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Spatial Analyses of the Flow of Slaughter Livestock in 1955 and 1960

J. Havlicek

R. L. Rizek

G. G. Judge

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SPATIAL STRUCTURE of the LIVESTOCK ECONOMY

II. Spatial Analyses of the Flows of Slaughter Livestock in 1955 and 1960



Agricultural Experiment Stations of
Illinois Minnesota
Indiana Missouri
Iowa Nebraska
Kansas North Dakota
Kentucky Ohio
Michigan South Dakota
 Wisconsin
and the United States Department of
Agriculture, cooperating

Agricultural Experiment Station
South Dakota State University
Brookings, South Dakota

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FOREWARD

Thirteen Agricultural Experiment Stations in the Midwest joined in a research project entitled, "Adjustments in Livestock Marketing in the North Central States to Changing Patterns of Production and Consumption." Agricultural economists, whose names appear on the preceding page have made extensive analyses of data on the geographical movement of livestock and meat in the United States in 1955 and 1960 and have made projections for future years. This publication is one of a series emanating from these studies.

Because of the large number of farms and businesses engaged in providing the Nation's meat supply and the importance of meat in the American diet, this study should have widespread significance. In a dynamic society in which the human population is migrating from rural to metropolitan areas and in which some metropolitan areas grow more rapidly than others, there must be a continuous change in the ultimate destination of the meat supply. Likewise, as farm technology and production patterns change there is a continuous change in the sources of supply. Businesses and industries engaged in the marketing, processing, and distribution of livestock and meat must continuously adjust to these changing conditions. Studies that throw light on these changes can provide valuable information to those who must make decisions in these business operations. It is to those farmers and ranchers, marketing and transportation agencies, processors, wholesalers and retailers who are engaged in the complex livestock and meat industry that the study is addressed.

C. PEAIRS WILSON
Administrative Advisor

CONTENTS

I. Introduction	4
II. The Basic Data	4
A. Regional Demarcation	5
B. Transportation Rates	5
C. Regional Livestock Slaughter	6
D. Regional Production of Livestock for Slaughter	7
1. Procedure for Estimating Production	7
a. Farm Slaughter	7
b. Commercial Production	7
(1). Cattle and Calves	7
(2). Hogs	9
(3). Sheep and Lambs	9
2. Estimates of Production for Slaughter	11
III. The Empirical Results	11
A. Annual Spatial Analyses	11
1. Slaughter Cattle	11
2. Slaughter Calves	15
3. Slaughter Hogs	19
4. Slaughter Sheep and Lambs	22
B. Quarterly Spatial Analyses	26
1. Slaughter Cattle	26
2. Slaughter Calves	28
3. Slaughter Hogs	29
4. Slaughter Sheep and Lambs	30
IV. Summary	31
Appendix A	35
Estimated Transport Rates for Livestock	
Appendix B	43
Annual Estimates of Live Weight Farm Slaughter and Quarterly Live Weight Commercial Slaughter, 26 Regions of the U. S., 1955 and 1960.	
Appendix C	48
Quarterly Estimates of Farm and Commercial Production for Slaughter of Cattle, Calves, Hogs, Sheep and Lambs, 26 Regions of the U. S., 1955 and 1960.	

II. Spatial Analyses of the Flows of Slaughter Livestock in 1955 and 1960*

J. HAVLICEK, R. L. RIZEK and G. G. JUDGE†

I. INTRODUCTION

The livestock economy is a complex of production, marketing, slaughtering, processing, distribution, and consumption of livestock and meat products. Changes are taking place in the livestock economy of the U.S. which affect the various components of this complex in a different manner. In some areas the changes are occurring more rapidly and are of greater magnitude than in other areas. The more prominent of these changes are the regional shifts in the locations of production, slaughter and consumption. Changes of this nature directly affect the activities of the various components of the livestock complex.

In this study attention is focused on the spatial aspects of slaughter livestock movements from production to slaughtering. Given the regional levels of production, slaughtering and the costs of moving one unit of various types of slaughter livestock from any one region to another region, this study is concerned with ascertaining the regional price differentials, and the volume and direction of regional imports and exports that are consistent with minimizing the total cost of moving the livestock from production to slaughter. In addition, questions about the consequences of changes in the existing structure of the livestock economy may be evaluated with regard to their impact on regional prices and slaughter livestock flows.

In particular, the problems with which the current research is concerned are as follows: (1) estimating annual and quarterly live weight quantities of slaughter production of cattle, calves, hogs, and sheep and lambs for 1955 and 1960 for 26 regions of the U.S., (2) estimating the set of transportation costs for moving each type of slaughter livestock among each of the 26 regions in 1955 and 1960, (3) determining annual and quarterly optimum flows of slaughter cattle, calves, hogs, and sheep

and lambs from production to slaughter for 1955 and 1960 for 26 regions of the U.S., (4) determining the competitive price differentials for each of the four types of slaughter livestock for 1955 and 1960, (5) determining the total transportation costs and regional transportation costs of optimum slaughter livestock movements for 1955 and 1960, (6) investigating the differences between the 1955 and 1960 optimum flows, (7) identifying and evaluating divergences between actual flows and optimum flows, and (8) examining what impact disturbances such as changes in transportation costs, geographical location of production, and geographical location of slaughtering have on optimum regional flows and the regional price pattern of each of the types of slaughter livestock. It is hoped that the information generated by these analyses will be useful in making decisions and policies concerning slaughter livestock.

II. THE BASIC DATA

Given the particular problems being considered and the specification of the type of data needed, the basic data used in describing the spatial structure of the livestock sector in 1955 and 1960 are presented in this section.

* This is the second in a series of three North Central regional bulletins concerned with the spatial structure of the livestock marketing system. This report is concerned with estimating the regional production of cattle, veal, calves, hogs, and sheep and lambs and determining the optimum geographical flows and competitive price differentials from production to slaughtering. The first bulletin in this series is entitled "Spatial Analyses of the Meat Marketing Sector in 1955 and 1960" and is concerned with estimating the regional consumption of beef, veal, pork, and lamb and mutton and deriving least-cost flows and competitive price differentials for these products. The third bulletin is entitled "Joint Spatial Analyses of Regional Slaughter and the Flows and Pricing of Livestock and Meat" and is concerned with estimating regional slaughtering capacities for each type of livestock and analyzing jointly the optimum location and level of livestock slaughtering and the geographical flows of each type of livestock and meat from production through slaughter to consumption.

† Associate professor of agricultural economics, Purdue University; regional Coordinator of NCM-25, MED-ERS USDA, Iowa State University; and professor of agricultural economics, University of Illinois.

A. Regional Demarcation

The delineation of regions considered in this study was conditioned by availability of data and the computational burden associated with larger numbers of regions. As a compromise between the need to portray reality and at the same time to limit the number of regions used, the United States was partitioned into 26 geographical contiguous regions (Table 1). Each region consists of one or more states since the basic data used are not available for smaller regions. Homogeneity in terms of production of livestock played an important role in suggesting the aggregation of states into regions. Major slaughter livestock-producing states each constitute a region whereas other regions are composed of two to six states.

A centrally located city was chosen as a market and supply point for each region. The regional demarcation and basing point cities are presented in Table 1.

B. Transportation Rates

The market and supply sources as formulated in the model are assumed to be designated by a single point in each region. Since transportation costs are a major determinant in the spatial interpretation, it is necessary to obtain costs or estimates of the transfer costs between the points that represent each pair of regions.

While it might be desirable to use actual point-to-point rates, the data problem hindered this approach.¹ In addition, the basing cities were chosen in some instances because of their proximity to the geographical center of the regions. Consequently, it is possible there has not been a sufficient number of livestock shipped between the alternative regions to establish representative rates. In view of these restrictions, a series of models were developed to estimate the point-to-point transport costs.

The model postulated to reflect truck rates for livestock between market and supply source points was:

$$C_{ij} = b_0 + b_1 D_{ij} + b_2 \sqrt{D_{ij}} + b_3 W_{ij} + b_4 \frac{D_{ij}}{T_{ij}}$$

where C_{ij} represents the cost in dollars of shipping 100 pounds of live animals from point i to point j by truck, D_{ij} is the highway mileage between i and j , W_{ij} is the total weight of the livestock per shipment from region i to region j , T_{ij} is the time in hours required to haul livestock from point i to point j , $D_{ij} \div T_{ij}$ is the average speed of the haul, and the b_i 's are estimated regression coefficients.

¹Data for 26 regions would require 650 rates for each species for each means of transportation.

Table 1. Regional Demarcation and Demand and Supply Points

Regions	State(s)	Demand and Supply Points
1	Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont	Boston, Mass.
2	Delaware, District of Columbia, Maryland, New Jersey, New York, Pennsylvania	Philadelphia, Pa.
3	North Carolina, Virginia, West Virginia	Richmond, Va.
4	Florida	Orlando, Fla.
5	Georgia and South Carolina	Atlanta, Ga.
6	Alabama and Mississippi	Columbus, Miss.
7	Kentucky and Tennessee	Nashville, Tenn.
8	Ohio	Columbus, Ohio
9	Indiana	Indianapolis, Ind.
10	Michigan	Detroit, Mich.
11	Illinois	Chicago
12	Wisconsin	Milwaukee
13	Arkansas and Louisiana	Alexandria, La.
14	Missouri	Columbia, Mo.
15	Iowa	Des Moines
16	Minnesota	St. Paul
17	Texas and Oklahoma	Fort Worth, Texas
18	Kansas	Kansas City
19	Nebraska	Lincoln
20	North Dakota and South Dakota	Bismarck, N. D.
21	Colorado	Denver
22	Montana and Wyoming	Billings, Mont.
23	Arizona and New Mexico	Phoenix, Ariz.
24	Idaho, Nevada, and Utah	Salt Lake City, Utah
25	California	Fresno
26	Oregon and Washington	Portland, Ore.

