best

fit. However, if the results of the equation and the corresponding graphical representation deviated from assumptions inherent in the original data, an alternative function was chosen. Specific reasons for choosing an alternative estimate will be explained in each case.

Tariff Analysis

Tariff rates from several midwestern cities representative of concentrations of beef packing to destinations across the U.S. were analyzed. The rates represent load minimums of between 38,000 and 44,000 pounds with the median minimum being 42,000 pounds. A regression analysis was applied to the rates from four origins to destination points in designated regions of the U.S.

Tariff rates for boxed beef to the Northeast region are illustrated in Table 10. Waterloo has the absolute rate advantage in nearly all cases illustrated in the table. The other origin points follow with general distance advantages falling to Omaha, Wichita and then Garden City respectively.

An examination of rate/distance relationships through regression analysis utilizing the three functional forms previously described resulted in the following equations for each origin point. Each coefficient is statistically significant at the 5.0 percent level. The standard error of each coefficient is indicated in parenthesis and the R-square term is indicated to the right of each equation. Garden City's best fit equation came in the form of a hyperbolic function while the other cities exhibited

relationships best described by quadratic equations.

Garden City

$$Y = 695.123 - \underset{(13878.750)}{210753.977/X_1} \qquad R^2 = .924$$

Omaha

$$Y = 52.596 + \underset{(0.0673)}{0.4323X_1} - \underset{(0.0000376)}{0.0000797X_1^2} \qquad R^2 = .967$$

Waterloo

$$Y = -10.263 + \underset{(0.0433)}{0.6295X_1} - \underset{(0.0000285)}{0.0002140X_1^2} \qquad R^2 = .990$$

Wichita

$$Y = -10.242 + \underset{(0.0789)}{0.6140X_1} - \underset{(0.0000395)}{0.0001751X_1^2} \qquad R^2 = .946$$

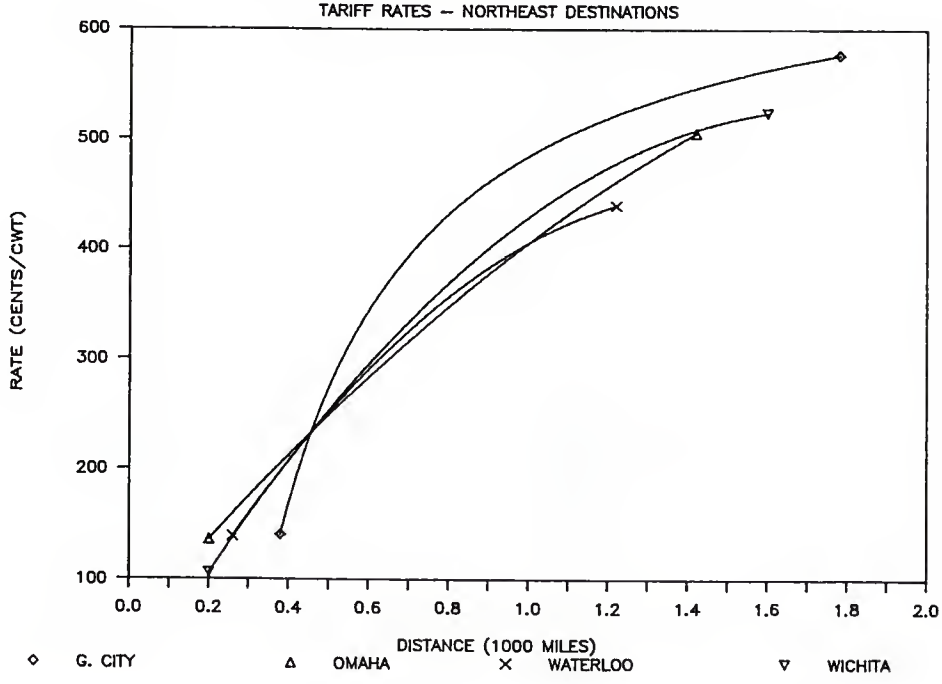
The graphic representations of these equations are illustrated in Figure G. All four curves increase at a decreasing rate depicting the curvilinear relationships with each varying in slope and shape. While the curves representing Omaha, Waterloo and Wichita are relatively close to one another, the curve for Garden City starts low but quickly increases to show a substantial gap above the other curves. This indicates that for points of equal distance, the rates are higher from Garden City than from the other origin points. The other major disparity shows up in the last quarter of the curve for Waterloo. Its slope decreases faster than the other curves giving it an advantage at longer distances. This phenomena coupled with Waterloo's nearer proximity to the Northeast locations results in the tariff rate advantages in Table 10.

TABLE 10
Tariff Rates to Northeast Destinations

Destinations	Origins			
	G. City	Omaha	Waterloo	Wichita
	(cents per 100 lbs)			
Kansas City	158	171	132	118
St. Louis	308	201	192	229
Springfield IL	418	.	155	.
Indianapolis	435	.	239	296
Chicago	365	219	159	269
Cincinnati	506	308	269	396
Dayton	501	319	266	398
Columbus	500	305	275	375
Detroit	552	290	284	406
Cleveland	522	361	289	412
Pittsburg	.	405	321	510
Buffalo	.	429	352	.
Baltimore	546	454	400	487
Washington	546	454	400	487
Syracuse	525	435	385	472
Philadelphia	546	454	400	487
Trenton	556	467	413	498
New York	556	467	413	498
Albany	556	467	413	498
Hartford	575	485	432	516
Springfield, MA	575	485	432	516
Providence	588	495	442	529
Boston	588	495	442	529

FIGURE G

PLOTTED REGRESSION EQUATIONS



A plausible explanation for the higher rates from Garden City origins would include backhaul potential to the Garden City area. This is an area of low population density and little industrial activity. Absence of two-way hauls may explain at least a part of the difference in rates. Secondly, the Garden City area was a rapidly expanding beef production area in 1985. Higher rates than from other origins may reflect a need to attract more truckers to the area. Backhaul conditions may also be reflected in the Waterloo rates at distances beyond 1000 miles.

Tariff rates for boxed beef to Southeast destinations are shown in Table 11. Absolute origin advantages or disadvantages are not as clearly evident as in rates to Northeast points with rates generally more equal. Most of the lowest rates are spit between Wichita and Waterloo while Garden City collects most of the highest rates to individual points. A regression analysis of the relationships using the same three functional forms yields the following equations.

Garden City

$$Y = 169.225 + \underset{(0.0165)}{0.20457X_1} \qquad R^2 = .895$$

Omaha

$$Y = 143.251 + \underset{(0.0206)}{0.21902X_1} \qquad R^2 = .869$$

Waterloo

$$Y = 96.763 + \underset{(0.0149)}{0.26078X_1} \qquad R^2 = .953$$

Wichita

$$Y = 54.771 + \underset{(0.0635)}{0.40585X_1} - \underset{(0.0000352)}{0.00008129X_1^2} \qquad R^2 = .948$$

Each coefficient is statistically significant at the 5.0 percent level. The standard error of each coefficient is indicated in parenthesis below the term and the R-square statistic is listed to the right of each equation. The analysis yielded linear equations for each data group except Wichita which was best represented by a quadratic equation. Several of the quadratic equations for the other origins resulted in slightly higher R-square percentages, but the X^2 term was deemed statistically insignificant and the equations were disregarded.

These equations are graphically represented in Figure H. The curves are similar without major discrepancies. The curvilinear nature of the function representing Wichita gives it a rate advantage for equal distance points at the lower end of the milage scale but a disadvantage at mid-curve. Waterloo also has a rate advantage at lower distances but quickly sees it turn to a disadvantage as its slope is steeper than the other curves.

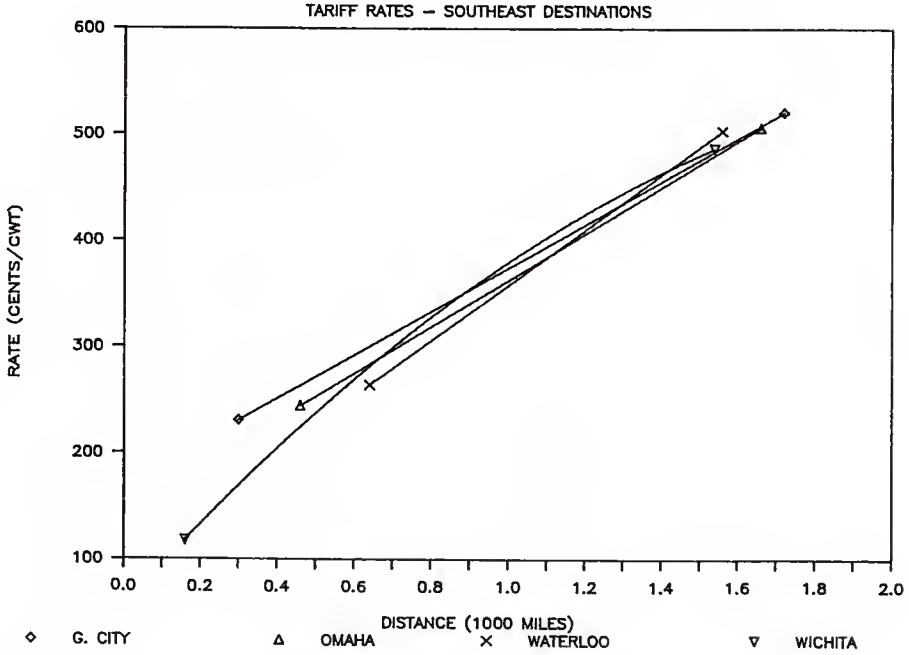
The tariff rates to western destinations are listed in Table 11. Rates to the West are zone rates in which destinations are grouped and equal rates applied to each destination within the zone. Prior to 1958, rates to the West region tended to be highly disorganized and favored plants in the older and more established terminal areas in the Midwest. Rates were so discriminatory that private carriers were competing for and winning a large portion of the western business. To alleviate the undue

TABLE 11
Tariff Rates to Southeast Destinations

Destinations	Origins			
	G. City	Omaha	Waterloo	Wichita
	(cents per 100 lbs.)			
Oklahoma City	222	272	.	100
Dallas	236	336	.	201
Little Rock	329	.	262	218
Memphis	328	287	304	236
Houston	385	388	.	352
Nashville	332	281	258	295
Birmingham	350	315	304	317
New Orleans	409	332	350	361
Chattanooga	355	317	295	311
Montgomery	368	327	318	327
Knoxville	373	327	298	332
Mobile	368	340	334	340
Atlanta	379	334	317	340
Tallahasse	421	415	398	390
Charlotte	474	415	388	409
Charleston	472	437	410	431
Jacksonville	449	441	427	420
Tampa	472	469	454	457
West Palm Beach	505	501	483	478
Miami	520	514	501	487

FIGURE H

PLOTTED REGRESSION EQUATIONS



high rates and to standardize and organize the rate structures, the Cudahy Packing Company of Omaha set up a milage scale for midwestern shipping firms based upon zones. These zone rates to the West became known as the "Cudahy Scale" and were adopted by the Rocky Mountain Tariff Bureau in their tariff rates. These rates have survived various protests to the Interstate Commerce Commission and exist today. (Bittel, pp. 63-65) The zonal nature of these rates to western points precluded the use of regression analysis.

Table 12 shows that the closest origin, Garden City, has an absolute rate advantage to all western points. Conversely, Waterloo is at a rate disadvantage. Unfavorable rates exist between individual destination points within each zone as delivery distances may vary as much as 1000 miles on a single rate. The shorter-distance destinations are subsidizing the longer-distance destinations of the same zone if differences are not offset by differences in backhaul or other transport conditions.

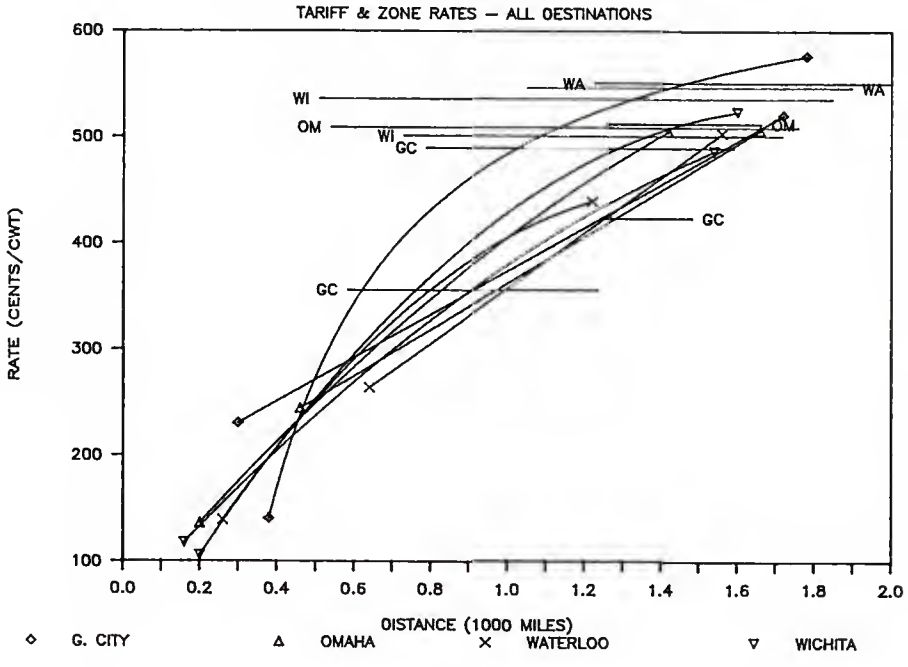
Figure I is a composite of the previous tariff figures plus the zone rates of the West region. Comparing the Northeast and Southeast destinations, the Southeast generally maintains a rate advantage for equal distances, especially when distances exceed 700 miles. The zone rates of the West region span the regression curves of the other regions in most cases. This would indicate that those points falling to the right of the curves are receiving an undue rate preference while those destinations falling to the

TABLE 12
Tariff Rates to West Destinations

Destinations	Origins			
	G. City	Omaha	Waterloo	Wichita
	(cents per 100 lbs.)			
Gallup	356	509	551	501
Flagstaff	356	509	551	501
Tucson	356	509	551	501
Phoenix	356	509	551	501
Las Vegas	356	509	551	501
Yuma	356	509	551	501
San Diego	356	509	551	501
Los Angeles	356	509	551	501
Reno	424	509	551	501
Fresno	424	509	551	501
Sacramento	424	509	551	501
san Francisco	424	509	551	501
Denver	.	.	.	.
Salt Lake City	313	509	536	536
Pocatello	490	509	547	536
Twin Falls	490	509	547	536
Helena	490	535	545	536
Boise	490	513	547	536
Spokane	490	513	547	536
Pendleton	490	513	547	536
Portland	490	513	547	536
Salem	490	513	547	536
Seattle	490	513	547	536

FIGURE I

PLOTTED REGRESSION EQUATIONS



left side of the curves are receiving a disadvantageous rate. Among zones, there are destination points of nearly identical distances, but because they are grouped in different zones, have vastly different rates. Many of the points between the 1000 to 1200 mile range have a variety of zones overlapping in which rates may vary nearly two dollars per hundredweight.

Contract Rate Analysis

Contract rates for boxed meat were collected from various midwestern carriers in October, 1986. The rates represented six origin points in high concentration beef production areas to destinations across the U.S. As with tariff data, destinations were divided into three directional groups so that a regression analysis could more easily be applied to the data. Three different functional forms again were used in the analysis. Contract rates are reported on a cents per mile basis for truck loads of boxed beef approximating 42,000 pounds.