The above model was postulated on the basis that truck rates are an increasing function of mileage; however, the relationship is not necessarily linear. As specified by the model, rates may increase as a function of distance at a decreasing or increasing rate as a result of the supply of transportation facilities available and demand for such facilities. The effective load density, load size, and size of truck were measured by the weight of livestock transported, while road conditions were accounted for by the average speed of the trip.

Since livestock are shipped by rail as well as by truck, an additional model was constructed to represent rail rates within and between the alternative freight territories.

$$C_{ij} = b_0 + b_1 M_{ij} + b_2 \sqrt{M_{ij}}$$

where C_{ij} is the cost in dollars of shipping 100 pounds of live animals from point i to point j , M_{ij} is the rail mileage between i and j , and the b_i 's are the estimated regression coefficients. Since livestock is generally not moved short distances by rail, the truck and rail transportation costs were combined to provide a realistic rate over all distances.

Table 2. Commercial Slaughter of Cattle, Calves, Hogs and Sheep and Lambs, 26 Regions of the United States, 1955 and 1960.

Region	Cattle		Calves		Hogs		Sheep and Lambs	
	1955	1960	1955	1960	1955	1960	1955	1960
	(1000 pounds liveweight)							
1	261,864	207,182	40,971	36,146	219,912	141,246	29,712	25,910
2	2,190,322	2,096,137	369,715	265,099	1,537,983	1,467,841	247,114	218,422
3	346,843	358,031	68,836	61,887	502,301	740,303	1,500	2,024
4	303,088	281,225	41,748	47,591	106,258	113,987	57	96
5	438,322	335,200	61,931	48,251	398,998	484,160	71	139
6	296,677	432,926	99,011	77,970	198,872	326,706	94	177
7	616,082	513,235	97,161	57,301	581,243	870,831	18,747	24,585
8	1,104,820	1,165,083	54,675	28,284	955,763	1,000,888	21,883	15,464
9	652,727	650,251	47,383	27,394	879,971	1,218,551	15,469	19,615
10	794,991	731,926	121,904	70,081	372,728	353,836	80,607	72,281
11	2,034,659	1,483,093	170,792	64,024	1,644,853	1,302,353	80,130	45,499
12	869,959	1,040,619	176,570	139,311	734,742	808,512	12,942	18,408
13	246,370	246,301	137,603	98,446	89,800	103,760	156	170
14	951,539	1,105,124	62,566	22,496	894,007	936,821	64,318	59,104
15	1,912,368	2,667,793	126,204	82,618	3,031,254	3,548,397	143,896	148,966
16	1,471,513	1,492,524	98,291	49,391	1,456,455	1,350,452	96,006	108,446
17	1,719,319	1,598,624	567,434	468,752	618,693	561,001	95,168	116,901
18	1,143,787	1,159,452	76,822	40,396	638,367	698,822	51,586	29,004
19	1,880,087	2,204,856	18,370	4,248	979,525	1,021,768	116,395	111,238
20	467,578	463,670	9,816	274	634,048	565,712	69,582	58,584
21	851,552	1,079,853	21,809	5,044	157,989	151,205	87,955	153,636
22	88,204	120,951	3,418	1,455	55,576	68,666	1,325	1,879
23	143,544	203,694	13,308	7,041	43,988	56,984	4,160	5,233
24	318,069	446,788	12,884	6,745	92,698	108,686	44,800	40,162
25	2,415,814	2,540,572	153,861	99,047	517,754	391,941	233,212	251,902
26	680,723	705,884	35,543	16,202	259,616	274,571	38,861	39,647
U. S. Total	24,200,821	25,330,994	2,688,626	1,825,494	17,603,394	18,658,000	1,555,746	1,567,492

The data for estimating the coefficients of the models were obtained from a survey of truckers and from the ICC 1 percent waybill sample data.² Least square regression techniques were used in obtaining estimates of parameters for both the truck and rail models. Due to the institutional peculiarities that exist in the rate structure between the alternative freight territories, separate functions were estimated for each freight territory. Since comparable data on truck transportation costs were not available for 1955, the 1960 truck rates were adjusted by the changes that occurred in rail rates for the different species between 1955 and 1960. The estimated 1955 and 1960 transport cost data are presented in appendix A, Tables 1-6.³

C. Regional Livestock Slaughter

Regional slaughter data for cattle, calves, hogs, and sheep and lambs for 1955 and 1960 consist of commercial slaughter estimates published by the USDA and estimates of farm slaughter based on reported numbers of animals slaughtered on farms. The annual estimates of commercial slaughter in each region consist of the sum of the reported annual commercial slaughter of the states included in the region. In each of the 26 regions of the U.S. the slaughtering is assumed to occur at the centrally located cities designated as market and supply points

of the regions in the previous section on regional demarcation. Annual estimates of regional commercial slaughter of cattle, calves, hogs, and sheep and lambs are presented in Table 2.

The number of animals slaughtered on farms weighted by an average adjusted farm slaughter weight was used to estimate farm slaughter live weight by states.⁴ Individual state live weights were summed for states included in a region to obtain the regional quantity. The adjusted average farm slaughter live weight is the state average commercial slaughter live weight adjusted by the difference between the U.S. average commercial slaughter live weight and the U.S. average farm slaughter

²The waybill data used in this study consist of a 1 percent sample of all full carloads of livestock shipped by rail in 1960 as reported by the railroads to the Interstate Commerce Commission. The state of origin and destination are specified for each carload. In estimating the transportation cost functions, the data were stratified according to freight regions. Transportation charges used were developed from total revenue, including costs of feeding and layover derived from shipments.

³The analysis for these estimated transport cost data and the other alternatives considered will be presented in two forthcoming North Central regional publications: *Transportation Patterns and Cost of Livestock Movements*, Brewer, D. and Rizek, R.L. and *Interregional Transportation and Intersectoral Adjustments in the Livestock Economy*, Maki, W. R.

⁴Agricultural Marketing Service, "Livestock and Meat Statistics," U.S. Department of Agriculture, Statistical Bulletin No. 230, Supplement for 1961 and Statistical Reporting Service, "Meat Animals," U.S. Department of Agriculture, Statistical Bulletin No. 284, May 1961.

live weight. An iterative procedure was used in adjusting the state farm slaughter live weight so that the product of reported numbers slaughtered on farms in each state and adjusted farm slaughter live weight when aggregated into regions and summed over the 26 regions is equal to the total live weight of farm slaughter reported for the U.S. The regional estimates of farm slaughter live weight for 1955 and 1960 are presented in Appendix B, Table 1.

For each of the 26 regions quarterly data of commercial slaughter live weight consist of the sum of the three monthly quantities included in each quarter. In each region within the year distribution of farm slaughter live weight is assumed to be the same as commercial slaughter live weight and the quarterly proportions of commercial slaughter live weight in each region were used to obtain the quarterly quantities of farm slaughter live weight. Quarterly estimates of regional commercial slaughter live weight for 1955 and 1960 are presented in Appendix B, Tables 2-9.

D. Regional Production of Livestock for Slaughter

1. Procedure for Estimating Production

Production in this study refers to the live weight quantity of livestock production for slaughter purposes. Two components of this production are farm production and commercial production for slaughter and on a national basis these two components are farm slaughter and commercial slaughter. However, production data for slaughter are not available for regions or states of the United States. If regional contributions to the total U.S. slaughter are to be identified, regional productions for farm and commercial slaughter need to be estimated.

a. Farm slaughter

Estimates of annual live weight quantities of farm production for slaughter are the same as those of farm slaughter. Regional live weights of farm production were assumed to be geographically located in the regions in which the number of animals slaughtered on farms was reported. Regional estimates of farm production for 1955 and 1960 are presented in Appendix B, Table 1.

b. Commercial production

Commercial production for slaughter is viewed as the live weight production which is commercially slaughtered during a given calendar year. For the U.S. as a whole, total commercial production for slaughter is synonymous with reported commercial slaughter live weight. Since data were not available for states or regions of the United States, estimates of cattle, calf, hog, and sheep and lamb commercial production were developed for each of the 26 regions of the United States.

The commercial production of a region was assumed to consist of three components: (1) live weight of inshipments and weight added to inshipments, (2) live weight of a decrease in inventory numbers, and (3) live weight resulting from production that has occurred entirely within the region during the current year. The latter is a portion of the reported production for the region. The quantities attributable to each of these three components were identified for each of the 26 regions. The sum of the quantities from each of the three components was considered the commercial production of the region and the sum of the commercial productions for the 26 regions was restricted to equal the live weight of commercial slaughter of the U.S. for that year. In allocating commercial production to regions, the quantities attributable to (1) and (2) above were known with the greatest certainty to exist in particular geographical locations and were allocated first. The geographical location of quantities accounted for by (3) was less certain and the quantities were allocated last as residuals.

(1) Cattle and calves

In each region the contribution of an inventory decrease to production for slaughter consists of the number of head weighted by the average marketing weight of cattle. It was assumed that an inventory decrease within a region consisted of mature cattle which were commercially slaughtered during the year.⁵ The live weight quantity due to an inventory decrease was assumed to be geographically located in the region which reported the decrease in number. Increasing or stable inventory numbers were assumed to provide no quantity for commercial slaughter and therefore make no contribution to commercial production.

The regional quantities of commercial production arising from inshipments were calculated by taking 95 percent⁶ of the reported inshipments of the previous year times the current year regional average marketing weight.⁷ Both the live weight of inshipments and the weight added to inshipments were credited as the commercial production of the region that received the inshipments. Although the inshipment weight portion was produced in some other region, at the time these animals were avail-

⁵Part of the inventory decrease may be due to normal death loss; however there was no satisfactory basis for taking account of this.

⁶Five percent of inshipment were assumed to never enter slaughtering channels largely because of death loss and diversion to other uses.

⁷Average inshipment weights and average marketing weights by states were provided as a special release by the Livestock and Poultry Statistics Branch, Agricultural Estimates Division, Statistical Reporting Service, U. S. Department of Agriculture.

able for slaughter both the inshipment weight and weight added were spatially located in the region which received the animals. All inshipments were assumed to remain to be finished in the region which initially received them and all of the marketing live weight of inshipments was considered to be a part of the commercial production of cattle for slaughter.

In order to avoid double counting the live weight of inshipments, the production of regions supplying feeder animals had to be adjusted by the outshipment live weight. In estimating outshipments, the 26 regions were classified on the basis of judgment and historical patterns into supplying and finishing areas. Regions receiving large numbers of inshipments and traditionally referred to as feeding areas were considered to be finishing areas and it was assumed that these regions had no outshipments. The Texas and Oklahoma, North and South Dakota, and New Mexico and Arizona regions were considered to be both supplying and finishing areas and were treated accordingly. These three regions, the Corn Belt, California, and Colorado were considered to be the feeding areas of the United States and the rest of the regions, except for the New England area, were considered to be the supplying regions.

In estimating the live weight of outshipments it was assumed that the total weight of inshipments into the finishing regions was equal to the total outshipment live weight of the supplying regions. In the supplying regions the base from which outshipments could come was considered to be (calves on hand January 1 plus births during the current year) less (deaths of calves plus calves slaughtered on farms plus calves slaughtered commercially). It was assumed that calves slaughtered commercially in a feeder animal supplying region were produced in that region. The base of each region was expressed as a proportion of the base of all of the supplying regions combined. The regional outshipments were obtained by allowing each region to account for a relative proportion of the total number of inshipments into the finishing area equal to its relative proportion of the base. The live weight of total outshipments of each region was obtained by weighting the numbers shipped out by the average inshipment weight of the finishing area. In each region outshipments were allocated between cattle outshipments and calf outshipments according to the proportion of marketing live weight of the region accounted for by each.

The procedure for estimating commercial production can be expressed symbolically as follows:

$$[(RP_1 - WA_1) (R_1) - (FS_1 + O_1)] \bullet \\ (CSR_1) + ID_1 + IM_1 = CSP_1$$

where:

RP_1 = reported live weight of cattle and calf production (USDA)

WA_1 = weight added to inshipments

R_1 = proportion that the live weight of cattle marketings is of the total live weight of cattle and calf marketings in each region.

FS_1 = estimate of the live weight of cattle farm slaughter

O_1 = estimate of the live weight of cattle outshipments from the supplying regions

CSR_1 = ratio of the portion of total U. S. commercial slaughter production of cattle after weight added to inshipments, farm slaughter weight, and outshipment weight were accounted for to reported total U.S. commercial cattle slaughter not accounted for by inventory decrease and inshipment marketings.

ID_1 = live weight production accounted for by a decrease in inventory

IM_1 = live weight production accounted for by inshipment marketings

CSP_1 = live weight commercial slaughter production of cattle

After the proportion of live weight of commercial¹ production accounted for by inventory change and inshipment marketings are identified spatially, the remaining proportion is obtained from reported production after adjusting for farm slaughter, outshipments of feeder animals, and weight added to feeder animals received in the region.

A similar procedure was used for estimating the regional commercial production of calves for slaughter. However, live weight production due to inventory decrease and inshipments of the previous year marketed during the current year were assumed not to make any contribution to calf production. Symbolically, the expression for commercial production of calves is as follows:

$$[(RP_1 - WA_1) (1 - R_1) - (FS_2 + O_2)] \bullet \\ CSR_2 = CSP_2$$

where:

RP_1 and WA_1 are the same as defined previously
 $(1 - R_1)$ = proportion that the live weight of calf marketings is of the total live weight of cattle and calf marketings in each region

FS_2 = estimate of the live weight of calf farm slaughter

O_2 = estimate of the live weight of calf outshipments from the supplying regions

CSR_2 = ratio of the portion of total U.S. commercial slaughter production of calves after weight and outshipment weight were accounted for to the total U.S. reported commercial calf slaughter

CSP_2 = live weight commercial slaughter production of calves

In developing the production estimates for cattle and calves, the calves were viewed as a residual production.

(2) Hogs

The procedure used in estimating commercial production of hogs is similar to that used for cattle and calves. The relationship which expresses regional commercial hog production is as follows:

$$(RP_3 - WA_3 - FS_3 - O_3) \cdot CSR_3 + ID_3 + IM_3 = CSP_3$$

where:

RP_3 = reported live weight production of hogs (USDA)

WA_3 = weight added to inshipments

FS_3 = estimate of the live weight of hog farm slaughter

O_3 = estimates of the live weight of hog outshipments from the supplying regions

CSR_3 = ratio of the portion of total U.S. commercial slaughter production of hogs after weight added to inshipments, farm slaughter weight, and outshipment weight were accounted for to the total reported U.S. commercial hog slaughter not accounted for by inventory decrease and inshipment marketings

ID_3 = live weight production accounted for by a decrease in inventory

IM_3 = live weight production accounted for by inshipment marketings

CSP_3 = live weight commercial slaughter production of hogs

For each region the contribution to live weight commercial production of inventory decrease and inshipments was obtained by weighting the number of head involved by the regional average marketing weight per head. Ninety-five percent of the current year inshipments was assumed to enter commercial slaughter channels and was used to estimate the live-weight attributable to inshipments.

In estimating the live weight of outshipments again the regions were categorized into finishing regions and feeder pig supplying regions⁸ on the basis

⁸Regions 2, 4, 8, 9, 11, 15, 16, 17, 18, 19, and 20 were considered finishing areas; 10, 12, and 13 were considered to be areas supplying feeder pigs. Missouri, region 14, was considered to be both a supplying and finishing area and was handled accordingly. Other regions account for small numbers of feeder pig movements and were not considered in developing outshipment estimates.

of judgment and number of inshipments received. For each region the proportion of the number of net births minus numbers slaughtered on farms relative to the total number of net births minus numbers slaughtered on farms for the entire feeder pig supplying area (eight regions combined) was computed. The outshipments of each region were obtained by allowing each region to account for a relative proportion of total numbers received in the finishing area equal to the region proportion relative to the total supplying area of the number of net births less number slaughtered on farms. The number of outshipments for regions 7 and 12 were modified slightly to conform with unpublished information about the feeder pig outshipments of these two regions. Outshipment numbers were weighted by the average inshipment weight of the finishing area to obtain the live weight of outshipments.

(3) Sheep and lambs

Sheep and lambs were combined to estimate the sheep and lamb commercial production for slaughter. The regional sheep and lamb commercial production may be expressed as follows:

$$[RP_4 - (WA_4 + WA_5 + FS_4 - FS_5 + O_4 + O_5)] \cdot CSR_4 + ID_4 + IM_4 = CSP_4$$

where:

RP_4 = reported live weight production of sheep and lambs (USDA)

WA_4 = weight added to inshipment of sheep

WA_5 = weight added to inshipments of lambs

FS_4 = estimate of the live weight of sheep slaughtered on farms

FS_5 = estimate of the live weight of lambs slaughtered on farms

O_4 = estimate of the live weight of sheep outshipments from the supplying regions

O_5 = estimate of the live weight of lamb outshipments from the supplying regions

CSR_4 = ratio of the portion of total U.S. commercial slaughter production of sheep and lambs after weight added to inshipments, farm slaughter weight and outshipment weight were accounted for to the total reported U.S. commercial sheep and lamb slaughter not accounted for by inventory decrease and inshipment marketings

ID_4 = live weight production accounted for by a decrease in the inventory number of sheep

IM_4 = live weight production accounted for by sheep and lamb inshipment marketings

CSP_4 = live weight commercial slaughter production of sheep and lambs

Table 3. Estimated Commercial Slaughter Production of Cattle, Calves, Hogs, and Sheep and Lambs, 26 Regions of the United State, 1955 and 1960.