The contract rates from the six origin points to the Northeast region are shown in Table 13. The rates show a rapid decrease in cents per mile for all destinations as trip distance becomes longer. Mileage rates decrease rapidly at the shorter distances represented by Midwest destinations but decrease quite slowly at the longer distances.

The regression analysis yields the equations listed below. Only two functional forms were utilized. A quadratic equation resulted in the best fit for Omaha and Waterloo while the remain-

TABLE 13

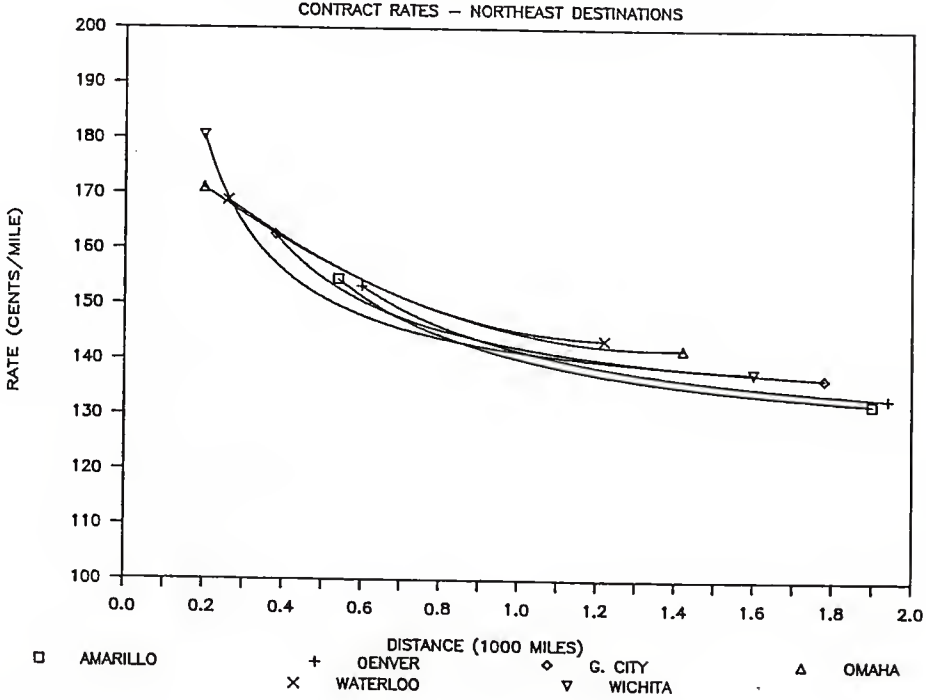
Contract Rates to Northeast Destinations

Destinations	Origins					
	Amarillo	Denver	G. City	Omaha	Waterloo	Wichita
	(cents per vehicle mile)*					
Kansas City	157	153	161	174	167	178
St. Louis	145	147	151	158	164	156
Springfield, IL	145	147	150	160	167	154
Indianapolis	140	138	144	156	158	148
Chicago	131	138	144	154	169	148
Cincinnati	136	138	143	152	156	146
Dayton	139	139	143	152	156	146
Columbus	139	139	142	152	156	144
Detroit	138	133	141	152	156	142
Cleveland	137	137	140	150	154	142
Pittsburg	134	137	140	146	152	140
Buffalo	136	136	140	145	152	140
Baltimore	135	135	139	143	146	139
Washington	135	135	139	143	146	139
Syracuse	134	135	139	143	146	139
Philadelphia	134	135	139	143	144	138
Trenton	134	135	137	142	144	138
New York	134	135	137	142	144	138
Albany	134	134	136	142	144	138
Hartford	133	134	137	142	144	137
Springfield, MA	134	135	137	142	144	136
Providence	134	133	136	142	144	136
Boston	130	131	136	142	144	136

* Truckload approximately equals 42,000 pounds of boxed beef

FIGURE J

PLOTTED REGRESSION EQUATIONS



ing origins were best represented by hyperbolic equations. All coefficients were significant at the 0.5 percent level. The standard error is listed below each coefficient in parenthesis and the R-square statistic is listed to the right of the equation.

Best fit regressions for contract rates to the Northeast are as follows:

Amarillo

$$Y = \underset{}{123.253} + \underset{(1583.78)}{16890.809/X_1} \qquad R^2 = .844$$

Denver

$$Y = \underset{}{124.124} + \underset{(1127.24)}{17507.485/X_1} \qquad R^2 = .920$$

Garden City

$$Y = \underset{}{129.771} + \underset{(415.60)}{12449.747/X_1} \qquad R^2 = .977$$

Omaha

$$Y = \underset{}{181.938} - \underset{(0.0054)}{0.05904X} + \underset{(0.0000030)}{0.00002182X_1^2} \qquad R^2 = .964$$

Waterloo

$$Y = \underset{}{183.745} - \underset{(0.0040)}{0.06443X} + \underset{(0.000002)}{0.00002586X_1^2} \qquad R^2 = .988$$

Wichita

$$Y = \underset{}{131.634} + \underset{(389.61)}{9766.951/X_1} \qquad R^2 = .967$$

These equations are graphed in Figure J. Curves flatten at longer distances, especially over 1000 miles. Two curves representing rate structures for Omaha and Waterloo are the highest curves almost the entire length of the chart, indicating a rate disadvantage to equal distance destinations. Conversely, Amarillo

and Denver show rate advantages for distances greater than 1000 miles with Amarillo holding the edge over Denver.

Contract rates to Southeast destinations are listed in Table 14. A quadratic equation best fits the Amarillo data while hyperbolic functions were used for the remaining data sets for this region. However, the correlation coefficient of the quadratic equation was higher than the correlation coefficient of the hyperbolic equation for the Waterloo rate data (.882 to .849) but the quadratic equation resulted in a curve that changed from a negative to a positive slope, while still within the boundaries of the mileages of the Waterloo data (from about 1350 miles on upward). Examining the data, it was found that rates from all origins to Southeast destinations generally did not increase with distance. The only increases noted were some irregular rates for origin points in the early or middle distance ranges. With this evidence, the hyperbolic equation was accepted as the more realistic.

Best fit regressions for contract rates, Southeast destinations are as follows:

Amarillo

$$Y = 178.713 - \underset{(0.0063)}{0.05212X_1} + \underset{(0.0000030)}{0.00001337X_1^2} \qquad R^2 = .958$$

Denver

$$Y = 112.497 + \underset{(1116.23)}{28867.448/X_1} \qquad R^2 = .974$$

Garden City

$$Y = 119.486 + \underset{(1030.79)}{22366.948/X_1} \qquad R^2 = .963$$

Omaha

$$Y = 119.486 + \underset{(1782.41)}{21966.107/X_1} \qquad R^2 = .894$$

Waterloo

$$Y = 120.101 + \underset{(2369.11)}{23828.792/X_1} \qquad R^2 = .849$$

Wichita

$$Y = 127.133 + \underset{(585.20)}{14039.382/X_1} \qquad R^2 = .970$$

Figure K illustrates the graphed curves representing these regression equations. Waterloo maintains the highest levels throughout most of the distances that it encompasses' denoting a higher rate structure. Two of the curves, Omaha and Garden City, follow nearly identical paths over shared distances. Amarillo's rate structure is reflected by a curve that stays below the other curves most of the time indicating a relative advantage for Amarillo shipments to the Southeast.

Contract rates to the West are presented in Table 15. The milage rates are characterized by extended distances of unchanging rates for the longer hauls. The structure of these

TABLE 14

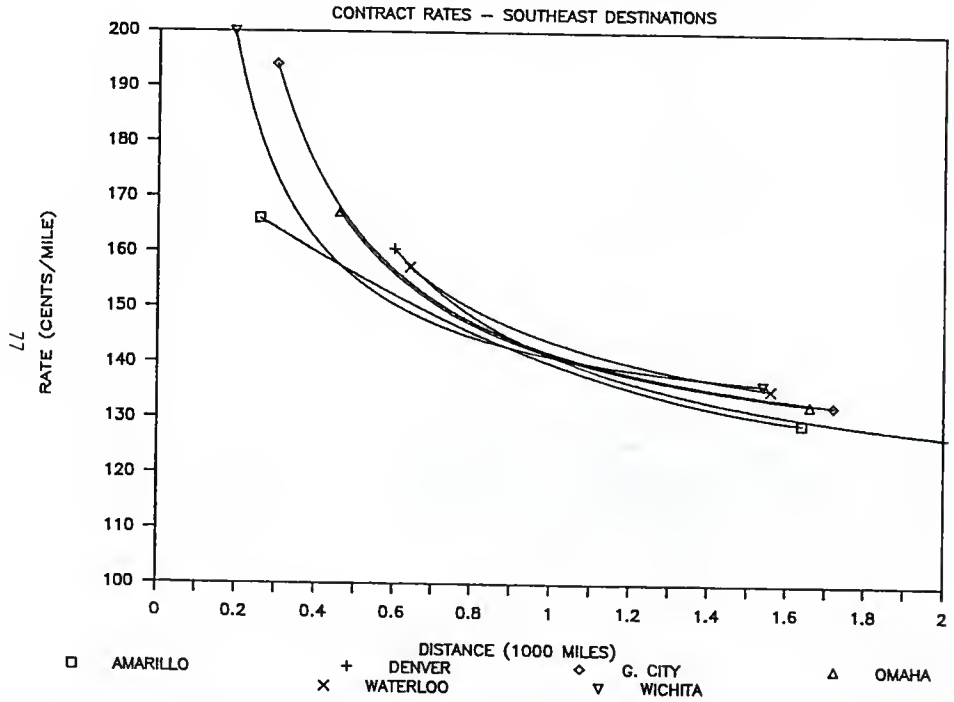
Contract Rates to Southeast Destinations

Destinations	Origins					
	Amarillo	Denver	G. City	Omaha	Waterloo	Wichita
	(cents per vehicle mile)*					
Oklahoma City	164	158	189	166	158	212
Dallas	.	154	165	159	156	170
Little Rock	159	142	162	160	158	164
Memphis	146	138	147	150	155	153
Houston	.	141	156	148	144	156
Nashville	141	137	144	150	159	147
Birmingham	141	136	142	143	154	146
New Orleans	145	136	142	142	138	150
Chattanooga	138	135	140	142	148	143
Montgomery	140	134	140	142	143	142
Knoxville	136	134	140	142	146	142
Mobile	141	134	140	136	145	142
Atlanta	137	134	139	134	145	141
Tallahasse	136	131	137	140	140	138
Charlotte	134	131	137	140	142	138
Charleston	134	130	136	138	140	136
Jacksonville	132	130	135	138	138	136
Tampa	132	128	135	136	138	135
West Palm Beach	130	127	131	134	140	137
Miami	129	126	130	133	138	136

* Truckload approximately equals 42,000 pounds of boxed beef

FIGURE K

PLOTTED REGRESSION EQUATIONS



rates is represented in the following list of regression equations with correlation coefficients and standard errors for specific coefficients. As with all other regression equations, the coefficients are statistically significant at the 0.5 percent level. All of the regressions are hyperbolic except for the linear regression representing Denver's rate structure. The hyperbolic function for Denver resulted in a low correlation coefficient (.717 compared to the linear function's .912) while the quadratic function had a statistically insignificant X^2 term. (See appendix B) It should be noted that the correlation coefficients for the West region were notably lower than those of the other two regions. The average R-square factor for the West is .840 while to the Northeast and Southeast, average coefficients were .943 and .935 respectively. While the Waterloo correlation coefficient in the West is considerably lower than all others and does much to pull the average down, it alone is not responsible as the region average without the Waterloo data is still only .874. Amarillo, Denver and Garden City have correlation coefficients that would fall within the range presented for the Northeast and Southeast regions, but at the low end of that range. Omaha, Waterloo and Wichita all have correlation coefficients lower than is observed from these points to the other destinations. Therefore, the regression functions do not as accurately reflect the data as similar functions for other destinations.

Best fit regressions for contract rates, West destinations

are as follows:

Amarillo

$$Y = 105.607 + \underset{(1748.01)}{29606.884/X_1} \qquad R^2 = .932$$

Denver

$$Y = 194.117 - \underset{(0.0040)}{0.05711X_1} \qquad R^2 = .912$$

Garden City

$$Y = 111.056 + \underset{(1979.18)}{26116.680/X_1} \qquad R^2 = .892$$

Omaha

$$Y = 114.759 + \underset{(2664.17)}{24934.409/X_1} \qquad R^2 = .807$$

Waterloo

$$Y = 110.854 + \underset{(4800.59)}{31657.444/X_1} \qquad R^2 = .674$$

Wichita

$$Y = 110.001 + \underset{(2845.20)}{28332.905/X_1} \qquad R_2 = .825$$

Regression functions to the West are plotted in Figure L. The curves maintain a close proximity to each other in the shorter distances. However, the curves start to differentiate from each other at middle distances. Waterloo has the highest rate curve on the chart for its entire distance. Amarillo has the lowest rate structure for the West after the plots move past the short distances. The lowest estimated rate from Denver is 127 cents per mile to Los Angeles. The linear function tends to overstate the decline in rates at longer distances in this case.

TABLE 15
Contract Rates to West Destinations

Destinations	Origins					
	Amarillo	Denver	G.City	Omaha	Waterloo	Wichita
	(cents per vehicle mile)*					
Gallup	172	169	167	149	132	155
Flagstaff	163	161	159	132	132	148
Tucson	155	148	148	132	132	147
Phoenix	152	151	145	132	130	130
Las Vegas	144	154	138	132	130	130
Yuma	144	138	132	132	130	130
San Diego	128	128	130	131	129	130
Los Angeles	128	127	129	131	129	130
Reno	127	128	130	132	129	128
Fresno	128	128	128	131	129	128
Sacramento	127	128	128	131	129	127
San Francisco	127	128	128	131	129	127
Denver	172	.	189	163	159	160
Salt Lake City	136	169	142	137	148	146
Pocatello	135	164	145	144	132	130
Twin Falls	127	161	136	132	132	130
Helena	127	148	130	132	132	130
Boise	127	170	130	132	132	130
Spokane	126	128	128	132	130	128
Pendleton	127	128	130	132	130	128
Portland	126	128	128	131	129	127
Salem	126	128	128	131	129	127
Seattle	126	128	128	131	129	127

* Truckload approximately equals 42,000 pounds of boxed beef

FIGURE L

PLOTTED REGRESSION EQUATIONS

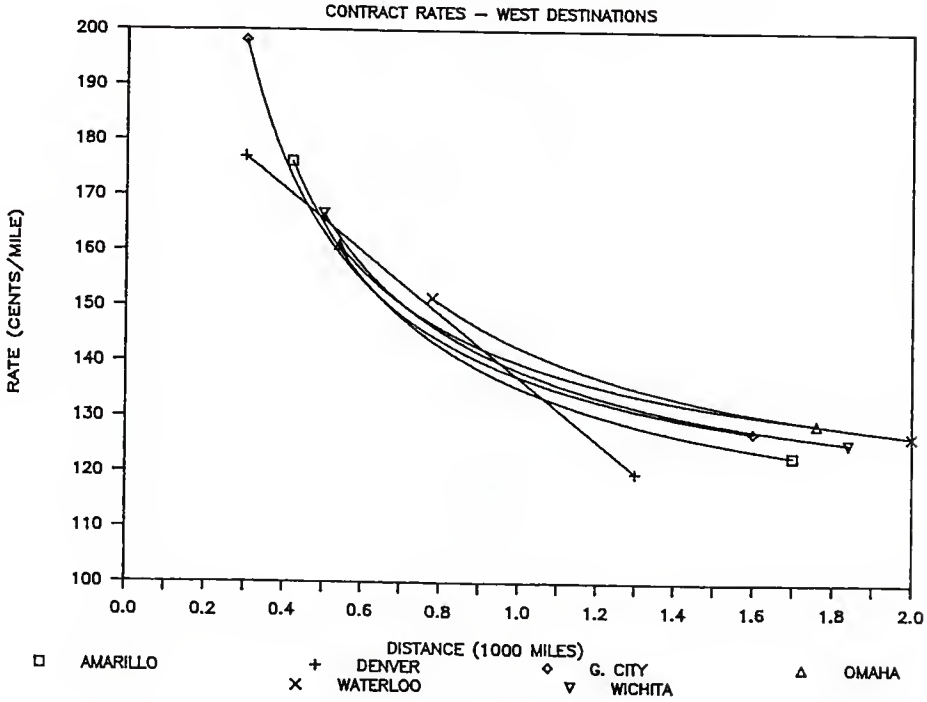


Table 16 summarizes contract rate estimates from various origins to destinations at distances of 500 miles, 1000 miles and 1500 miles. In Table 16, rate estimates have been converted from vehicle mile rates to hundredweight rates based on a uniform 42,000 pounds per truckload.

Similarities and differences among origin points and destination groups can be observed from the graphs of the various functions and from estimated rates in Table 16. Table 16 further specifies differences among origins. For individual origins, Waterloo rates are consistently the highest at each distance presented to all destination groups while Omaha generally ranks second highest with some exception at 500 mile distances. Conversely, Amarillo's estimated rates result in a regression plot that is below other contract rate regressions, especially at longer distances. Denver rates also are low relative to shipments originating at Waterloo, Omaha, Garden City or Wichita.

By destination groups, the average of rates from six origins to the Northeast for distances of 500 miles were 8 cents per hundredweight below shipment to the Southeast and 12 cents below shipments to the West. For 1000 mile shipments the Northeast was 2 cents and 10 cents higher than Southeast and West respectively and at 1500 miles 18 cents and 48 cents higher.

Comparisons Between Tariff and Contract Rates

Five years ago the principle means of shipping beef products was under a tariff rate. Today, because of relaxed restrictions

TABLE 16

Estimated Contract Rates for 500-, 1000-, and 1500-Mile Shipments by Origin to Each Destination Group

Origins	Destination Groups		
	Northeast	Southeast	West
	(cents per 100 pounds)		
	- 500 miles -		
Amarillo	187	186	196
Denver	189	202	198
Garden City	188	195	194
Omaha	187	194	196
Waterloo	188	200	207
Wichita	180	185	199
Average	(186)	(194)	(198)
	- 1000 miles -		
Amarillo	333	333	321
Denver	338	336	326
Garden City	338	338	326
Omaha	345	336	333
Waterloo	346	343	340
Wichita	336	336	328
Average	(339)	(337)	(329)
	- 1500 miles -		
Amarillo	478	468	446
Denver	486	471	686
Garden City	492	479	457
Omaha	509	479	468
Waterloo	519	486	471
Wichita	492	489	461
Average	(496)	(478)	(448)

brought on by the 1980 Motor Carriers Act, a majority of beef products are hauled by contract carriers. Traffic managers for beef packing plants expect further increases in the use of contract carriers. The underlying reason is rates. Comparing the total costs to the shipper between tariff rates and contract rates on an individual trip basis shows that in the overwhelming majority of cases, the total cost to haul under a contract rate is less than costs to haul under a tariff rate. (A listing of the total costs of both tariff and contract rate hauls along with mileages and rates by region and origin can be found in Appendix C).

The cost advantage for contract rates range as high as $970 on a single truckload. Conversely, in an unusual case, there exists a tariff advantage of $244 per truckload. For the Northeast region, only one route (Amarillo to St. Louis) has a tariff rate that is lower than the reported contract rates. In the Southeast region, it is generally the Florida destinations to which it would be advantageous to ship under a tariff authority. West Palm Beach and Miami have the same rate from all origins. Western shipments have a more irregular assortment of tariff versus contract cost advantages and disadvantages. This results from the zonal tariff rates to the region. However, the number of destinations with favorable contract rates easily outnumber those with lower tariff rates. A savings of $1000 per truckload is the equivalent of 2.38 cents per pound of beef.

Tariff and contract rates estimated from rate functions from four origins to two destination groups (Northeast and Southeast) are compared in Table 17.

Data in Table 17 indicate that contract shipment rates on average were below tariff rates by 71 and 53 cents per hundredweight on 500-mile hauls to the Northeast and to the Southeast respectively. The contract/tariff spread increased for Northeast shipments for 1000-mile hauls but decreased from 53 cents to 30 cents for Southeast shipments. When the respective functions are extended to 1500 miles, rate differences virtually disappeared with tariff rates higher by only 8 cents to the Northeast and lower by 4 cents to the Southeast.

Tariff and contract rates thus demonstrate differences both in structure and in level. Tariff rates exceed contract rates by a significant margin at shorter distances but, in general, the difference systematically disappears at longer distance. Rate differences among origins also change between contract rates and tariff rates. For example, the Garden City tariff rate function lies above other origins but this is not true for contract rates. Waterloo has the higher contract rates relative to other origins.

Likely, understanding of these differences lie in availability of backhauls and in changes in product market competition as distance from origin increases. Differences warrant further study.

TABLE 17

Estimated Tariff and Contract Rates
for 500-, 1000-, and 1500-Mile Shipments
from Four Origins to Northeast and Southeast Destinations

	Destinations			
	Tariff Rates		Contract Rates	
Origins	Northeast	Southeast	Northeast	Southeast
	(cents per 100 pounds)			
		- 500 miles -		
Garden City	274	272	188	195
Omaha	249	253	187	194
Waterloo	251	227	188	200
Wichita	253	237	180	185
Average	(257)	(247)	(186)	(194)
		- 1000 Miles -		
Garden City	484	374	338	338
Omaha	405	362	345	336
Waterloo	405	358	346	343
Wichita	430	379	336	336
Average	(431)	(368)	(341)	(338)
		- 1500 Miles -		
Garden City	555	476	492	479
Omaha	522	472	509	479
Waterloo	452	488	519	486
Wichita	517	481	492	489
Average	(511)	(479)	(503)	(483)

Historical Rate Comparison Analysis

A similar study of common carrier tariff rates for beef products was conducted in 1972. (Bittel) Numerous changes since that time have impacted the rates and rate structure under which beef products are hauled. Foremost among these developments was the enactment of the Motor Carriers Act of 1980. This has strongly influenced the decline in use of tariff rates thereby boosting contract rate dependence. No contract rates were analyzed in the 1972 study. Also, the earlier study was confined to three origins; Wichita, Omaha and Waterloo.

Generally speaking, the tariff rates for 1972 are similar in nature to those in 1985. Rates to the Northeast and Southeast generally increase at a decreasing rate as trip distance increases. A quadratic or linear equation best represents the data (hyperbolic functions were not considered in the 1972 study). The West region had zone rates with groupings similar to those seen in 1985. Consequently, there were no regression analyses for that region in either study.

The 1972 regression equations for both the Northeast and Southeast regions are listed as follows with the correlation coefficient listed to the right and the standard error of each coefficient in parenthesis.

Northeast Region

Omaha

$$Y = \underset{}{16.5} + \underset{(0.036)}{0.27X_1} - \underset{(0.000020)}{0.000079X_1^2} \qquad R^2 = .956$$

Waterloo

$$Y = \underset{}{-3.207} + \underset{(0.027)}{0.271X_1} - \underset{(0.000018)}{0.000059X_1^2} \qquad R^2 = .989$$

Wichita

$$Y = \underset{}{-3.03} + \underset{(0.513)}{0.332X_1} - \underset{(0.000026)}{0.0000987X_1^2} \qquad R^2 = .914$$

Southeast Region

Omaha

$$Y = \underset{}{107.08} + \underset{(0.0186)}{0.0945X_1} \qquad R^2 = .590$$

Waterloo

$$Y = \underset{}{31.81} + \underset{(0.207)}{0.2282X_1} - \underset{(0.00010)}{0.0000541X_1^2} \qquad R^2 = .593$$

Wichita

$$Y = \underset{}{39.66} + \underset{(0.030)}{0.2010X_1} - \underset{(0.000017)}{0.0000381X_1^2} \qquad R^2 = .955$$

Source: Bittel, Steven G. An Analysis of Flow Patterns and Transportation for Beef from Kansas Federally Inspected Plants in 1972, Unpublished MS Thesis, Department of Agricultural Economics, Kansas State University, Manhattan, Kansas: 1974.

The R-square terms for the Northeast region are similar in range and magnitude to the 1985 study. However, the R-square terms for the Southeast region in the 1972 study are significantly lower than those presented in the 1985 study. Omaha and Waterloo possess very marginal correlation coefficients. This indicates that as the rates were revised through the years, more emphasis

was placed upon establishing rates on a mileage foundation, therefore resulting in the higher R-square terms seen in the 1985 study.

The rates were not increased in specific increments or with all rates getting the same numerical increase. This fact bears itself out in an examination of the slopes of the various curves. The following example will illustrate. The slopes for Omaha to Northeast destinations in 1972 may be defined as below:

$$\frac{dY}{dX} = 0.27 - 0.000158X_1$$

Solving for the Marginal Rate for three specific mileage distances (X_1) yields the following:

X_1 = 500 miles - 0.191 ¢/mile
X_1 = 1000 miles - 0.112 ¢/mile
X_1 = 1500 miles - 0.033 ¢/mile

Using the same methods for Omaha to the Northeast region for 1985 yields the following:

$$\frac{dY}{dX} = 0.432 - 0.000159X_1$$

X_1 = 500 miles - 0.352 ¢/mile
X_1 = 1000 miles - 0.273 ¢/mile
X_2 = 1500 miles - 0.194 ¢/mile

Comparing the slopes of the two studies shows wide variations. If all the rates had been increased incrementally , then the slopes would have been very similar if not identical. The probability exists that the rates were increased proportionally. In fact, the rate changes that were discovered in the course of researching the tariff rates for this study were indeed proportional.

Figures M and N give the plotted regression curves from the 1972 study for the Northeast and Southeast respectively. An examination of the two Northeast regions consistently depict the Wichita rate structure as maintaining the highest level of the three plotted regressions. Waterloo and Omaha tend to switch relative positions. Comparing the plotted regressions for the Southeast region, little significant change between the rate structures can be observed, even though the correlation of the rates to mileage has sharply increased over the years.

Data in Table 18 suggest substantially less increase in truck rates than in other prices. Consumer price index figures have risen over 257 percent for all items and 351 percent for motor fuels since 1972 and illustrate the shortfall in price increases for the transportation rates in Table 18.

These data (as in the earlier contract tariff rate comparisons) indicate that contract rates in 1986 were lower, relative to 1972 tariffs, at shorter distances than at longer distances. Hence a shift to contract rates was of greater benefit when shipping to relatively nearby destinations than in shipping longer distances.

Factors Related to Beef Transportation

In the course of collecting beef distribution and rate data from packers and carriers, interviews were conducted with traffic and distribution managers. Personal interviews were conducted with packers while those with the carriers were by telephone.

TABLE 18

1986 Tariff Rates and 1986 Contract Rates
as a Percent of 1972 Tariff Rates from Three Origins
to Northeast and Southeast Destinations

	Destinations			
	Tariff Rates		Contract Rates	
Origins	Northeast	Southeast	Northeast	Southeast
	(cents per 100 pounds)			
	- 500 miles -			
Omaha	189	164	142	126
Waterloo	213	171	160	150
Wichita	183	181	130	141
Average	(195)	(172)	(144)	(139)
	- 1000 Miles -			
Omaha	233	185	166	166
Waterloo	192	176	166	166
Wichita	187	187	146	166
Average	(204)	(183)	(159)	(166)
	- 1500 Miles -			
Omaha	214	190	209	192
Waterloo	167	194	192	193
Wichita	191	187	180	192
Average	(192)	(190)	(194)	(192)

FIGURE M

PLOTTED REGRESSION EQUATIONS – 1972

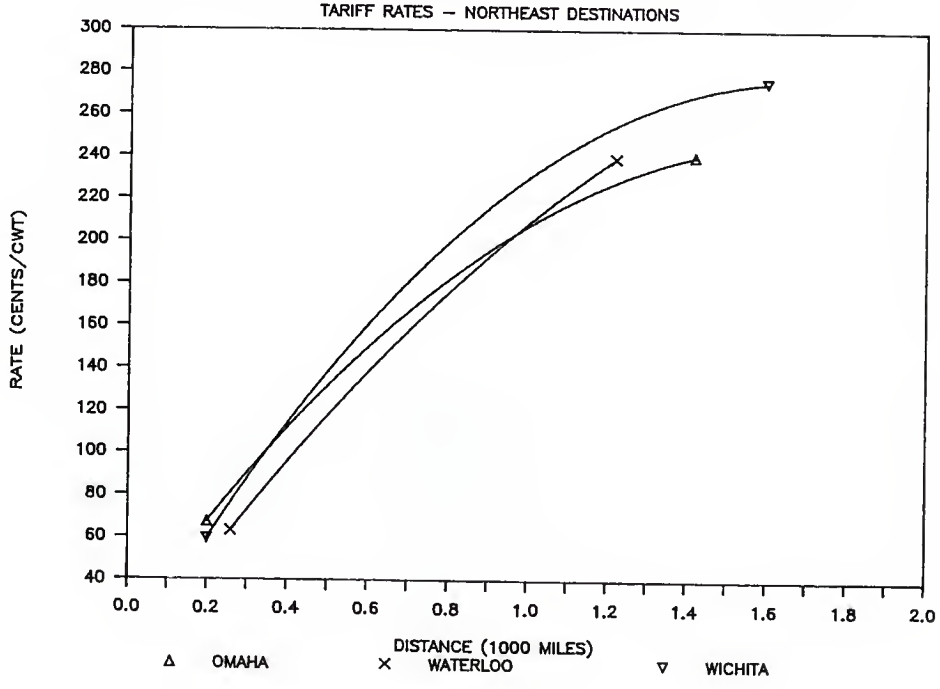
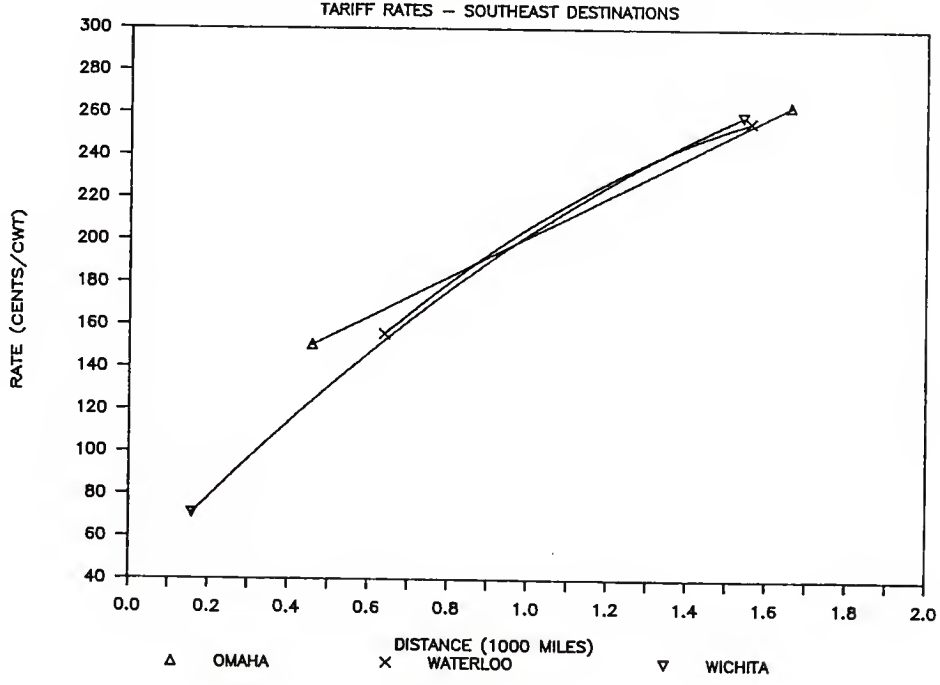


FIGURE N

PLOTTED REGRESSION EQUATIONS – 1972



Through these interviews, various subjects were discussed that were related to or impacted upon beef transportation. Results of these interviews provide insights into the operations involved with beef transportation.