Region	Cattle		Calves		Hogs		Sheep and Lambs	
	1955	1960	1955	1960	1955	1960	1955	1960
	(1000 pounds liveweight)							
1	185,009	149,913	39,023	37,511	45,417	47,877	2,888	3,218
2	908,525	875,177	193,694	175,550	285,646	249,605	20,614	21,482
3	477,842	520,317	134,570	126,543	348,618	491,835	21,863	14,380
4	128,746	143,197	67,080	34,573	69,682	69,815	157	265
5	159,238	99,155	62,682	29,272	361,141	497,931	1,193	1,444
6	302,272	281,671	135,406	95,921	312,556	391,151	4,724	3,983
7	413,153	412,570	111,770	68,437	507,012	715,367	39,455	43,224
8	616,576	588,737	47,026	34,524	918,356	876,204	59,227	58,452
9	760,531	745,559	28,529	25,283	1,557,007	1,730,038	36,580	32,176
10	435,937	408,643	41,337	36,578	237,160	242,599	23,184	20,959
11	1,938,503	2,159,185	35,876	17,922	2,355,005	2,737,389	59,396	61,581
12	569,464	498,099	158,148	108,973	689,600	650,786	17,257	14,152
13	304,453	192,808	145,700	84,463	138,940	152,509	4,271	2,709
14	1,156,322	1,270,807	148,773	112,917	1,166,771	1,293,774	61,880	54,987
15	3,192,487	3,789,796	69,398	55,500	4,499,199	4,478,148	144,306	161,795
16	1,227,056	1,621,086	93,311	75,851	1,372,938	1,345,487	78,498	90,814
17	1,849,662	1,860,991	525,539	242,962	377,426	391,101	113,484	118,318
18	1,768,275	1,978,551	34,569	21,710	303,197	378,008	55,623	58,118
19	2,376,275	2,214,325	40,061	63,221	959,603	879,866	100,534	88,864
20	934,374	689,994	109,947	54,333	766,695	673,732	108,179	140,532
21	943,134	1,216,031	54,406	48,753	44,243	56,622	129,775	149,424
22	565,261	402,338	79,411	78,022	43,641	49,399	97,614	104,984
23	457,850	670,703	83,482	25,845	15,213	20,165	30,978	24,060
24	444,017	375,847	37,832	33,482	40,811	57,263	139,015	117,688
25	1,659,797	1,879,717	169,981	94,492	101,194	90,809	150,781	139,439
26	426,062	285,777	41,075	42,856	86,323	90,520	54,270	40,444
Total U. S.	24,200,821	25,330,994	2,688,626	1,825,494	17,603,394	18,658,000	1,555,746	1,567,492

For each region the contributions to live weight commercial production of an inventory decrease and inshipments were obtained by weighting the number of head involved by the regional average marketing weight per head. In estimating the live weight accounted for by inshipments, 95 percent of the sheep and lamb inshipments of the previous year was assumed to enter commercial slaughter channels in the current year.

In estimating regional outshipments of sheep and lambs, 13 regions were considered finishing regions, seven regions were considered supplying regions of feeder sheep and lambs, and six regions were not considered in estimating outshipments.⁹ The number of inshipments of sheep and lambs of the finishing area times the regional average inshipment weights of sheep and lambs respectively was assumed to be the total live weight which had to be accounted for by the supplying area. The live weight of inshipments of sheep and lambs was considered separately. In each of the supplying regions

⁹Regions 8, 9, 10, 11, 12, 14, 15, 16, 18, 19, 20, 21, and 25 were considered inshipment receiving or finishing regions; regions 3, 7, 17, 22, 23, 24, and 26 were considered exporters of feeder sheep and lambs; and regions 1, 2, 4, 5, 6, and 13 account for small numbers of feeder sheep and lambs and were not considered in estimating outshipment live weight of feeder sheep and lambs.

a base from which outshipments could come was estimated for sheep and lambs separately. Ewes on hand January 1 formed the base for the outshipments of sheep and a relative proportion that each supplying region had of the total supplying area was computed. Each supplying region was assumed to account for the proportion of total number of sheep inshipments received in the finishing area equal to its relative proportion of the number of ewes on hand January 1. The live weight of sheep outshipments for each region is the number of head of sheep times the average inshipment weight of sheep in the finishing area.

In each supplying region the base for lambs was obtained by subtracting from the regional net births the number of lambs slaughtered on farms and the regional commercial lamb slaughter. Each supplying region's base was expressed as a proportion of the lamb base for the total supplying area and each supplying region was assumed to account for the proportion of the number of lamb inshipments received in the finishing area equal to its relative proportion of the lamb base. The live weight of lamb outshipments for each supplying region was obtained as the product of the number of head shipped out and the average inshipment weight of lambs in the finishing area.

2. Estimates of Production for Slaughter

The 1955 and 1960 commercial production estimates of cattle, calves, hogs, and sheep and lambs for each of the 26 regions are presented in Table 3. Regional commercial production is the live weight which during the year is slaughtered in the region where it is located or in some other region to which part of it may have been shipped. Also, the part of the regional commercial production accounted for by feeder animals was in reality produced in some feeder animal supplying area but the live weight was credited to the region in which the animals were located immediately prior to shipment for slaughter.

Quarterly estimates of 1955 and 1960 farm and commercial production of cattle, calves, hogs, and sheep and lambs for each of the 26 regions are presented in Appendix C, Table 1-16. The quarterly production of each region was estimated by allocating the annual regional production among quarters of the year on the basis of the quarterly proportional distribution of total regional commercial slaughter.

III. THE EMPIRICAL RESULTS

A linear-programming transportation model is used to determine the minimum cost flows of slaughter livestock from location of production to location of slaughtering. The regional live weight quantities of slaughter production, regional live weight quantities of slaughter, and the transportation costs of moving one unit of slaughter livestock from each region to every other region are taken as given. The regional live weight quantities of production and transportation costs are estimated by procedures discussed in previous sections. Regional quantities of slaughter are reported amounts that were actually slaughtered in each of the regions. Instead of using regional surplus and deficit quantities in the programming framework, total regional commercial production and total regional live weight slaughtered commercially are used. The details of the formal model used in this study are presented in the first of this series of bulletins entitled "Spatial Analyses of the Flows of Meat in 1955 and 1960."

The analyses presented in this report include the optimum price differentials and the minimum cost shipment patterns as derived by the formal model for the four species of slaughter livestock. The 1955 analysis discussed in the text refers to the optimum flows when only truck transportation rates are considered. The 1960 analysis utilizes a combination truck-rail rate as well as the truck transportation rates. Quarterly analyses for 1960 utilize only the combination truck-rail rates.

The flow solutions are optimum only in that they minimize the costs of shipping livestock, given the regional supplies and demands of slaughter livestock—where demand for slaughter livestock in any given region is the amount that was actually slaughtered during the year. No consideration was given to the regional slaughter capacities or the final meat consuming areas.

A. Annual Spatial Analyses

1. Slaughter Cattle

The results of the spatial analyses for 1955 and 1960 are presented in Tables 4 and 5, respectively. The numbers at the left side of these tables and in the tables for other species refer to the surplus or deficit of slaughter livestock in each region. The underlined numbers appearing in the body of the tables represent the live weight amounts of slaughter cattle shipped interregionally to satisfy regional demands and to minimize total transportation costs. The resulting U_i and V_j of the final solution refer to the live animal price differentials relative to the base region (region 1). For example, under 1955 equilibrium conditions (Table 4), the estimated cost of live animals is \$1.64 per hundred pounds less in Missouri (region 14) than in the New England area (region 1). The numbers not underlined in the body of Table 4 are the result of the difference between direct and indirect costs of shipping from one region to another. They are calculated by subtracting $(U_i - V_j)$ from C_{ij} , the cost of shipping 100 pounds of live weight from region i to region j . For example, the element .42 which appears in the cell common to deficit region 1 and surplus region 19 indicates that if region 19 shipped to region 1 the shipment cost between regions 1 and 19 would be increased by 42 cents per hundred pounds.

The estimates of total quantities of slaughter cattle shipped and the total transportation costs appear directly below the table. These estimates have meaning only for the regional demarcation used in these analyses. However, since all subsequent analyses in this publication as well as other publications in this series use the same regional breakdown, comparisons of estimates of total costs and shipments may be made.

Optimum flows of live weights of slaughter cattle for 1955 and 1960 are presented graphically in Figures 1 and 2. The unshaded regions in Figures 1 and 2 and in figures for other species of slaughter livestock denote deficit regions. Conversely, shaded areas denote regions with surplus livestock production for slaughter. Lines originating from the shaded regions represent the optimum movement of slaughter cattle and the numbers appearing in the breaks indicate the quantities shipped between the regions.