There was a range of percentages presented when carriers and packers were asked to estimate the amount of beef that moved under contract carrier authority versus tariff authority. The range extended from 25 percent to 100 percent. However, there were several regularities that appeared through the data. The larger packing plants, if not already using 100 percent contract carriers, were rapidly moving that way. Between 50 and 65 percent of shipments of the smaller shippers moved on tariff rates, but those shippers were also moving to an increased use of contract carriers. Total contract carrier usage averaged between 75 and 80 percent, however, one carrier estimated that the percentage would approach 95 percent in only a couple of years.

Many packers stated the primary reason for the shift from tariff to contract was the added control they gained. They were able to establish rates and set other conditions that were not available to them under tariff. Shippers reported opportunity to be more selective in their choice of carrier. Opportunity to negotiate alternative rates based on service alternatives were also reported. The carriers generally supported the assertion that rates were adequately and fairly set relative to costs for

carriers with an efficient operations.

The level of service was extremely important to the packers and was a primary criteria for their choice of carrier. Factors such as timeliness, condition and reliability of tractors and equipment, especially the refrigeration units, and availability on short notice were mentioned by many of the packers. Packers stated that much of their business is based on service reliability and they demanded the same from their carriers. Several carriers also noted that they were a service oriented company and built the foundation of their businesses on that concept.

Beef being shipped interstate moves almost exclusively by tractor trailer. Other options such as Trailer-on-Flat-Car (TOFC or piggyback) or refrigerated boxcar are generally not used. Several negative factors have nearly eliminated the use of these alternatives. Unreliable service was the number one complaint. TOFC deliveries often took at least 24 to 48 hours longer than truck service. Cars could get lost or switched to a siding resulting in extended delays. In rail transport it was reported that no one person was responsible for the cars and the refrigerated trailers on the cars, therefore, if a refrigeration unit broke down, it would frequently go unnoticed and no corrective action taken in time to maintain product quality.

In the case of railroads, only selected areas could be served due to the location of railheads with the capability to handle TOFC units. There is also the added expense and trouble

of picking up the trailer and delivering to the warehouse or supermarket, a short trip where expenses are the highest on a per-mile basis. While several packers stated that TOFC was priced competitively, they said the additional expense of end-line pick-up plus the service uncertainties eliminated their consideration of TOFC transport.

The use of refrigerated rail cars was prohibitive for similar reasons. However, there was a limited amount of frozen beef headed for export ports that was shipped out in refrigerated rail cars. Time and service were not of the same importance as for regular domestic shipments. Since rails could often go directly to the port there was not the problem of the extra transfers, hence rail shipment of frozen beef for export becomes viable.

Exports themselves are only a small portion of the total shipments by beef packers, amounting to only two to three percent. However, several comments were made that packing firms were exploring options leading to increased exports. Most of the 1985 export movement went to the West Coast for final delivery to East-Asian countries, but there were recorded shipments to the Gulf for export to South America and Europe. Direct shipments to Canada and Mexico also were reported.

All of the carriers indicated that obtaining a backhaul and avoiding any deadhead miles (hauling an empty trailer) was important to efficient trucking operations. Estimates by truckers

of the percentage of total miles that were deadhead miles their trailers were obliged to travel ranged from eight to seventeen percent but averaged about eleven percent. Carriers serving shippers in non-metropolitan areas reported frequent difficulty in finding backhauls. Often the trailers haul to the nearest metropolitan area (ex: Kansas City, Denver, Dallas-Ft. Worth) and then must deadhead back to the packing plants in non-metropolitan locations. This can and does have an impact on the rate making process, although it was difficult to define in the rate structures presented earlier.

Also affecting rate determination is the availability of backhaul at the destination. Areas such as New York City and Dallas-Ft. Worth were reported to offer few products as return hauls relative to the number of trailers bringing products in. Therefore, rates need to be slightly higher to compensate the carrier. In other areas such as Florida or California where an abundance of produce and other products create a large amount of out-bound traffic, rates may be lower to reflect the easier availability of a backhaul. This may be represented in the rate structures plotted earlier. The high mileage area of the curves of the Southeast and West regions, mainly Florida and the West Coast respectively, maintain lower rates than the high mileage sections of the Northeast, principally, the East Coast metropolitan area.

Competition in the carrier industry was noted by both

packers and carriers to be very intense. Exit and entry has become easier and are common events. Margins are generally thin and it takes an efficient organization or operator to survive. Although economics literature reports very limited economies of scale in the motor carrier industry, carriers and shippers both reported competitive leadership by large carriers. External economies in soliciting backhauls may have contributed to a strengthened position for larger firms. One carrier commented that the large firms made it very tough for a 25 to 50 truck firm to compete and survive. Intense competition among carriers, of course, has been to the advantage of the packers. Many of them noted that where they often had problems obtaining trucks on short notice just five years ago, they have no such problem today. Private carriage by packer-owned trucks operated through transportation subsidiaries of packing companies are increasing in use. All of the major packing firms operating in Kansas utilize this type of arrangement and all said they plan to increase the size of their truck fleets. The Motor Carrier Act of 1980 made this possible as it allowed private carriers to operate as contract carriers, thus permitting backhauls. The carriers are also allowed to haul for other packing plants and interviewed private carriers did so in varying amounts.

CHAPTER VI

SUMMARY

The tradition of the cattle and beef industry in Kansas is a long and storied one. From the historic early cattle drives to the present, Kansas has become the largest beef slaughtering state in the U.S. Much of the growth in the beef slaughtering industry has occurred within the past five years in which Kansas has moved from a ranking of fourth among states to first . Liveweight beef slaughter in Kansas has increased by 3694 million pounds since 1980, an expansion of 115 percent.

Objectives of this study were to determine the destinations of beef products originating from Kansas beef packing plants on a state by state basis and to weigh the results against consumption demand in each state. Rates and rate structures used by beef product carriers hauling from Kansas origins and from major competing beef surplus areas were determined. Market advantages or disadvantages of Kansas shippers resulting from transport conditions were evaluated. Current (1985) beef transport conditions were compared with a similar study completed in 1972.

Much of the recent changes in the transport of beef resulted from passage of the Motor Carriers Act of 1980. This legislation allowed much easier entry into the motor carrier industry. A general commodities hauling authority was created so that a trucking firm could haul a wide variety of products. A carrier was also allowed to hold dual common and contract authority or private and contract authority. Tariff rates were allowed a ten

percent increase or decrease without Interstate Commerce Commission approval. Intercorporate hauling for wholly-owned subsidiaries was permitted. These provisions of the act were designed to enhance the competitive position of the trucking industry.

Data for the distribution analysis were obtained from the eight largest beef packing and/or fabrication plants in Kansas through personal, on-site interviews. These plants accounted for about 95 percent of the Kansas commercial slaughter in 1985. Due to the various recordkeeping methods of the plants, different sampling techniques were employed. Several plants had monthly or quarterly summaries on a state-by-state basis. For plants with weekly summary sheets, every fifth week was sampled resulting in a 20.9 percent sample of the total loads for the year. One plant maintained only a daily shipping record. In this case, every fifth load of every seventh shipping day was sampled yielding a 2.88 percent sample. Carcasses imported from other states and fabricated at Kansas plants are mixed with Kansas slaughtered beef and are not differentiated in shipping records. Geographic shipping patterns were applied to Kansas slaughter weights to determine overall destination volumes for Kansas beef.

An expansion of the survey data reveals shipments of Kansas slaughtered beef to every state in the U.S. except for Wyoming, Alaska and Hawaii. Kansas shows up as the highest recipient of Kansas beef. However, the figures are skewed by interstate shipments of carcasses to other plants for fabrication or proces-

sing. Nebraska and Iowa also received abnormally high volumes of Kansas beef as they are receiving beef for redestination. Other states such as Texas, Oklahoma and Colorado may also have similar redistribution characteristics, but were not as easily identifiable.

The huge population base and the closeness of the market have made Texas the next largest recipient (after Kansas) of Kansas beef with 9.56 percent of the interstate shipments. Other large destination states are: Pennsylvania with 5.55 percent of the interstate shipments; California, 5.49 percent; New York, 5.13 percent; Ohio, 4.72 percent; Florida, 4.61 percent; and Illinois, 4.40 percent. The top nine states, Iowa through Illinois, account for 49.13 percent of the interstate shipments of Kansas beef.

To determine the relative strengths and/or weaknesses of Kansas beef, an estimate of consumption demand was calculated for each state. Regional per capita consumption data from the USDA report, Consumer Demand for Red Meats, Poultry and Fish, total consumption and state population estimates were condensed into state-by-state beef consumption estimates. An estimate of beef carcass production by state was made from which the consumption estimates were subtracted to yield a surplus or a deficit. The data indicates every state east of the Mississippi River except Wisconsin to be a deficit beef producing state with New York having the largest deficit. Other large deficit states are

California, New Jersey, Ohio and Florida.

The study shows that Kansas provided 16.35 percent of the beef consumed nationwide in 1985. Those states ranking the highest in percent of beef consumption supplied by Kansas are Connecticut at 28.4 percent, Missouri at 23.4 percent, Oklahoma at 22.4 percent, Georgia at 21.2 percent and Texas at 20.9 percent. Regionally, New England ranked highest at 21.1 percent of total beef demand shipped from Kansas origins in 1985. Kansas supplied 18.9 percent of demand in the West South Central region and 15.1 percent in the South Atlantic region. In the Pacific and Mountain states 6.3 and 9.1 percent respectively originated in Kansas.

A historical comparison to the 1972 distribution pattern points out the wider distribution now practiced by Kansas beef packers as North Dakota, South Dakota, Washington, Idaho and Nevada have been added to the list of states receiving Kansas beef. Shipment destinations are now more evenly distributed by regions than in 1972. Every region increased receipt of Kansas beef between 1972 and 1985, indicating the broad base of Kansas beef shipments.

The analysis of carrier shipping rates for boxed beef products included two different types of rates; common carrier tariff rates and contract carrier rates. Tariff rates were obtained from several different tariff rate publications printed by motor carrier associations. Commodity tariffs for boxed beef

that were in effect on June 30, 1985 were utilized for the study.

Contract rates are negotiated privately between the carrier and shipper and are not required by the ICC to be published. As contract rates are the primary rates used, it was important to obtain a listing. These rates were obtained from individual carriers across the central U.S.

Six specific origin points were selected for rate analysis. They included: Amarillo, Texas; Denver, Colorado; Garden City, Kansas; Omaha, Nebraska; Waterloo, Iowa; and Wichita, Kansas. These sites represent concentrations of beef packing plants that are all competitive with one another. The destination points represent population centers throughout the United States and were grouped regionally into the Northeast region, Southeast region and West region.

Regression analysis was used to estimate the structure of rates between origin points and destination regions. Independent variables consisted of mileage associated with each individual rate or its square or reciprocal. Three different functional forms were examined. These were linear, quadratic and hyperbolic functions. The determining factor between functions was the R-square statistic unless the equation deviated from assumptions inherent in the data. In those cases the second best fit was chosen.

In the tariff rate analysis, only four origin points, Garden City, Omaha, Waterloo and Wichita, were chosen as data were

insufficient for the other two sites. For Northeast destination, rates show an absolute rate advantage for Waterloo for almost all destinations. Regression analyses resulted in a hyperbolic function to represent the rate structure for Garden City while the other three origin points were best described by quadratic functions. The equations explained over 90 percent of the variation in all four cases. The functions show that after the rates pass the early mileages that Garden City has the highest equal distance rates of the group and is therefore at the largest competitive rate disadvantage. Waterloo's rate advantage increases at the longer distances enhancing its already distinct distant advantage.

Rates in the Southeast region are more nearly equal between origins. Regression analysis yields a quadratic equation for Wichita and linear equations elsewhere with 85 percent or more of the variation in rates explained by the equations. Wichita maintains equal distance rate advantage in the early distances, but moves to a rate disadvantage at about 900 miles. Waterloo moves from an advantage to a disadvantage in the longer distances.

The zone rates developed by the Cudahy Packing Company for the West region in 1958 did not lend themselves to regression analysis. Garden City owned the absolute rate advantage to all destinations as it has the shortest distance to cover and its rates per mile are the lowest. The zone rates discriminate against the shorter distance destinations in each zone as their

costs per mile are much higher than the longer distance rates. Destination points of similar distances but of different zones also have different rates, creating advantages/disadvantages. The distance range of 1000 to 1200 miles contains rates that vary nearly two dollars per hundredweight between zones.

Contract rates are expressed in cents per mile per 42,000 pound load and therefore decrease as distance increases. Regression analyses for Northeast destinations yielded quadratic equations for Omaha and Waterloo and hyperbolic equations elsewhere. Over 84 percent of the variation in rates was explained by the equations. The highest rate structures belong to Omaha and Waterloo while Amarillo and Denver show rate advantages past the 1000 mile distance.

The rate structures for the Southeast region was estimated by a quadratic equation for Amarillo, and hyperbolic functions for the other origin points. R-square terms were once again at an 84 percent level or higher. Waterloo maintained the worst equal distance rate disadvantage while Amarillo the best rate advantage.

The West region produced five hyperbolic equations and one linear equation, that being Denver. The R-square terms for this region were significantly lower than was observed in the previous two regions. The 67 percent explanation of variation indicates a rate structure where rates are not as closely associated with distances in this region. Waterloo possesses the highest rate

structure after the shorter distances have been cleared while Amarillo maintains the lowest rate structure again after the shorter distances have been exceeded.

Viewing the plotted regression lines for each region collectively and comparing the three regions shows that in the lower distances the West region has a higher rate structure but decreases more rapidly than the rate structure in the Northeast region. Because of the more rapid decrease in rates in the West region its rate structure is lower than that seen in the Northeast at the longer distances. An examination of the individual rate structures between regions consistently shows Waterloo with the highest rate structure in each region while Amarillo most often possesses the lowest equal distance rates.

Contracting the total trip costs for identical hauls of tariff and contract rates shows an overwhelming advantage for contract rates. The cost advantage of contract rates over tariff rates range as high as $970 per truckload. The Northeast region maintains an advantage for contract rates on every route except one. The Southeast region is dominated by the contract rate advantage except for the Florida destinations to which it would generally be advantageous to haul under tariff authority. The zoned tariff rates confuse the situation for the West region. However, less expensive contract rate hauls easily outnumber the cheaper tariff rate hauls.

A historical comparison of tariff rates illustrates the

similar nature of the two sets of rates as the Northeast and Southeast regions possess rates that generally increase at a decreasing rate while the West maintained zone rates in both time periods. Inspecting the R-square terms reveals much lower correlation coefficients in the Southeast region in the 1972 study than in the 1985 study indicating an increased emphasis on mileage in rate establishment. Studying the slopes of specific regression functions at specific distances indicates that rates were raised proportionately instead of incrementally. Plotted regressions of both the 1972 study and 1985 study reveal that Wichita consistently had the highest rate to Southeast destinations.