As indicated in Table 4, an estimated total of

Table 4. Regional Price Differences, Surpluses and Deficits, and Optimum Flows of Cattle for Slaughter, 26 Regions of the U. S., 1955.*

Region	Surplus or Deficit (100,000 lbs.)	Origins and Quantities of Shipments (100,000 pounds and cents per pound)														V _i
		3	6	9	13	14	15	17	18	19	20	21	22	23	24	
1	-769	.49	1.25	.45	1.66	<u>769</u>	.46	1.24	.56	.42	.60	.31	.41	1.42	2.04	.00
2	-12,818	<u>1451</u>	.67	<u>1078</u>	1.07	.55	<u>9374</u>	.77	.02	.01	.21	<u>915</u>	.20	2.39	1.57	-.01
3	1,310		.92	<u>31</u>	<u>141</u>	.49	<u>59</u>	.94	.52	.60	.80	1.23	1.70	2.81	2.11	-.45
4	-1,744	1.08	.09	.39	<u>1744</u>	.24	.51	.05	.23	.19	.87	1.01	1.69	1.85	4.63	.10
5	-2,791	1.18	<u>56</u>	.20	<u>22</u>	<u>1279</u>	.29	.11	<u>1456</u>	.12	.66	.79	1.57	1.88	1.70	-.49
6	56															
7	-2,029	1.80	.49	.24	.62	.02	.23	.29	<u>2029</u>	.16	.58	.76	1.50	2.01	1.60	-.94
8	-4,882	1.25	.97	.06	.81	.09	.05	.38	<u>2760</u>	<u>2122</u>	.32	.44	.60	2.31	1.53	-.87
9	1,078															
10	-3,591	1.46	1.22	.26	1.47	.22	<u>3426</u>	.97	.16	<u>165</u>	.12	.42	.43	2.51	1.51	-.87
11	-962	2.30	1.33	.60	1.26	.29	.12	.75	.26	<u>962</u>	.11	.62	.65	2.56	1.52	-1.38
12	-3,005	2.42	1.52	.72	1.73	.40	.10	1.17	.30	<u>1712</u>	<u>1293</u>	.68	.51	2.63	1.53	-1.34
13	581	1.90	.95	1.37		.60	.70	<u>1304</u>	.40	.42	<u>147</u>	.47	.87	1.01	.86	-1.40
14	2,048															
15	12,800															
16	-2,444	3.46	2.41	1.50	2.35	.85	.47	1.44	.58	.30	<u>2444</u>	.84	.52	2.64	1.49	-1.80
17	1,304															
18	6,245															
19	4,961															
20	4,668															
21	915															
22	4,771															
23	3,144															
24	1,259															
25	-7,559	6.59	3.90	3.87	1.79	2.65	2.57	.96	2.17	1.89	1.52	.55	<u>3156</u>	<u>3144</u>	<u>1259</u>	-1.05
26	-2,546	6.87	4.78	2.89	4.33	2.16	1.79	1.87	1.70	1.34	<u>931</u>	.58	<u>1615</u>	1.43	.05	-1.18
U _i		-.45	-1.16	-1.21	-1.40	-1.64	-1.78	-1.93	-1.88	-2.15	-2.54	-2.29	-2.54	-2.03	-2.40	

*Based on 1955 truck transportation rates. Regions and basing points are identified in Table 1.
Total shipments 4,514,000,000 pounds.
Total costs \$58,017,930.

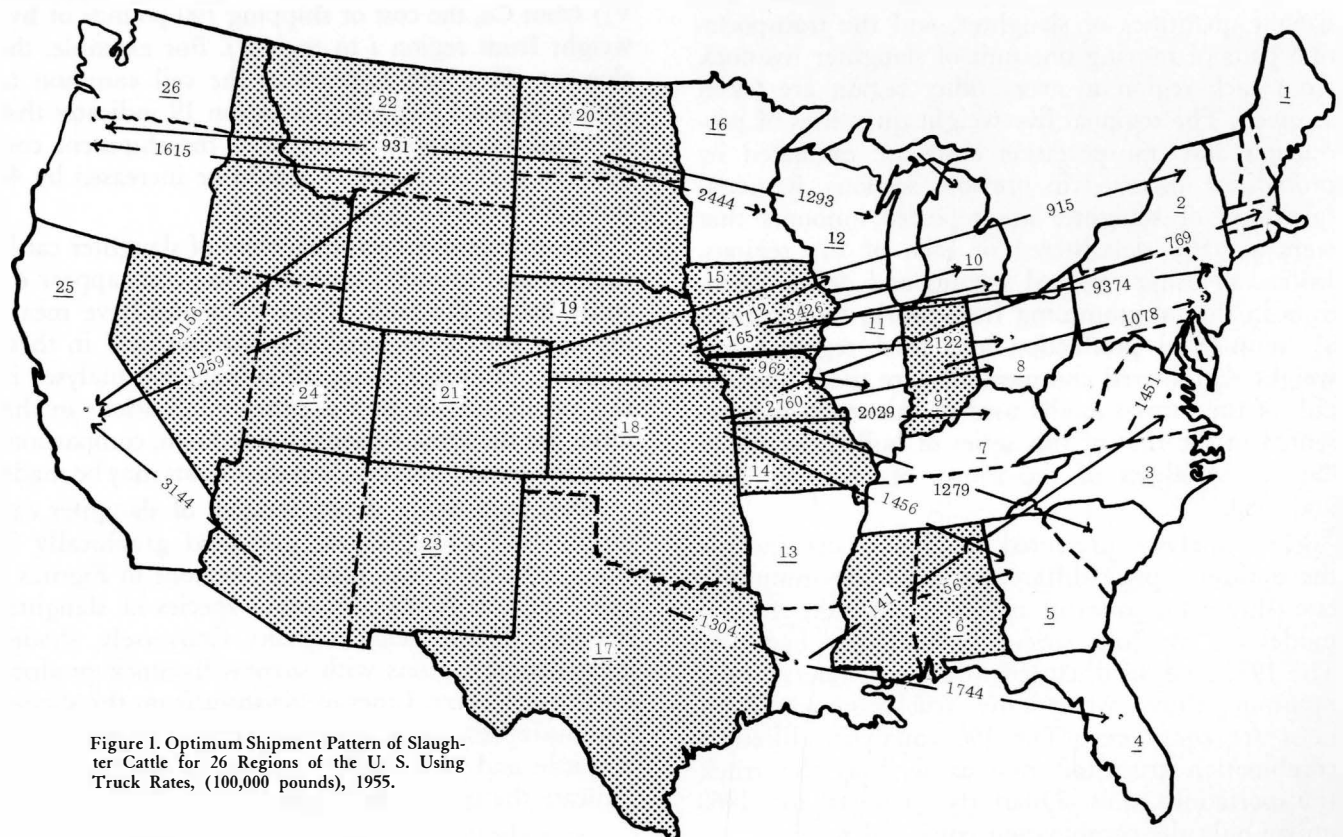


Figure 1. Optimum Shipment Pattern of Slaughter Cattle for 26 Regions of the U. S. Using Truck Rates, (100,000 pounds), 1955.

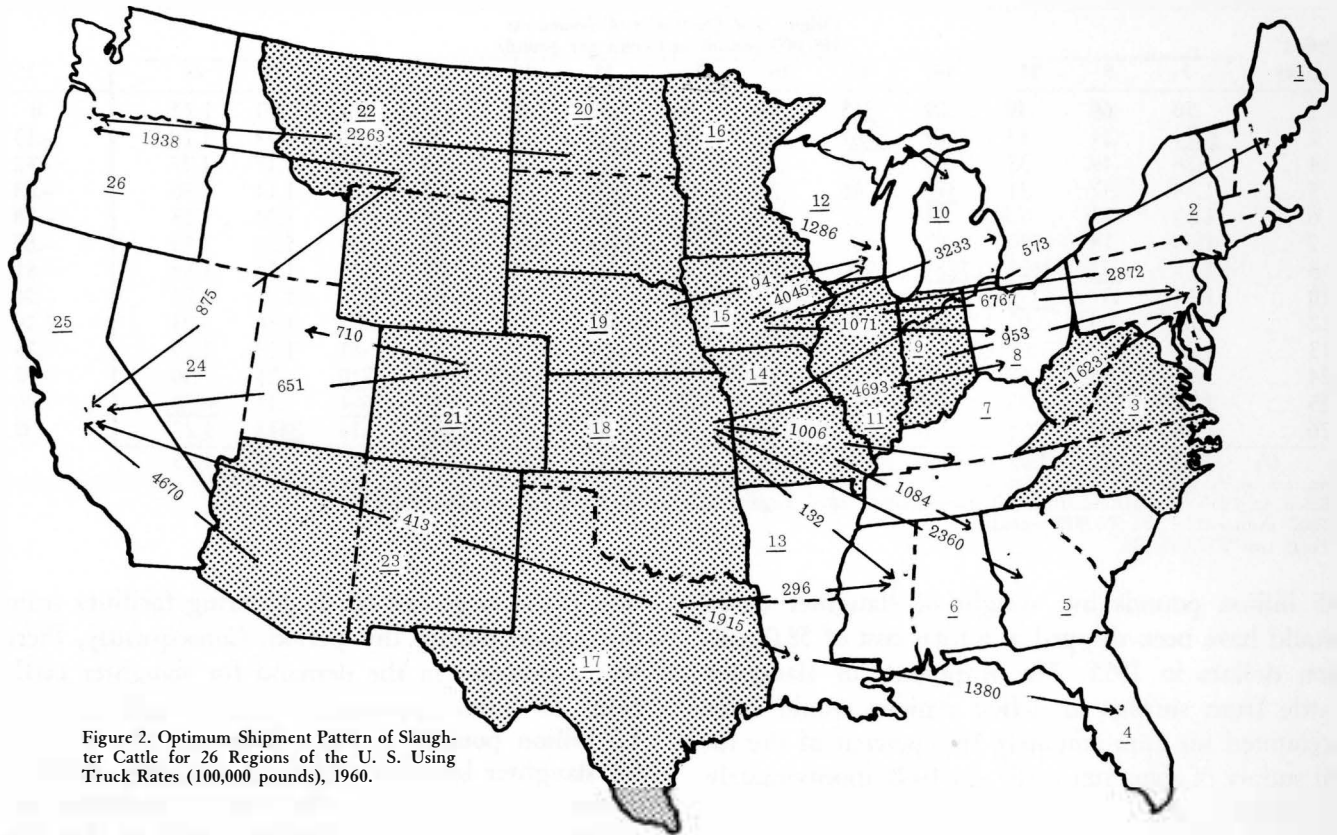


Figure 2. Optimum Shipment Pattern of Slaughter Cattle for 26 Regions of the U. S. Using Truck Rates (100,000 pounds), 1960.

Table 5. Regional Price Differences, Surpluses and Deficits, and Optimum Flows of Cattle for Slaughter, 26 Regions of the U. S. 1960.*

Region	Surplus or Deficit (100,000 lbs.)	Origins and Quantities of Shipments (100,000 pounds and cents per pound)														V _i
		3	9	11	13	14	15	16	17	18	19	20	21	22	23	
1	-573	.44	.40	.26	1.86	.573	.42	.67	1.48	.56	.48	1.83	.89	1.45	2.57	.00
2	-12,209	<u>1623</u>	<u>953</u>	<u>6767</u>	1.31	.74	<u>2872</u>	.25	1.05	.08	.12	1.50	.64	1.33	3.73	-1.12
3	1,623															
4	-1,380	1.09	.36	.53	<u>1380</u>	.33	.52	.97	.09	.26	.27	2.19	1.73	3.11	3.29	.07
5	-2,360	1.24	.17	.32	.28	.06	.28	.71	.18	<u>2360</u>	.20	1.96	1.49	2.98	3.34	-.61
6	-1,512	2.13	.71	.53	.19	<u>1084</u>	.37	.90	<u>296</u>	<u>132</u>	.20	2.05	1.36	2.81	2.97	-.97
7	-1,006	1.93	.23	.32	.74	.08	.21	.66	.40	<u>1006</u>	.24	1.86	1.45	2.90	3.48	-1.12
8	-5,764	1.35	.03	.10	.98	.16	<u>1071</u>	.22	.55	<u>4693</u>	.06	1.56	1.08	1.75	3.64	-1.04
9	953															
10	-3,233	1.64	.30	.06	1.77	.36	<u>3233</u>	.19	1.27	.23	.11	1.39	1.11	1.62	3.90	-1.09
11	6,761															
12	-5,425	2.61	.72	.12	1.96	.46	<u>4045</u>	<u>1286</u>	1.39	.29	<u>94</u>	1.14	1.30	1.62	3.95	-1.52
13	-535	1.97	1.40	1.29	<u>1915</u>	.65	.65	1.68	<u>1915</u>	.36	.44	2.78	1.03	2.09	2.25	-1.55
14	1,657															
15	11,221															
16	1,286															
17	2,624															
18	8,191															
19	94															
20	2,263															
21	1,361															
22	2,817															
23	4,670															
24	-710	4.99	2.28	2.05	1.54	1.47	.93	1.24	.64	.89	.22	1.04	<u>710</u>	.38	1.03	-.97
25	-6,609	6.27	2.96	2.78	.94	1.85	1.65	2.04	<u>413</u>	1.25	.98	1.71	<u>651</u>	<u>875</u>	<u>4670</u>	-.05
26	-4,201	6.59	1.91	1.59	3.84	1.30	.77	.52	<u>103</u>	.72	.37	<u>2263</u>	.04	<u>1938</u>	<u>1.63</u>	-2.20
	U _i	-.61	-1.46	-1.68	-1.55	-1.86	-2.13	-2.09	-2.13	-2.19	-2.44	-1.74	-2.07	-1.75	-1.17	

*Based on 1960 truck transportation rates. Regions and basing points are identified in Table 1. Total shipments 4,552,600,000 pounds. Total cost \$58,454,120.

Table 6. Regional Price Differences and Optimum Flows of Cattle for Slaughter, 26 Regions of the U. S., 1960.*

Deficit Regions	Origins and Quantities of Shipments (100,000 pounds and cents per pound)													V _i
	3	9	11	14	15	16	17	18	19	20	21	22	23	
1	.50	.60	.39	.09	<u>315</u>	.09	.54	.02	.02	<u>258</u>	.72	.75	1.22	0
2	<u>1623</u>	.21	.14	.07	<u>6767</u>	.09	.48	<u>3819</u>	.02	.00	.70	.74	1.18	-.13
4	1.26	.49	.33	.04	.08	.25	.18	<u>1380</u>	.12	.23	.81	1.17	1.27	-.42
5	1.38	.47	.31	<u>374</u>	.06	.24	.50	<u>1986</u>	.10	.17	.82	1.14	1.36	-.63
6	1.83	.72	.50	.11	.17	.37	<u>1512</u>	.02	.15	.28	.81	1.24	1.25	-.78
7	1.69	.18	.20	.02	.09	.29	.33	<u>1006</u>	-.02	.06	.89	1.26	1.50	-.87
8	1.25	<u>953</u>	<u>3528</u>	<u>1283</u>	.00	.22	.71	.04	.20	.45	1.14	1.14	1.58	-.81
10	1.44	.31	<u>3233</u>	.24	.04	.23	1.47	.31	.26	.52	1.28	1.21	1.73	-.90
12	2.00	.69	.02	.30	<u>4139</u>	<u>1286</u>	1.55	.33	.15	.21	1.52	1.36	2.03	-1.29
13	1.94	.83	.62	.18	.24	.48	<u>535</u>	.09	.21	.33	.81	1.23	1.25	-.78
24	2.06	1.06	.68	.43	.18	.35	.35	.20	.00	.00	<u>710</u>	.21	.50	-.52
25	1.78	.79	.43	.42	.17	.35	<u>577</u>	.17	<u>94</u>	<u>617</u>	<u>651</u>	.11	<u>4670</u>	.20
26	1.90	.90	.55	.54	.29	.56	.34	.28	.11	<u>1388</u>	.14	<u>2813</u>	1.27	.08
U _i	-.62	-1.26	-1.55	-1.79	-1.90	-1.86	-1.74	-1.92	-1.95	-2.03	-1.52	-1.47	-1.25	

*Based on 1960 combination truck-rail transportation rates. Regions and basing points are identified in Table 1. Total shipments 4,552,600,000 pounds. Total cost \$57,065,896.

4.5 billion pounds live weight of slaughter cattle would have been shipped at a total cost of 58.0 million dollars in 1955. The shipments of slaughter cattle from surplus to deficit regions would have accounted for approximately 18.6 percent of the total supply of slaughter cattle. In 1960 approximately 4.6 billion pounds of slaughter cattle, or 18.0 percent of the total supply of slaughter cattle, would have been shipped at a cost of 58.5 million dollars.¹⁰

It is interesting to note that in 1955 the average cost of shipping slaughter cattle was \$1.29 per hundred, while in 1960 the average cost was \$1.28 per hundred even though transportation rates had increased approximately 13 percent. This suggests that the average length of haul in 1960 was less than that of 1955.

The main deficit regions in both 1955 and 1960 were regions 2 and 25, of which region 2 (New York, Pennsylvania, etc.) received slightly more than one-fourth of the total shipments. In both years the large surplus areas of slaughter cattle were Iowa and Kansas.

The primary differences between the optimum flows estimated for 1955 and 1960 occurred because some areas changed from surplus to deficit and vice versa. For example, in 1955 regions 6, 13, and 24 were all surplus areas of slaughter cattle production, while in 1960 these areas became deficit. Conversely, regions 11 and 16, Illinois and Minnesota, respectively, were deficit regions in 1955 but surplus regions in 1960. One reason for the change in Illi-

nois is the large exit of slaughtering facilities from this region during this period. Consequently, there was a decrease in the demand for slaughter cattle from 2.0 billion pounds in 1955 to approximately 1.5 billion pounds in 1960. Although the demand for slaughter livestock remained relatively stable in Minnesota (region 16), there was a substantial increase in production of slaughter cattle so that this region became a surplus area in 1960. The changing structure of the meat packing industry is further exemplified by the optimum flow patterns derived for 1955 and 1960 with reference to Nebraska, region 19. In 1955, Nebraska would have shipped out approximately 500 million pounds of slaughter cattle; however, in 1960 Nebraska exported only 9.4 million pounds. While there was a slight decrease in production from 1955 to 1960 in Nebraska the demand for slaughter cattle was increased over 300 million pounds as a result of packing facilities moving to the areas of production. This is illustrated further by the increase in demand of 550 million pounds in Iowa.

The spatial analyses for 1955 and 1960 illustrate the potential ability of the Plains States and Colorado to ship either east or west, depending on demand and supply conditions. In 1955 regions 17 and 21 would have moved their cattle east while region 20 would have moved cattle in both directions. However, in 1960 regions 20 and 21 would optimally have shipped only west, while cattle from region 17 would have moved in both directions.

The optimum shipment pattern estimated for slaughter cattle in 1960 based on the combination truck-rail transportation rates is presented in Table 6 and the optimum flows are presented graphically in Figure 3. Since the combination rate was lower on longer distances, the estimated total transportation

¹⁰Due to the structure of the transportation rates used in this analysis, (rates were developed separately for the different regions) cross-hauling occurred in two regions (regions 3 and 13) in 1955 and in region 13 in 1960. Consequently, in 1960 the total shipments of 4.6 billion pounds include a double counting of 138 million pounds.