It should be remembered that although many apparent inconsistencies exist in carrier rates for boxed beef, it is not the structure of these rates that are the primary determining factor in the establishment of destination markets (the exception is the immediately surrounding area). The difference between rates of the closest origin point discussed in this study and the furthest origin point generally amounts to no more than two cents per pound of beef hauled. This figure may appear insignificant in relative terms but even small unit savings become very large and significant when applied to the volume of beef shipped from Kansas origins.

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APPENDICES

APPENDIX A

BOXED BEEF CONTRACT RATE MATRIX

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BOXED BEEF CONTRACT RATE MATRIX

As only telephone interviews were conducted with motor carriers and the rate data requested from these firms were too massive to transmit over the phone, a rate matrix was mailed to each firm. The matrix is presented on the following two pages. Along with the matrix was a letter detailing the instructions to complete the matrix and a milage chart depicting the distances between origination and destination points as an easy reference for those carriers whose rates are mileage based.

FIGURE 0

BOXED BEEF CONTRACT RATES

Please enter the contract rates for which you have experience. The Garden City column may contain rates originating from Garden City (preferred), Liberal or Dodge City. Also, please fill in the information requested below. The information will remain confidential. Thank you.

Your name: _____

Firms name: _____

Are rates stated as "cents/mile" or "cents/cwt"? _____

DESTINATION POINTS	ORIGINATION POINTS					
	AMARILLO	DENVER	GARDEN CITY	OMAHA	WATERLOO	WICHITA
GALLUP, NM						
FLAGSTAFF, AZ						
TUCSON, AZ						
PHOENIX, AZ						
LAS VEGAS, NV						
YUMA, AZ						
SAN DIEGO, CA						
LOS ANGELES, CA						
RENO, NV						
FRESNO, CA						
SACRAMENTO, CA						
SAN FRANCISCO, CA						
DENVER, CO						
SALT LAKE CITY, UT						
POCATELLO, ID						
TWIN FALLS, ID						
BUTTE, MT						
HELENA, MT						
BOISE, ID						
SPOKANE, WA						
PENDLETON, OR						
PORTLAND, OR						
SALEM, OR						
SEATTLE, WA						

FIGURE 0
Page 2

BOXED BEEF CONTRACT RATES

DESTINATION POINTS	ORIGINATION POINTS					
	AMARILLO	DENVER	GARDEN CITY	OMAHA	WATERLOO	WICHITA
KANSAS CITY						
ST LOUIS, MO						
SPRINGFIELD, IL						
INDIANAPOLIS, IN						
CHICAGO, IL						
CINCINNATI, OH						
DAYTON, OH						
COLUMBUS, OH						
DETROIT, MI						
CLEVELAND, OH						
PITTSBURG, PN						
BUFFALO, NY						
BALTIMORE, MD						
WASHINGTON, DC						
SYRACUSE, NY						
PHILADELPHIA, PN						
TRENTON, NJ						
NEW YORK, NY						
ALBANY, NY						
HARTFORD, CN						
SPRINGFIELD, MA						
PROVIDENCE, RI						
BOSTON, MA						
OKLAHOMA CITY, OK						
DALLAS, TX						
LITTLE ROCK, AR						
MEMPHIS, TN						
HOUSTON, TX						
NASHVILLE, TN						
BIRMINGHAM, AL						
NEW ORLEANS, LA						
CHATTANOOGA, TN						
MONTGOMERY, AL						
KNOXVILLE, TN						
MOBILE, AL						
ATLANTA, GA						
TALLAHASSEE, FL						
CHARLOTTE, NC						
CHARLESTON, SC						
JACKSONVILLE, FL						
TAMPA, FL						
WEST PALM BEACH, FL						
MIAMI, FL						

APPENDIX B

AN ANALYSIS OF THE DENVER TO WEST DESTINATION RATES

APPENDIX B

AN ANALYSIS OF THE DENVER TO WEST DESTINATION RATES

Of the three types of regressions (linear, quadratic or hyperbolic) investigated for contract rates to the West region from Denver, the linear regression was chosen as the "best" regression. This was the case despite the fact that the quadratic equation produced a better R-squared statistic. To explain, the derived equations are presented below with accompanying statistics.

Regressions I

Linear

$$Y = 194.117 - \underset{(0.0040)}{0.0571}\ X_1 \qquad R^2 = .912 \text{ F-Value} = 207.4$$

Quadratic

$$Y = 201.327 - \underset{(0.025)}{0.0764}\ X_1 + \underset{(0.000015)}{0.000012}X_1^2 \qquad R^2 = .915 \text{ F-Value} = 101.9$$

Hyperbolic

$$Y = 112.097 + \underset{(3385.22)}{24097.853}/X_1 \qquad R^2 = .717 \text{ F-Value} = 50.67$$

An examination of the functions shows that the hyperbolic equation fails in significantly explaining the variables with a low R-squared of .717. The linear and quadratic correlation coefficients are very similar with the quadratic equation holding the edge. However, the significance of the quadratic equation declines as compared to the linear function. The resulting F-value of the X-squared coefficient (0.60) indicates its significance is extremely limited. Therefore, the quadratic equation

was eliminated and the linear function chosen.

However, a detailed look of the data suggests some inconsistencies. The following graph (Figure R) details the contract rates from Denver to the West Region plus the plotted curve of the quadratic equation. The first observation shows itself to be an outlier, neither near or about the regression line or grouped with any other data. As this observation is the first one (the lowest miles) it exerts a larger degree of influence on the regression than the other variables. Therefore, in order to better estimate the relationships between the remaining contract rates and mileages, regressions were calculated from the data minus the outlier observation. These regressions are presented as follows:

Regressions II

Linear

$$Y = 197.551 - \underset{(0.0043)}{0.0605X_1} \qquad R^2 = .911 \quad F\text{-Value} = 194.8$$

Quadratic

$$Y = 238.522 - \underset{(0.0284)}{0.1600X_1} + \underset{(0.000016)}{0.000056X_1^2} \qquad R^2 = .947 \quad F\text{-Value} = 162.2$$

Hyperbolic

$$Y = 94.625 + \underset{(2792.20)}{39868.335/X_1} \qquad R^2 = .915 \quad F\text{-Value} = 203.9$$

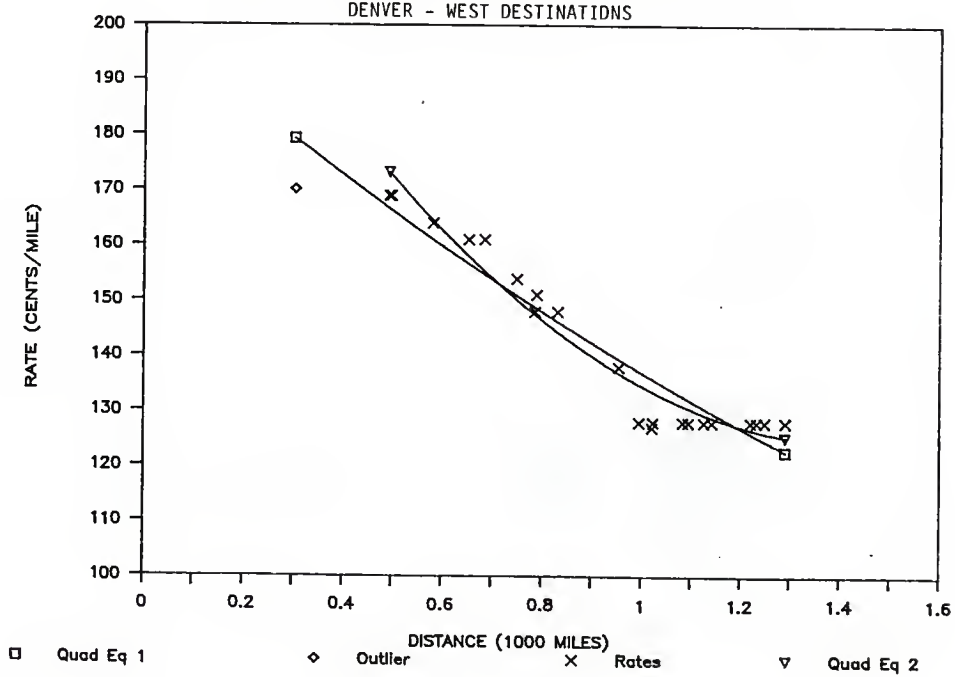
Comparing the equations shows that the linear regression changed very little when the observation was omitted. However, both the quadratic and hyperbolic functions increased in both significance and correlation. The R-squared values increased from .915 to .947 and .717 to .915 for the quadratic and hyperbol-

ic functions respectively. The F-values for the equations also increased illustrating a higher significance and the X^2 term of the quadratic equation is now highly significant.

With the omission of one observation there has been a change in the observed relationship between contract rates and mileages. The statistics would now indicate using the quadratic equation due to its significance and correlation.

FIGURE P

PLOTTED QUADRATIC EQUATIONS AND CONTRACT RATES
DENVER - WEST DESTINATIONS



APPENDIX C

COMPLETE RATES AND MILEAGE MATRICES

APPENDIX C

COMPLETE RATES AND MILEAGE MATRICES

The following tables depict the various mileages, tariff rates, contract rates, total costs of each type of haul and their differences. Each table represents the information grouped by origin point and destination region for eighteen tables in all (six origin points times three destination regions). The following index will better define the headings used in the tables.

DEST- Destination Point

MILES- Distance between origin and destination points

CONTRACT- Representative contract rate for a boxed beef haul. Shown as ¢/mile.

TARIFF- Representative tariff rate for a boxed beef haul drawn from rate bureau publications. Shown as ¢/cwt.

CONTCOST- Total cost of boxed beef haul under a contract rate. Figures are in cents.

TARICOST- Total cost of boxed beef haul under a tariff rate. Assumes a 42,000 pound load. Figures are in cents.

DIFF- The total cost under a contract rate minus the total cost under a tariff rate. (CONTCOST-TARICOST) Figures are in cents.

*- Represents missing or not available data.

TABLE 19

TOTAL COSTS OF BOXED BEEF SHIPMENTS WITH DIFFERENCES ($)
CONTRACT(CENTS/MILE) AND TARIFF(CENTS/CWT) RATES
AMARILLO TO THE NORTHEAST REGION

OBS	DEST	MILES	CONTRACT	TARIFF	CONTCOST	TARICOST	DIFF
1	KANSAS_CITY	542	157	240	850.94	1008.0	-157.06
2	ST_LOUIS	749	145	242	1086.05	1016.4	69.65
3	SPRINGFIELD_IL	845	145	.	1225.25	.	.
4	INDIANAPOLIS	983	140	389	1376.20	1633.8	-257.60
5	CHICAGO	1034	131	378	1354.54	1587.6	-233.06
6	CINCINNATI	1090	136	418	1482.40	1755.6	-273.20
7	DAYTON	1088	139	462	1512.32	1940.4	-428.08
8	COLUMBUS	1153	139	476	1602.67	1999.2	-396.53
9	DETROIT	1262	138	462	1741.56	1940.4	-198.84
10	CLEVELAND	1279	137	514	1752.23	2158.8	-406.57
11	PITTSBURG	1334	134	618	1787.56	2595.6	-808.04
12	BUFFALO	1464	136	.	1991.04	.	.
13	BALTIMORE	1544	135	.	2084.40	.	.
14	WASHINGTON	1540	135	.	2079.00	.	.
15	SYRACUSE	1611	134	.	2158.74	.	.
16	PHILADELPHIA	1613	134	.	2161.42	.	.
17	TRENTON	1638	134	.	2194.92	.	.
18	NEW_YORK	1704	134	.	2283.36	.	.
19	ALBANY	1743	134	.	2335.62	.	.
20	HARTFORD	1797	133	.	2390.01	.	.
21	SPRINGFIELD_MA	1818	134	.	2436.12	.	.
22	PROVIDENCE	1857	134	.	2488.38	.	.
23	BOSTON	1893	130	.	2460.90	.	.

TABLE 20

TOTAL COSTS OF BOXED BEEF SHIPMENTS WITH DIFFERENCES (S)
CONTRACT(CENTS/MILE) AND TARIFF(CENTS/CWT) RATES
AMARILLO TO THE SOUTHEAST REGION

OBS	DEST	MILES	CONTRACT	TARIFF	CONTCOST	TARICOST	DIFF
1	OKLAHOMA_CITY	258	164	.	423.12	.	.
2	DALLAS	356	.	.	.	.	.
3	LITTLE_ROCK	592	159	.	941.28	.	.
4	MEMPHIS	721	146	.	1052.66	.	.
5	HOUSTON	592	.	.	.	.	.
6	NASHVILLE	926	141	.	1305.66	.	.
7	BIRMINGHAM	962	141	.	1356.42	.	.
8	NEW_ORLEANS	846	145	.	1226.70	.	.
9	CHATTANOOGA	1032	138	.	1424.16	.	.
10	MONTGOMERY	993	140	.	1390.20	.	.
11	KNOXVILLE	1102	136	.	1498.72	.	.
12	MOBILE	940	141	.	1325.40	.	.
13	ATLANTA	1086	137	.	1487.82	.	.
14	TALLAHASSE	1177	136	.	1600.72	.	.
15	CHARLOTTE	1314	134	.	1760.76	.	.
16	CHARLESTON	1371	134	.	1837.14	.	.
17	JACKSONVILLE	1340	132	.	1768.80	.	.
18	TAMPA	1418	132	.	1871.76	.	.
19	WEST_PALM_BEACH	1582	130	.	2056.60	.	.
20	MIAMI	1643	129	.	2119.47	.	.

TABLE 21

TOTAL COSTS OF BOXED BEEF SHIPMENTS WITH DIFFERENCES (6)
CONTRACT(CENTS/MILE) AND TARIFF(CENTS/CWT) RATES
AMARILLO TO THE WEST REGION

OBS	DEST	MILES	CONTRACT	TARIFF	CONTCOST	TARICOST	DIFF
1	GALLUP	422	172	362	725.84	1520.4	-794.56
2	FLAGSTAFF	611	163	362	995.93	1520.4	-524.47
3	TUCSON	678	155	362	1050.90	1520.4	-469.50
4	PHOENIX	714	152	362	1085.28	1520.4	-435.12
5	LAS_VEGAS	859	144	362	1236.96	1520.4	-283.44
6	YUMA	884	144	362	1272.96	1520.4	-247.44
7	SAN_DIEGO	1056	128	414	1351.68	1738.8	-387.12
8	LOS_ANGELES	1076	128	414	1379.84	1738.8	-358.96
9	RENO	1302	127	501	1653.54	2104.2	-450.66
10	FRESNO	1206	128	452	1543.68	1898.4	-354.72
11	SACRAMENTO	1368	127	462	1737.36	1940.4	-203.04
12	SAN_FRANCISCO	1380	127	462	1752.60	1940.4	-187.80
13	DENVER	421	172	.	724.12	.	.
14	SALT_LAKE_CITY	878	136	.	1194.08	.	.
15	POCATELLO	997	135	.	1345.95	.	.
16	TWIN_FALLS	1095	127	.	1390.65	.	.
17	HELENA	1196	127	.	1518.92	.	.
18	BOISE	1218	127	.	1546.86	.	.
19	SPOKANE	1505	126	.	1896.30	.	.
20	PENDLETON	1433	127	.	1819.91	.	.
21	PORTLAND	1643	126	.	2070.18	.	.
22	SALEM	1659	126	.	2090.34	.	.
23	SEATTLE	1701	126	.	2143.26	.	.

TABLE 22

TOTAL COSTS OF BOXED BEEF SHIPMENTS WITH DIFFERENCES (1)
CONTRACT(CENTS/MILE) AND TARIFF(CENTS/CWT) RATES
DENVER TO THE NORTHEAST REGION

OBS	DEST	MILES	CONTRACT	TARIFF	CONTCOST	TARICOST	DIFF
1	KANSAS_CITY	603	153	222	922.59	932.4	-9.81
2	ST_LOUIS	856	147	*	1258.32	*	*
3	SPRINGFIELD_IL	865	147	*	1271.55	*	*
4	INDIANAPOLIS	1055	138	*	1455.90	*	*
5	CHICAGO	956	130	*	1374.48	*	*
6	CINCINNATI	1165	138	*	1607.70	*	*
7	DAYTON	1160	139	*	1612.40	*	*
8	COLUMBUS	1225	139	*	1702.75	*	*
9	DETROIT	1249	138	*	1723.62	*	*
10	CLEVELAND	1319	137	*	1807.03	*	*
11	PITTSBURG	1406	137	*	1926.22	*	*
12	BUFFALO	1504	136	*	2045.44	*	*
13	BALTIMORE	1610	135	*	2181.60	*	*
14	WASHINGTON	1612	135	*	2170.20	*	*
15	SYRACUSE	1651	135	*	2228.85	*	*
16	PHILADELPHIA	1685	135	*	2274.75	*	*
17	TRENTON	1710	135	*	2308.50	*	*
18	NEW_YORK	1776	135	*	2397.60	*	*
19	ALBANY	1783	134	*	2389.22	*	*
20	HARTFORD	1865	134	*	2499.10	*	*
21	SPRINGFIELD_MA	1865	135	*	2517.75	*	*
22	PROVIDENCE	1929	133	*	2565.57	*	*
23	BOSTON	1946	131	*	2549.26	*	*

TABLE 23

TOTAL COSTS OF BOXED BEEF SHIPMENTS WITH DIFFERENCES (1)
CONTRACT(CENTS/MILE) AND TARIFF(CENTS/CWT) RATES
DENVER TO THE SOUTHEAST REGION

OBS	DEST	MILES	CONTRACT	TARIFF	CONTCOST	TARICOST	DIFF
1	OKLAHOMA_CITY	609	158	280	962.22	1201.2	-238.98
2	DALLAS	777	154	.	1196.58	.	.
3	LITTLE_ROCK	942	142	.	1337.64	.	.
4	MEMPHIS	1037	138	.	1431.06	.	.
5	HOUSTON	1013	141	.	1428.33	.	.
6	NASHVILLE	1152	137	.	1578.24	.	.
7	BIRMINGHAM	1278	136	.	1738.08	.	.
8	NEW_ORLEANS	1267	136	.	1723.12	.	.
9	CHATTANOOGA	1278	135	.	1725.30	.	.
10	MONTGOMERY	1363	134	.	1826.42	.	.
11	KNOXVILLE	1325	134	.	1775.50	.	.
12	MOBILE	1356	134	.	1817.04	.	.
13	ATLANTA	1390	134	.	1862.60	.	.
14	TALLAHASSE	1562	131	.	2046.22	.	.
15	CHARLOTTE	1542	131	.	2020.02	.	.
16	CHARLESTON	1671	130	.	2172.30	.	.
17	JACKSONVILLE	1696	130	.	2204.80	.	.
18	TAMPA	1803	128	.	2307.84	.	.
19	WEST_PALM_BEACH	1962	127	.	2491.74	.	.
20	MIAMI	2023	126	.	2548.98	.	.

TABLE 24

TOTAL COSTS OF BOXED BEEF SHIPMENTS WITH DIFFERENCES (3)
CONTRACT(CENTS/MILE) AND TARIFF(CENTS/CWT) RATES
DENVER TO THE WEST REGION

OBS	DEST	MILES	CONTRACT	TARIFF	CONTCOST	TARICOST	DIFF
1	GALLUP	497	169	304	839.93	1276.8	-436.87
2	FLAGSTAFF	652	161	304	1049.72	1276.8	-227.08
3	TUCSON	831	146	304	1229.88	1276.8	-46.92
4	PHOENIX	789	151	304	1191.39	1276.8	-85.41
5	LAS_VEGAS	749	154	304	1153.46	1276.8	-123.34
6	YUMA	953	138	304	1315.14	1276.8	38.34
7	SAN_DIEGO	1083	126	304	1388.24	1276.8	109.44
8	LOS_ANGELES	1021	127	304	1296.67	1276.8	19.87
9	RENO	995	128	314	1273.60	1318.8	-45.20
10	FRESNO	1142	128	314	1461.76	1318.8	142.96
11	SACRAMENTO	1126	128	314	1441.28	1318.8	122.48
12	SAN_FRANCISCO	1221	128	314	1562.88	1318.8	244.08
13	DENVER	.	.	.	.	.	.
14	SALT_LAKE_CITY	493	169	.	833.17	.	.
15	POCATELLO	581	164	314	952.84	1318.8	-365.96
16	TWIN_FALLS	685	161	314	1102.85	1318.8	-215.95
17	HELENA	785	148	.	1161.80	.	.
18	BOISE	302	170	314	513.40	1318.8	-805.40
19	SPOKANE	1094	128	363	1400.32	1524.6	-124.28
20	PENDLETON	1023	128	363	1309.44	1524.6	-215.16
21	PORTLAND	1233	128	363	1578.24	1524.6	53.64
22	SALEM	1249	128	363	1598.72	1524.6	74.12
23	SEATTLE	1291	128	363	1652.48	1524.6	127.88

TABLE 25

TOTAL COSTS OF EXAEC BEEF SHIPMENTS WITH DIFFERENCES (3)
CONTRACT(CENTS/MILE) AND TARIFF(CENTS/CWT) RATES
GARDEN CITY TO THE NORTHEAST REGION

OBS	DEST	MILES	CONTRACT	TARIFF	CENTCOST	TARIFCST	DIFF
1	KANSAS_CITY	378	161	158	608.58	603.6	-55.02
2	ST_LOUIS	630	151	308	951.30	1293.6	-342.30
3	SPRINGFIELD_IL	681	150	418	1021.50	1755.6	-734.10
4	INDIANAPOLIS	861	144	435	1239.84	1827.0	-587.16
5	CHICAGO	873	144	365	1257.12	1533.0	-275.88
6	CINCINNATI	970	143	506	1387.10	2125.2	-738.10
7	DAYTON	966	143	501	1381.38	2104.2	-722.82
8	COLUMBUS	1031	142	500	1464.02	2100.0	-635.98
9	DETROIT	1109	141	552	1563.69	2318.4	-754.71
10	CLEVELAND	1148	140	522	1607.20	2192.4	-585.20
11	PITTSBURG	1212	140	*	1696.80	*	*
12	BUFFALO	1333	140	*	1866.20	*	*
13	BALTIMORE	1422	139	546	1976.58	2293.2	-316.62
14	WASHINGTON	1418	139	546	1971.02	2293.2	-322.18
15	SYRACUSE	1480	139	525	2057.20	2205.0	-147.80
16	PHILADELPHIA	1491	139	546	2072.49	2293.2	-220.71
17	TRENTON	1516	137	556	2070.92	2335.2	-258.28
18	NEW_YORK	1582	137	550	2167.34	2335.2	-167.86
19	ALBANY	1612	136	556	2192.32	2335.2	-142.88
20	HARTFORD	1674	137	575	2293.38	2415.0	-121.62
21	SPRINGFIELD_MA	1694	137	575	2320.78	2415.0	-94.22
22	PROVIDENCE	1735	136	588	2359.60	2469.6	-110.00
23	BOSTON	1771	136	588	2408.56	2469.6	-61.04

TABLE 26

TOTAL COSTS OF BOXED BEEF SHIPMENTS WITH DIFFERENCES (3)
CONTRACT(CENTS/MILE) AND TARIFF(CENTS/CWT) RATES
GARDEN CITY TO THE SOUTHEAST REGION

OBS	DEST	MILES	CONTRACT	TARIFF	CONTCOST	TARICOST	DIFF
1	OKLAHOMA_CITY	305	189	222	576.45	932.4	-355.95
2	DALLAS	509	165	236	839.85	991.2	-151.35
3	LITTLE_ROCK	638	162	329	1033.56	1381.8	-348.24
4	MEMPHIS	738	147	328	1084.86	1377.6	-292.74
5	HOUSTON	745	156	385	1162.20	1617.0	-454.80
6	NASHVILLE	897	144	332	1291.68	1394.4	-102.72
7	BIRMINGHAM	979	142	350	1390.18	1470.0	-79.82
8	NEW_ORLEANS	966	142	409	1374.56	1717.8	-343.24
9	CHATTANOOGA	1023	140	355	1432.20	1491.0	-58.80
10	MONTGOMERY	1064	140	368	1489.60	1545.6	-56.00
11	KNOXVILLE	1072	140	373	1500.80	1566.6	-65.80
12	MOBILE	1052	140	368	1472.80	1545.6	-72.80
13	ATLANTA	1103	139	379	1533.17	1591.8	-58.63
14	TALLAHASSE	1263	137	421	1730.31	1768.2	-37.89
15	CHARLOTTE	1269	137	474	1765.93	1990.8	-224.87
16	CHARLESTON	1388	136	472	1887.68	1982.4	-94.72
17	JACKSONVILLE	1401	135	449	1891.35	1885.8	5.55
18	TAMPA	1504	135	472	2030.40	1982.4	48.00
19	WEST_PALM_BEACH	1663	131	505	2178.53	2121.0	57.53
20	MIAMI	1724	130	520	2241.20	2184.0	57.20

TABLE 27

TOTAL COSTS OF EQUED BEEF SHIPMENTS WITH DIFFERENCES (S)
CONTRACT(CENTS/MILE) AND TARIFF(CENTS/CWT) RATES
GARDEN CITY TO THE WEST REGION

OBS	DEST	MILES	CONTRACT	TARIFF	CONTCOST	TARICOST	DIFF
1	GALLUP	584	167	356	975.28	1495.2	-519.92
2	FLAGSTAFF	767	159	356	1219.53	1495.2	-275.67
3	TUCSON	852	148	356	1260.96	1495.2	-234.24
4	PHOENIX	876	145	356	1270.20	1495.2	-225.00
5	LAS_VEGAS	986	136	356	1360.66	1495.2	-134.52
6	YUMA	1046	132	356	1380.72	1495.2	-114.48
7	SAN_DIEGO	1218	130	356	1583.40	1495.2	88.20
8	LOS_ANGELES	1234	129	356	1591.86	1495.2	96.66
9	RENO	1255	130	424	1631.50	1780.6	-149.30
10	FRESNO	1362	128	424	1743.36	1780.8	-37.44
11	SACRAMENTO	1386	128	424	1774.08	1780.8	-6.72
12	SAN_FRANCISCO	1481	128	424	1895.68	1780.8	114.88
13	DENVER	304	189	*	574.56	*	*
14	SALT_LAKE_CITY	789	142	313	1120.38	1314.6	-194.22
15	POCATELLO	880	145	490	1276.00	2058.0	-782.00
16	TWIN_FALLS	984	136	490	1338.24	2058.0	-719.76
17	HELENA	1059	130	490	1376.70	2058.0	-681.30
18	BOISE	1142	130	490	1484.60	2058.0	-573.40
19	SPOKANE	1368	128	490	1751.04	2058.0	-306.96
20	PENDLETON	1322	130	490	1718.60	2058.0	-339.40
21	PORTLAND	1532	128	490	1960.96	2058.0	-97.04
22	SALEM	1548	128	490	1981.44	2058.0	-76.56
23	SEATTLE	1590	128	490	2035.20	2058.0	-22.80

TABLE 28

TOTAL COSTS OF BOXED BEEF SHIPMENTS WITH DIFFERENCES (4)
CONTRACT(CENTS/MILE) AND TARIFF(CENTS/CWT) RATES
OMAHA TO THE NORTHEAST REGION

OBS	DEST	MILES	CONTRACT	TARIFF	CONTCOST	TARICOST	DIFF
1	KANSAS_CITY	203	174	171	353.22	716.2	-362.98
2	ST_LOUIS	454	158	201	717.32	644.2	-126.88
3	SPRINGFIELD_IL	410	160	.	656.00	.	.
4	INDIANAPOLIS	587	156	.	915.72	.	.
5	CHICAGO	462	154	219	711.48	919.8	-208.32
6	CINCINNATI	693	152	308	1053.36	1293.6	-240.24
7	DAYTON	690	152	319	1048.80	1339.8	-291.00
8	COLUMBUS	750	152	305	1140.00	1281.0	-141.00
9	DETROIT	722	152	290	1097.44	1218.0	-120.56
10	CLEVELAND	791	150	361	1186.50	1516.2	-329.70
11	PITTSBURG	903	146	405	1318.38	1701.0	-382.62
12	BUFFALO	976	145	429	1415.20	1801.8	-386.60
13	BALTIMORE	1121	143	454	1603.03	1906.8	-303.77
14	WASHINGTON	1123	143	454	1605.89	1906.8	-300.91
15	SYRACUSE	1123	143	435	1605.89	1827.0	-221.11
16	PHILADELPHIA	1192	143	454	1704.56	1906.8	-202.24
17	TRENTON	1215	142	467	1725.30	1961.4	-236.10
18	NEW_YORK	1267	142	467	1799.14	1961.4	-162.26
19	ALBANY	1254	142	467	1780.68	1961.4	-180.72
20	HARTFORD	1351	142	485	1918.42	2037.0	-118.58
21	SPRINGFIELD_MA	1335	142	485	1895.70	2037.0	-141.30
22	PROVIDENCE	1412	142	495	2005.04	2079.0	-73.96
23	BOSTON	1416	142	495	2010.72	2079.0	-68.28

TABLE 29

TOTAL COSTS OF BOXED BEEF SHIPMENTS WITH DIFFERENCES (4)
CONTRACT(CENTS/MILE) AND TARIFF(CENTS/CWT) RATES
OMAHA TO THE SOUTHEAST REGION

OBS	DEST	MILES	CONTRACT	TARIFF	CONTCOST	TARICOST	DIFF
1	OKLAHOMA_CITY	453	166	272	751.98	1142.4	-390.42
2	DALLAS	648	159	336	1030.32	1411.2	-380.88
3	LITTLE_ROCK	595	160	.	952.00	.	.
4	MEMPHIS	658	150	287	987.00	1205.4	-218.40
5	HOUSTON	867	148	388	1312.76	1629.6	-316.84
6	NASHVILLE	752	150	281	1128.00	1180.2	-52.20
7	BIRMINGHAM	904	143	315	1292.72	1323.0	-30.28
8	NEW_ORLEANS	1013	142	332	1438.46	1394.4	44.06
9	CHATTANOOGA	887	142	317	1259.54	1331.4	-71.86
10	MONTGOMERY	985	142	327	1404.38	1373.4	30.98
11	KNOXVILLE	926	142	327	1314.92	1373.4	-58.48
12	MOBILE	1022	136	340	1389.92	1428.0	-38.08
13	ATLANTA	1005	134	334	1346.70	1402.8	-56.10
14	TALLAHASSE	1193	140	415	1670.20	1743.0	-72.80
15	CHARLOTTE	1135	140	415	1589.00	1743.0	-154.00
16	CHARLESTON	1281	138	437	1767.78	1835.4	-67.62
17	JACKSONVILLE	1318	138	441	1818.84	1852.2	-33.36
18	TAMPA	1435	136	469	1951.60	1969.8	-18.20
19	WEST_PALM_BEACH	1591	134	501	2131.94	2104.2	27.74
20	MIAMI	1656	133	514	2202.48	2158.8	43.68