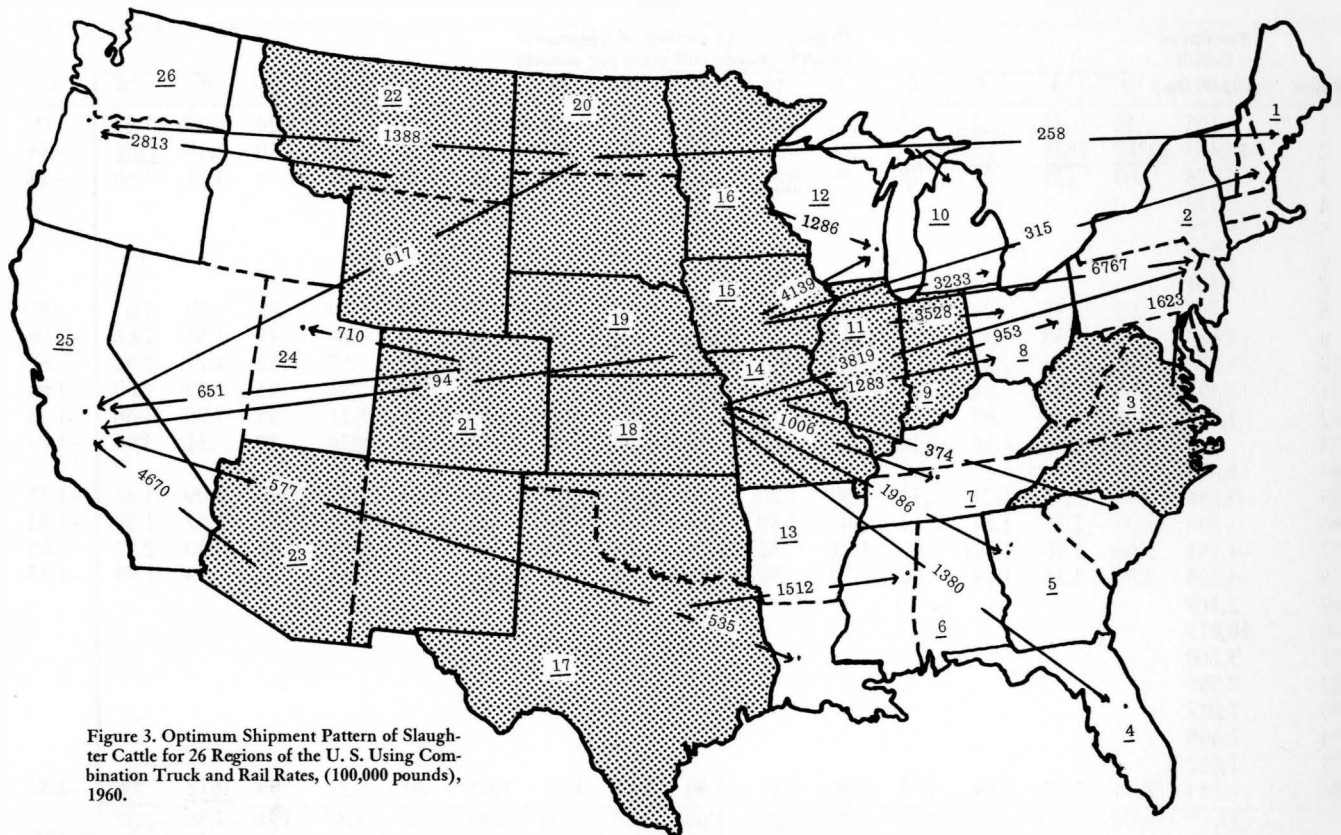


Figure 3. Optimum Shipment Pattern of Slaughter Cattle for 26 Regions of the U. S. Using Combination Truck and Rail Rates, (100,000 pounds), 1960.

cost would have been reduced from approximately 58.5 million dollars to 57.1 million dollars and the average cost would be \$1.25 per hundred. In addition, longer hauls would have resulted particularly from regions bordering and regions west of the Mississippi River.

In terms of the directional flows, only slight differences would have occurred between the two alternative optimums. Under the combination rate, Nebraska would have shipped west, and North and South Dakota would have shipped both east and west. However, when truck rates were utilized, Nebraska's slaughter cattle would have moved east and slaughter cattle from North and South Dakotawould have gone west.

Some cross- and back-hauling can be expected to exist in reality. This is partly due to the location of market and slaughtering facilities in adjoining states. A second factor not accounted for in the optimum models that might result in some cross- and back-hauling is the demand and supply for a specific grade and quality of animal in a specific region. However, even if account had been taken of these factors, it appears as if a considerable amount of inefficiency exists in the movement of slaughter cattle.

2. Slaughter Calves

The results of the spatial analyses for slaughter calves for 1955 and 1960 are presented in Tables 7

and 8 and Figures 4 and 5. In 1955, an estimated total of 584.3 million pounds of slaughter calves, or 21.7 percent of the total commercial production would have been shipped interregionally, at a cost of approximately 7.8 million dollars. In 1960, 523.7 million pounds, or 28.7 percent of the total calf production for slaughter would have moved at a cost of 6.3 million dollars.

As shown in Figure 4 and 5, there was a considerable divergence between the optimum flow patterns derived for 1955 and 1960. To a large degree this is due to the large decrease of over 860 million pounds from 1955 to 1960 in the U.S. aggregate supply and regions changing from surplus to deficit areas and vice versa. In the 1955 solution, all regions west of the Mississippi River except Kansas (region 18) and Texas and Oklahoma (region 17) were surplus producers of slaughter calves. The major deficit areas were regions 2, 10, and 11 which received 67 percent of the total shipments. As a result, most of the surplus slaughter calves of the Mountain States would have moved east into the Corn Belt and the Northeastern States. Surpluses of the Southeastern States would have moved into the eastern Corn Belt as well as the northeastern areas (regions 1 and 2). With the large decrease in aggregate supply in 1960, Texas and Oklahoma (region 17), became a large deficit area, approximately 226 million pounds. Con-

Table 7. Regional Price Differences, Surpluses and Deficits, and Optimum Flows of Calves for Slaughter, 26 Regions of the U. S., 1955.*

Region	Surplus or Deficit (10,000 lbs.)	Origins and Quantities of Shipments (10,000 pounds and cents per pound)															U _i
		3	4	5	6	7	13	14	19	20	21	22	23	24	25	26	
1	-195	.16	.23	.22	.25	.42	1.33	<u>195</u>	.85	.78	.21	.18	.08	1.24	2.37	1.00	.00
2	-17,603	<u>10209</u>	<u>2533</u>	<u>75</u>	<u>2620</u>	.20	1.07	.88	.77	.72	.23	.30	1.38	1.10	2.14	<u>2166</u>	-34
3	6,573	.00	.21	.22	.25	.50	<u>3636</u>	.82	1.36	1.31	1.46	1.80	1.80	1.64	3.21	4.60	-78
4	2,533																
5	75																
6	3,640																
7	1,461																
8	-765	.95	.55	.24	<u>765</u>	.02	.51	.12	.46	.53	.37	.40	1.00	.76	1.74	1.65	-90
9	-1,885	1.37	.58	.30	<u>255</u>	<u>1004</u>	.53	<u>626</u>	.43	.36	.36	.40	.84	.43	1.55	1.68	-1.08
10	-8,056	.93	.53	.23	.02	<u>457</u>	.94	.02	.23	.10	.12	<u>7599</u>	.97	.51	1.71	1.42	-67
11	-13,491	1.68	.94	.64	.04	.29	.64	<u>6834</u>	.14	<u>6657</u>	.23	<u>13</u>	.93	.43	1.59	1.60	-1.09
12	-1,842	1.91	1.20	.89	.34	.51	1.22	.22	.25	<u>1842</u>	.40	.10	1.11	.55	1.73	1.60	-1.16
13	810	1.90	1.03	1.16	.28	1.22	.00	.93	1.18	1.98	.70	.97	<u>2826</u>	.39	.31	3.96	-1.73
14	8,620																
15	-5,680	2.49	1.54	1.23	.53	.83	.70	.13	<u>2169</u>	<u>1016</u>	.09	.03	.52	<u>2495</u>	1.09	1.42	-1.35
16	-498	2.95	2.17	1.84	1.23	1.46	1.84	.67	.55	<u>498</u>	.56	.11	1.12	.51	1.67	1.39	-1.62
17	-4,191	3.66	1.90	1.87	.91	1.71	.82	1.26	1.16	1.58	.66	1.17	<u>4191</u>	.42	.30	2.32	-2.02
18	-4,225	2.52	1.36	1.04	.26	.70	.50	<u>965</u>	.04	.12	<u>3260</u>	.27	.14	.02	.79	1.43	-1.35
19	2,169																
20	10,013																
21	3,260																
22	7,599																
23	7,017																
24	2,495																
25	1,612																
26	554	7.68	7.27	5.89	4.92	5.30	5.14	3.30	2.91	1.32	1.62	.91	1.23	.39	<u>1612</u>	.00	-2.32
U _i		-78	-2.20	-1.70	-2.16	-1.59	-1.73	-1.64	-1.72	-2.36	-2.39	-2.77	-3.37	-3.20	-3.56	-2.32	

*Based on 1955 truck transportation rates. Regions and basing points are identified in Table 1. Total shipments 584,310,000 pounds. Total costs \$7,781,473.