TABLE 30

TOTAL COSTS OF BOXED BEEF SHIPMENTS WITH DIFFERENCES (S)
CONTRACT(CENTS/MILE) AND TARIFF(CENTS/CWT) RATES
OMAHA TO THE WEST REGION

DES	DEST	MILES	CONTRACT	TARIFF	CONTCOST	TARICOST	DIFF
1	GALLUP	999	149	50$	1488.51	2137.8	-649.29
2	FLAGSTAFF	1170	132	50$	1544.40	2137.8	-593.40
3	TUCSON	1266	132	50$	1671.12	2137.8	-466.68
4	PHOENIX	1296	132	50$	1710.72	2137.8	-427.08
5	LAS_VEGAS	1365	132	50$	1801.80	2137.8	-336.00
6	YUMA	1471	132	50$	1941.72	2137.8	-196.08
7	SAN_DIEGO	1645	131	50$	2154.95	2137.8	17.15
8	LOS_ANGELES	1647	131	50$	2157.57	2137.8	19.77
9	RENO	1481	132	50$	1954.92	2137.8	-182.88
10	FRESNO	1758	131	50$	2302.98	2137.8	165.18
11	SACRAMENTO	1617	131	50$	2118.27	2137.8	-19.53
12	SAN_FRANCISCO	1707	131	50$	2236.17	2137.8	98.37
13	DENVER	540	163	*	880.20	*	*
14	SALT_LAKE_CITY	942	137	50$	1290.54	2137.8	-847.26
15	POCATELLO	1025	144	50$	1476.00	2137.8	-661.80
16	TWIN_FALLS	1129	132	50$	1490.28	2137.8	-647.52
17	HELENA	1055	132	53$	1392.60	2247.0	-854.40
18	BOISE	1258	132	51$	1660.56	2154.6	-494.04
19	SPOKANE	1378	132	51$	1818.96	2154.6	-335.64
20	PENDLETON	1483	132	51$	1957.56	2154.6	-197.04
21	PORTLAND	1690	131	51$	2213.90	2154.6	59.30
22	SALEM	1708	131	51$	2237.48	2154.6	82.88
23	SEATTLE	1661	131	51$	2175.91	2154.6	21.31

TABLE 31

TOTAL COSTS OF BOXED BEEF SHIPMENTS WITH DIFFERENCES (S) CONTRACT(CENTS/MILE) AND TARIFF(CENTS/CWT) RATES WATERLOO TO THE NORTHEAST REGION

OBS	DEST	MILES	CONTRACT	TARIFF	CONTCOST	TARICOST	DIFF
1	KANSAS_CITY	307	167	132	512.69	554.4	-41.71
2	ST_LOUIS	354	164	192	580.56	806.4	-225.84
3	SPRINGFIELD_IL	295	167	155	492.65	651.0	-158.35
4	INDIANAPOLIS	450	158	239	711.00	1003.8	-292.80
5	CHICAGO	268	169	159	452.92	667.8	-214.88
6	CINCINNATI	556	156	269	867.36	1129.8	-262.44
7	DAYTON	536	156	266	836.16	1117.2	-281.04
8	COLUMBUS	572	156	275	892.32	1155.0	-262.68
9	DETROIT	532	156	284	829.92	1192.8	-362.88
10	CLEVELAND	601	154	289	925.54	1213.8	-288.26
11	PITTSBURG	718	152	321	1091.36	1348.2	-256.84
12	BUFFALO	766	152	352	1164.72	1478.4	-263.68
13	BALTIMORE	934	146	400	1363.64	1680.0	-316.36
14	WASHINGTON	936	146	400	1366.56	1680.0	-313.44
15	SYRACUSE	933	146	385	1362.18	1617.0	-254.82
16	PHILADELPHIA	1005	144	400	1447.20	1680.0	-232.80
17	TRENTON	1028	144	413	1480.32	1734.6	-254.28
18	NEW_YORK	1077	144	413	1550.88	1734.6	-183.72
19	ALBANY	1064	144	413	1532.16	1734.6	-202.44
20	HARTFORD	1161	144	432	1671.84	1814.4	-142.56
21	SPRINGFIELD_MA	1145	144	432	1648.80	1814.4	-165.60
22	PROVIDENCE	1222	144	442	1759.68	1856.4	-96.72
23	BOSTON	1226	144	442	1765.44	1856.4	-90.96

TABLE 32

TOTAL COSTS OF BOXED BEEF SHIPMENTS WITH DIFFERENCES (1)
CONTRACT(CENTS/MILE) AND TARIFF(CENTS/CWT) RATES
WATERLOO TO THE SOUTHEAST REGION

OBS	DEST	MILES	CONTRACT	TARIFF	CONTCOST	TARICOST	DIFF
1	OKLAHOMA_CITY	655	158	.	1034.90	.	.
2	DALLAS	797	156	.	1243.32	.	.
3	LITTLE_ROCK	646	156	262	1020.88	1100.4	-79.72
4	MEMPHIS	639	155	304	990.45	1276.8	-286.35
5	HOUSTON	1036	144	.	1491.84	.	.
6	NASHVILLE	647	159	258	1028.73	1083.6	-54.87
7	BIRMINGHAM	823	154	304	1267.42	1276.8	-9.38
8	NEW_ORLEANS	1030	138	350	1421.40	1470.0	-48.60
9	CHATTANOOGA	782	148	295	1157.36	1239.0	-81.64
10	MONTGOMERY	917	143	318	1311.31	1335.6	-24.29
11	KNOXVILLE	805	146	298	1175.30	1251.6	-76.30
12	MOBILE	987	145	334	1431.15	1402.8	28.35
13	ATLANTA	900	145	317	1305.00	1331.4	-26.40
14	TALLAHASSE	1121	140	398	1569.40	1671.6	-102.20
15	CHARLOTTE	1006	142	388	1428.52	1629.6	-201.08
16	CHARLESTON	1160	140	410	1624.00	1722.0	-98.00
17	JACKSONVILLE	1213	138	427	1673.94	1793.4	-119.46
18	TAMPA	1355	136	454	1809.80	1906.8	-36.90
19	WEST_PALM_BEACH	1494	140	483	2091.60	2028.6	63.00
20	MIAMI	1562	138	501	2155.56	2104.2	51.36

TABLE 33

TOTAL COSTS OF EQUAL BEEF SHIPMENTS WITH DIFFERENCES (3)
CONTRACT(CENTS/MILE) AND TARIFF(CENTS/CWT) RATES
WATERLOO TO THE WEST REGION

OBS	DEST	MILES	CONTRACT	TARIFF	CONTCOST	TARICOST	DIFF
1	GALLUP	1227	132	551	1619.64	2314.2	-694.56
2	FLAGSTAFF	1413	132	551	1865.16	2314.2	-449.04
3	TUCSON	1494	132	551	1972.08	2314.2	-342.12
4	PHOENIX	1524	130	551	1981.20	2314.2	-333.00
5	LAS_VEGAS	1608	130	551	2090.40	2314.2	-223.80
6	YUMA	1699	130	551	2208.70	2314.2	-105.50
7	SAN_DIEGO	1873	129	551	2416.17	2314.2	101.97
8	LOS_ANGELES	1890	129	551	2438.10	2314.2	123.90
9	RENO	1742	129	551	2247.18	2314.2	-67.02
10	FRESNO	2001	129	551	2581.29	2314.2	267.09
11	SACRAMENTO	1860	129	551	2399.40	2314.2	85.20
12	SAN_FRANCISCO	1950	129	551	2515.50	2314.2	201.30
13	DENVER	783	159	.	1244.97	.	.
14	SALT_LAKE_CITY	1195	148	536	1768.60	2251.2	-482.60
15	POCATELLO	1231	132	547	1624.92	2297.4	-672.48
16	TWIN_FALLS	1053	132	547	1389.96	2297.4	-907.44
17	HELENA	1181	132	545	1558.92	2289.0	-730.08
18	BOISE	1454	132	547	1919.28	2297.4	-378.12
19	SPOKANE	1504	130	547	1955.20	2297.4	-342.20
20	PENDLETON	1657	130	547	2154.10	2297.4	-143.30
21	PORTLAND	1850	129	547	2386.50	2297.4	89.10
22	SALEM	1696	129	547	2445.84	2297.4	148.44
23	SEATTLE	1787	129	547	2305.23	2297.4	7.83

TABLE 34

TOTAL COSTS OF BOXED BEEF SHIPMENTS WITH DIFFERENCES (1) CONTRACT(CENTS/MILE) AND TARIFF(CENTS/CWT) RATES WICHITA TO THE NORTHEAST REGION

OBS	DEST	MILES	CONTRACT	TARIFF	CONTCOST	TARICOST	DIFF
1	KANSAS_CITY	197	178	118	350.66	495.6	-144.94
2	ST_LOUIS	452	156	229	705.12	961.8	-256.68
3	SPRINGFIELD_IL	510	154	*	785.40	*	*
4	INDIANAPOLIS	678	148	296	1003.44	1243.2	-239.76
5	CHICAGO	698	148	269	1033.04	1129.8	-96.76
6	CINCINNATI	784	146	356	1144.64	1003.2	-518.56
7	DAYTON	795	146	398	1146.10	1671.6	-525.50
8	COLUMBUS	849	144	375	1222.56	1575.0	-352.44
9	DETROIT	946	142	406	1343.32	1703.2	-361.88
10	CLEVELAND	974	142	412	1383.08	1730.4	-347.32
11	PITTSBURG	1035	140	510	1449.00	2142.0	-693.00
12	BUFFALO	1159	140	*	1622.60	*	*
13	BALTIMORE	1242	139	487	1720.38	2045.4	-319.02
14	WASHINGTON	1244	139	487	1729.16	2045.4	-316.24
15	SYRACUSE	1306	139	472	1815.34	1982.4	-167.06
16	PHILADELPHIA	1313	138	487	1811.94	2045.4	-233.46
17	TRENTON	1336	138	498	1843.68	2091.6	-247.92
18	NEW_YORK	1397	138	498	1927.86	2091.6	-163.74
19	ALBANY	1437	138	498	1983.06	2091.6	-108.54
20	HARTFORD	1500	137	516	2055.00	2167.2	-112.20
21	SPRINGFIELD_MA	1518	136	516	2064.48	2167.2	-102.72
22	PROVIDENCE	1561	136	529	2122.96	2221.8	-98.84
23	BOSTON	1595	136	529	2169.20	2221.8	-52.60

TABLE 35

TOTAL COSTS OF EQUAL BEEF SHIPMENTS WITH DIFFERENCES ($)
CONTRACT(CENTS/MILE) AND TARIFF(CENTS/CWT) RATES
WICHITA TO THE SOUTHEAST REGION

OBS	DEST	MILES	CONTRACT	TARIFF	CONTCOST	TARICOST	DIFF
1	OKLAHOMA_CITY	158	212	100	334.96	420.8	-85.84
2	DALLAS	370	170	201	629.00	844.2	-215.20
3	LITTLE_ROCK	452	164	218	741.28	915.6	-174.32
4	MEMPHIS	534	153	236	817.02	991.2	-174.18
5	HOUSTON	609	156	352	950.04	1478.4	-528.36
6	NASHVILLE	699	147	295	1027.53	1239.0	-211.47
7	BIRMINGHAM	780	146	317	1138.80	1331.4	-192.60
8	NEW_ORLEANS	825	150	361	1237.50	1516.2	-278.70
9	CHATTANOOGA	834	143	311	1192.62	1306.2	-113.58
10	MONTGOMERY	865	142	327	1228.30	1373.4	-145.10
11	KNOXVILLE	874	142	332	1241.08	1394.4	-153.32
12	MOBILE	893	142	340	1268.06	1428.0	-159.94
13	ATLANTA	902	141	340	1271.82	1428.0	-156.18
14	TALLAHASSE	1069	138	390	1475.22	1638.0	-162.78
15	CHARLOTTE	1100	138	409	1518.00	1717.8	-199.80
16	CHARLESTON	1205	136	431	1638.80	1810.2	-171.40
17	JACKSONVILLE	1207	136	420	1641.52	1764.0	-122.48
18	TAMPA	1311	135	457	1769.85	1919.4	-149.55
19	WEST_PALM_BEACH	1467	137	478	2009.79	2007.6	2.19
20	MIAMI	1532	136	487	2083.52	2045.4	38.12

TABLE 36

TOTAL COSTS OF BOXED BEEF SHIPMENTS WITH DIFFERENCES (S)
CONTRACT(CENTS/MILE) AND TARIFF(CENTS/CWT) RATES
WICHITA TO THE WEST REGION

OBS	DEST	MILES	CONTRACT	TARIFF	CONTCOST	TARICOST	DIFF
1	GALLUP	731	155	501	1133.05	2104.2	-971.15
2	FLAGSTAFF	919	148	501	1360.12	2104.2	-744.08
3	TUCSON	998	147	501	1467.06	2104.2	-637.14
4	PHOENIX	1098	130	501	1427.40	2104.2	-676.80
5	LAS_VEGAS	1184	130	501	1539.20	2104.2	-565.00
6	YUMA	1203	130	501	1563.90	2104.2	-540.30
7	SAN_DIEGO	1377	130	501	1790.10	2104.2	-314.10
8	LOS_ANGELES	1397	130	501	1816.10	2104.2	-288.10
9	RENO	1512	128	501	1935.36	2104.2	-168.84
10	FRESNO	1536	128	501	1966.08	2104.2	-138.12
11	SACRAMENTO	1644	127	501	2087.88	2104.2	-16.32
12	SAN_FRANCISCO	1716	127	501	2179.32	2104.2	75.12
13	DENVER	509	160	*	814.40	*	*
14	SALT_LAKE_CITY	1005	146	536	1467.30	2251.2	-783.90
15	POCATELLO	1111	130	536	1444.30	2251.2	-806.90
16	TWIN_FALLS	1215	130	536	1579.50	2251.2	-671.70
17	HELENA	1239	130	536	1610.70	2251.2	-640.50
18	BOISE	1344	130	536	1747.20	2251.2	-504.00
19	SPOKANE	1562	128	536	1999.36	2251.2	-251.84
20	PENDLETON	1569	128	536	2008.32	2251.2	-242.88
21	PORTLAND	1776	127	536	2255.52	2251.2	4.32
22	SALEM	1794	127	536	2278.38	2251.2	27.18
23	SEATTLE	1845	127	536	2343.15	2251.2	91.95

APPENDIX D

CHANGING FACTORS IN BEEF SLAUGHTER

APPENDIX D

CHANGING FACTORS IN BEEF SLAUGHTER

The continued increase of cattle feedlots in and surrounding Kansas contributed greatly to packing industry growth. Figure Q illustrates the grwoth and concentration of feedlots in Kansas, particularly Southwest Kansas, and the U.S. Increased feed production from use of hybrid seed stock, irrigation, and the relatively mild weather in the area has prompted much of this increase.

Further evidence of the shift in the area of slaughter is presented in Table 37. In 1950 the West North Central and East North Central regions led the nation with 32.4 and 24.9 percent of the total cattle slaughtered. By 1984 the West North Central region had increased its percentage to 42.0 while the South Central region jumped from 8.1 percent to 20.0 percent, mostly at the expense of the East North Central region. This all ties directly to a marked increase in feedgrain production in these same areas.

The total number of large (over 50,000 head per year capacity) plants has been steadily decreasing since the mid-1970s. New, larger, more efficient plants have often resulted in the closing of smaller plants. Tables 38 and 38A further illustrate the growth in the past few years of the very large plants (500,000 head and over per year).

Evidence of the increasing efficiency of the meat packing industry is illustrated in an examination of output per man-hour.

Indexes of output and productivity of the red meat products industry using 1977 as a base year are reported in Table 39. Total output increased steadily through 1977, leveled off, and began a decline in 1982. Output per employee hour has increased in all but a couple of years with the largest gains made in the late 1970s. Productivity increases and stable or decreasing output after 1977 resulted in a decrease in industry employment from a high of 245,000 jobs to 218,000 in 1982.

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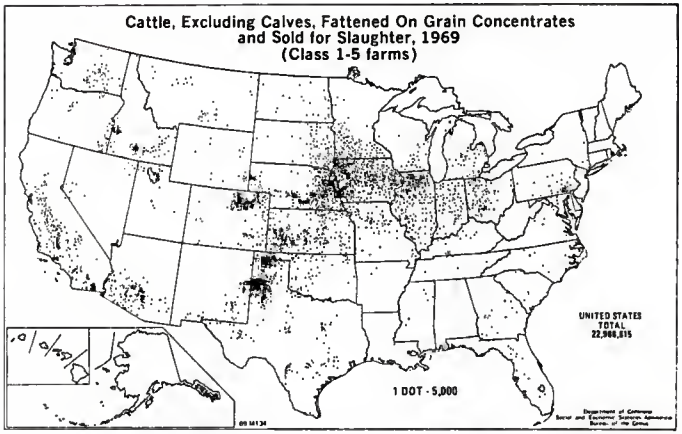
FIGURE Q

Fed Cattle Sold, 1969 and 1982



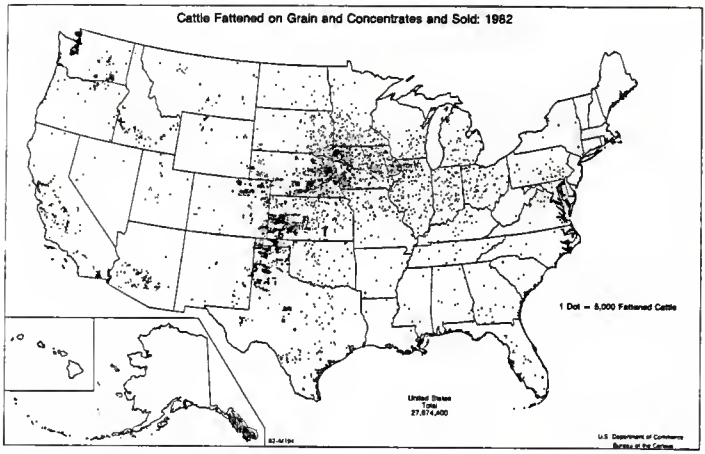


TABLE 39

Productivity and Related Indexes for the Red Meat Products Industry, 1967-82 (1977=100)

YEAR	MEAT PACKING INDUSTRY	PREPARED MEATS INDUSTRY	RED MEAT PRODUCTS INDUSTRY			
	OUTPUT PER EMPLOYEE HOUR			TOTAL OUTPUT	TOTAL EMPLOYEE HOURS	TOTAL EMPLOYEES
1967	73.6	79.2	74.8	76.5	102.3	N.A.
1968	76.1	78.9	76.6	77.3	100.9	100.7
1969	76.3	73.8	75.7	76.2	100.6	100.2
1970	78.7	72.8	77.3	78.3	101.3	100.2
1971	79.8	78.8	79.3	81.8	103.1	101.5
1972	87.1	80.2	85.0	84.9	99.9	99.5
1973	88.7	69.1	82.8	78.2	94.5	94.8
1974	88.1	76.7	84.5	85.2	100.8	99.5
1975	88.6	74.8	84.4	82.3	97.5	97.4
1976	97.5	84.2	93.4	92.8	99.4	98.4
1977	100.0	100.0	100.0	100.0	100.0	100.0
1978	100.9	93.6	98.7	97.0	98.3	98.4
1979	104.9	94.6	101.7	97.9	96.3	96.1
1980	109.1	101.8	107.0	101.4	94.8	95.4
1981	114.1	94.3	107.9	100.5	93.1	93.5
1982	115.6	90.4	107.7	96.3	89.4	90.2

Average Annual Rates of Change (in percent)

YEAR	MEAT PACKING INDUSTRY	PREPARED MEATS INDUSTRY	RED MEAT PRODUCTS INDUSTRY			
	OUTPUT PER EMPLOYEE HOUR			TOTAL OUTPUT	TOTAL EMPLOYEE HOURS	TOTAL EMPLOYEES
1967-72	+2.9	+0.1	+2.2	+2.1	-0.1	0.0
1972-75	+0.4	-1.0	0.0	-0.1	-0.1	-0.2
1975-80	+3.7	+5.4	+4.2	+3.4	-0.7	-0.5
1980-82	+2.9	-5.8	+0.3	-2.5	-2.9	-2.8
1967-82	+3.2	+1.9	+2.8	+2.2	-0.6	-0.5

Source: United States Department of Labor, Monthly Labor Review, Bureau of Labor Statistics, Washington, D.C., April, 1984, Vol. 107 #4.

TABLE 38A

Percentage of U.S. Federally Inspected Cattle Slaughtering Plants and Cattle Slaughtered by Plant Size (1974-1983)

	UNDER 1000		1,000 - 9,999		10,000 - 49,999		30,000 AND OVER	
YEAR	% OF PLANTS	% OF (1000 HEAD)	% OF PLANTS	% OF (1000 HEAD)	% OF PLANTS	% OF (1000 HEAD)	% OF PLANTS	% OF (1000 HEAD)
1974	46.9	0.7	24.6	3.2	13.9	14.1	14.7	82.0
1975	46.7	0.7	23.9	3.4	13.7	14.9	13.6	81.1
1976	48.6	0.7	26.2	3.6	12.1	12.9	13.0	82.7
1977	47.7	0.9	27.6	3.2	13.3	15.4	13.3	83.2
1978	30.9	0.9	24.6	3.4	12.1	12.3	12.5	83.3
1979	33.7	1.0	22.9	3.5	11.1	13.6	10.4	82.0
1980	36.8	0.9	22.3	3.0	10.4	11.3	10.6	84.7
1981	62.0	1.0	20.3	3.1	9.3	11.6	8.2	84.3
1982	60.0	1.0	21.2	3.1	9.4	11.2	8.9	84.8
1983	39.5	1.0	23.0	3.1	8.6	9.8	9.0	86.0
1984	61.3	0.9	20.9	2.6	8.6	9.0	9.1	87.3
1985	64.8	1.0	19.1	2.3	8.0	8.3	8.1	88.2

	100,000 - 249,999		230,000 - 499,999		500,000 AND OVER		TOTAL	
YEAR	% OF PLANTS	% OF (1000 HEAD)	% OF PLANTS	% OF (1000 HEAD)	% OF PLANTS	% OF (1000 HEAD)	% OF PLANTS	% OF (1000 HEAD)
1974	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	100.0	100.0
1975	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	100.0	100.0
1976	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	100.0	100.0
1977	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	100.0	100.0
1978	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	100.0	100.0
1979	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	100.0	100.0
1980	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	100.0	100.0
1981	3.0	22.8	1.4	24.6	0.7	26.0	100.0	100.0
1982	3.1	20.7	1.7	23.7	0.8	27.8	100.0	100.0
1983	3.0	19.6	1.6	23.7	0.9	32.4	100.0	100.0
1984	3.1	20.6	1.3	19.6	1.1	36.3	100.0	100.0
1985	2.9	19.2	0.9	13.5	1.3	46.1	100.0	100.0

Source: United States Department of Agriculture, "Livestock Slaughter: Annual Summary", various issues, Statistical Reporting Service, Washington, D.C.

Note: Individual categories above 50,000 were not available until 1981, therefore, the "50,000 and Over" classification.

TABLE 38

Number of U.S. Federally Inspected Cattle Slaughtering Plants and Cattle Slaughtered by Plant Size (1974-1985)

	UNDER 1000		1,000 - 9,999		10,000 - 49,999		50,000 AND OVER	
YEAR	# OF PLANTS	% OF (1000 HEAD)	# OF PLANTS	% OF (1000 HEAD)	# OF PLANTS	% OF (1000 HEAD)	# OF PLANTS	% OF (1000 HEAD)
1974	633	221.8	332	1,074.9	167	4,692.5	198	27,329.4
1975	723	244.8	401	1,252.5	212	5,490.0	211	29,916.4
1976	809	264.9	437	1,406.5	202	5,041.9	217	32,258.3
1977	748	360.7	432	2,008.0	212	5,977.5	211	32,215.0
1978	779	314.7	376	1,262.1	185	4,602.8	191	30,766.0
1979	822	504.4	356	1,116.4	164	4,331.6	153	26,140.0
1980	601	299.7	314	960.9	147	3,612.5	149	27,030.0
1981	964	536.7	315	1,001.2	147	5,797.9	129	27,572.0
1982	904	349.8	320	1,035.0	146	3,776.9	134	28,696.5
1983	893	334.8	345	1,075.9	129	5,422.4	155	29,951.7
1984	922	333.4	313	932.8	129	3,211.3	136	31,305.3
1965	940	330.5	277	665.6	116	2,873.6	116	30,532.4

	100,000 - 249,999		250,000 - 499,999		500,000 AND OVER		TOTAL	
YEAR	# OF PLANTS	% OF (1000 HEAD)	# OF PLANTS	% OF (1000 HEAD)	# OF PLANTS	% OF (1000 HEAD)	# OF PLANTS	% OF (1000 HEAD)
1974	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	1350	35,318.6
1975	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	1547	36,903.7
1976	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	1665	36,991.6
1977	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	1566	38,716.9
1978	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	1531	36,947.5
1979	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	1477	31,892.6
1980	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	1411	31,903.1
1981	47	7,456.4	22	8,043.0	11	8,490.1	1555	52,707.8
1982	47	7,013.4	25	8,664.9	12	9,396.0	1506	35,658.2
1983	45	6,635.4	24	8,241.0	14	11,269.4	1502	34,614.8
1984	47	7,368.0	20	7,025.7	16	13,075.7	1500	35,782.8
1985	42	6,641.5	15	4,677.4	19	15,960.1	1451	34,602.3

Source: United States Department of Agriculture, "Livestock Slaughter: Annual Summary", various issues, Statistical Reporting Service, Washington, D.C.

Note: Individual categories above 50,000 were not available until 1981, therefore, the "50,000 and Over" classification.

TABLE 37

Commercial Cattle Slaughter for Nine Regions and U.S. with Percentage Distribution, 1950-1985

	NEW ENGLAND		MID ATLANTIC		SOUTH ATLANTIC		EAST SOUTH CENTRAL		EAST NORTH CENTRAL	
YEAR	# OF CATTLE	% OF U.S. TOTAL	# OF CATTLE	% OF U.S. TOTAL	# OF CATTLE	% OF U.S. TOTAL	# OF CATTLE	% OF U.S. TOTAL	# OF CATTLE	% OF U.S. TOTAL
1950	331	1.8	1529	8.5	781	4.4	705	3.9	4455	24.9
1960	205	0.8	1728	6.9	1273	5.0	1107	4.4	5956	23.6
1965	234	0.7	1865	5.8	1431	4.4	1535	4.7	5605	17.3
1970	164	0.5	1535	4.8	1139	3.5	1285	4.0	3996	12.4
1975	160	0.4	1657	4.6	1825	5.1	2048	5.7	4615	12.9
1980	97	0.3	1081	3.2	902	2.7	868	2.6	3926	11.6
1985	92	0.3	1304	3.6	932	3.0	1001	2.6	3864	10.6

	WEST NORTH CENTRAL		WEST SOUTH CENTRAL		MOUNTAIN		PACIFIC		UNITED STATES	
YEAR	# OF CATTLE	% OF U.S. TOTAL	# OF CATTLE	% OF U.S. TOTAL	# OF CATTLE	% OF U.S. TOTAL	# OF CATTLE	% OF U.S. TOTAL	# OF CATTLE	% OF U.S. TOTAL
1950	5797	32.4	1441	8.1	874	4.9	1987	11.1	17901	100.0
1960	8766	34.8	2141	8.5	1848	7.3	3178	12.6	25224	100.0
1965	11834	36.6	3187	9.9	2756	8.5	3901	12.1	32347	100.0
1970	12779	42.8	4155	12.9	3640	11.3	3520	10.9	32172	100.0
1975	15011	41.8	6589	18.4	3677	10.3	3343	9.3	35871	100.0
1980	13909	41.1	6526	19.3	3649	10.8	2849	8.4	33807	100.0
1985	16064	44.3	6860	18.9	3469	9.6	2707	7.5	36293	100.0

Source: United States Department of Agriculture, "Livestock Slaughter: Annual Summary", various issues, Statistical Reporting Service, Washington, D.C.

DISTRIBUTION AND TRANSPORTATION ANALYSIS OF KANSAS SLAUGHTERED BEEF IN 1985

by

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B.S., Kansas State University, 1979

AN ABSTRACT OF A MASTER'S THESIS

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ABSTRACT

In recent years (since 1980), Kansas has evolved from a fourth place position among states to a first place ranking in commercial beef slaughter. While many factors have contributed to this shift, the focus of the study investigated the relationships of transportation factors to the Kansas beef slaughter industry. Specific objectives included a determination of carrier rate structures from Kansas origins and surrounding competitive origins, a determination of the distribution of Kansas beef by states, and a determination of transportation factors on costs and efficient movement of Kansas slaughtered beef.

The distribution information was obtained from direct interviews with managerial personnel representing the eight largest slaughters/fabricators and 95 percent of the commercial slaughter in the state. Summary data was available on a daily, weekly or yearly basis and appropriate samples were taken.

The data revealed wide ranging shipments to all but three states. Intrastate shipments accounted for 11.8 percent of the total, much of it attributed to plant-to-plant shipments for further fabrication. The most prominent shift in distribution patterns since 1972 occurred in shipments to Mid-Atlantic and West North Central destinations as the percent of total Kansas shipments to the Mid-Atlantic region declined 12.06 and increased 8.6 percentage points to the West North Central region. The absolute level of shipment increased for all regions.

Regression analysis was used to examine the structures of common carrier tariff rates and of contract rates of two Kansas beef product shipping points and four other representative surrounding competitive shipping points. Tariff rate relationships showed an absolute and an equal distance rate advantage for Waterloo, Iowa to northeastern destinations while the rate structure for southeastern destinations showed only small rate differences with Garden City having the most consistent disadvantage. Tariff rates to western destinations are zone rates based on the "Cudahy Scale" and therefore were unsuitable for regression analysis. Numerous unequal rates exist for equal distance points.

Regression analysis of contract rates revealed different rate structures for the various origins to the three regional destinations. Availability or difficulty in obtaining backhauls played an important part in rate determination for both origination and destination points. By destination, backhauls were available from Florida and California fruit and vegetable producing regions while working against highly urbanized and non-producing regions. Estimated average rates at 500, 1000 and 1500 mile destinations for the three destination regions show that the Northeast rate advantage at the 500 mile level and the West region an advantage at the 1000 and 1500 mile distances.

Shippers and carriers indicated a large move to contract rates in recent years and increased use of privately-owned truck fleets. Rail shipment was non-existent except for a few

export orders. Many shippers cited level of service as their number one criterion and railroads were not able to approach the needed level of service. Also noted by both carrier and shipper is the increased competitiveness of the trucking industry since the implementation of the Motor Carrier Act of 1980.