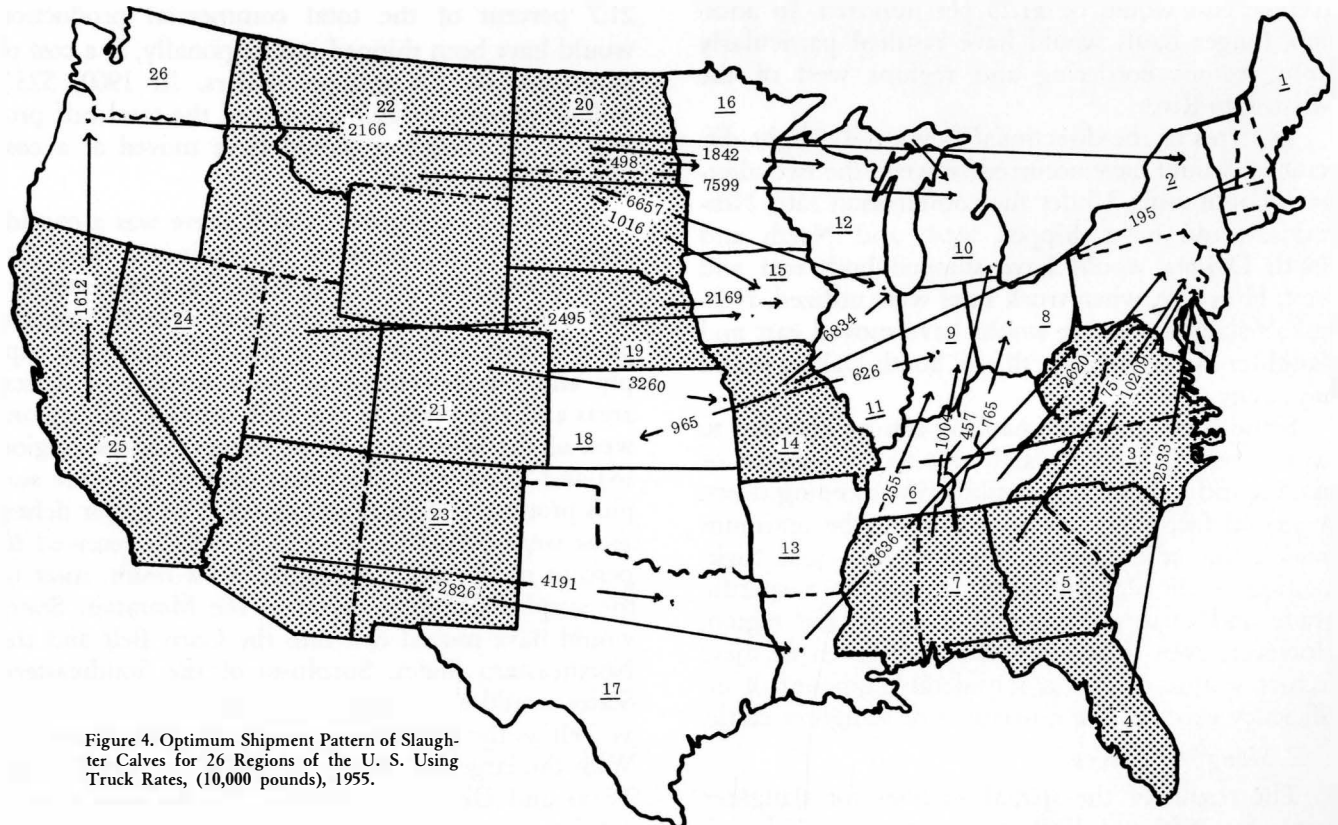


Figure 4. Optimum Shipment Pattern of Slaughter Calves for 26 Regions of the U. S. Using Truck Rates, (10,000 pounds), 1955.

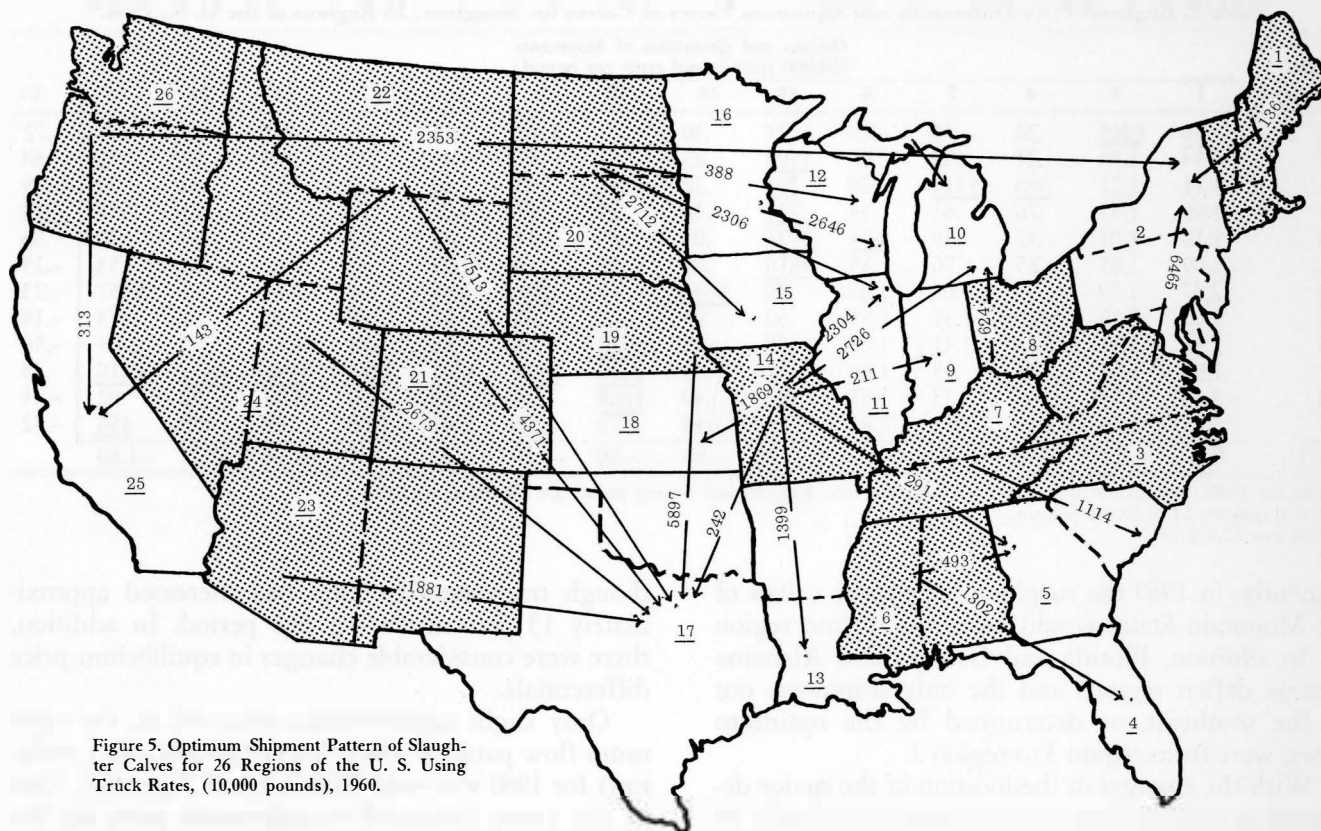


Figure 5. Optimum Shipment Pattern of Slaughter Calves for 26 Regions of the U. S. Using Truck Rates, (10,000 pounds), 1960.

Table 8. Regional Price Differences, Surpluses and Deficits, and Optimum Flows of Calves for Slaughter, 26 Regions of the U. S., 1960*

Region	Surplus or Deficit (10,000 lbs.)	Origins and Quantities of Shipments (10,000 pounds and cents per pound)														V _i		
		1	3	6	7	8	14	16	19	20	21	22	23	24	26			
1	136																	
2	-8,954	<u>136</u>	<u>6465</u>	1.31	.96	.48	1.18	.88	1.16	.99	1.12	.52	3.04	2.23	2353			
3	6,465																	
4	-1,302	1.24	.64	<u>1302</u>	.14	.75	.22	1.05	.76	1.13	1.66	1.75	2.05	5.32	5.26			1.46
5	-1,898	1.41	.84	<u>493</u>	<u>1114</u>	.58	<u>291</u>	.84	.74	.95	1.47	1.67	2.15	2.03	3.84			.73
6	1,795																	
7	1,114																	
8	624																	
9	-211	1.80	1.46	1.14	.58	.54	<u>211</u>	.35	.60	.40	1.09	.49	2.32	1.36	1.68			.06
10	-3,350	.91	.94	1.13	.54	<u>624</u>	<u>2726</u>	.02	.35	.08	.79	.01	2.41	1.40	1.35			.55
11	-4,610	1.90	1.82	1.20	.91	.85	<u>2304</u>	.04	.28	<u>2306</u>	.95	.20	2.42	1.37	1.60			.04
12	-3,034	2.19	2.08	1.54	1.17	1.10	.27	<u>2646</u>	.41	<u>388</u>	1.15	.18	2.63	1.51	1.62			-.05
13	-1,399	3.03	.98	.39	.86	1.26	<u>1399</u>	<u>1.22</u>	.39	1.18	.42	.19	.47	.39	3.38			.38
14	9,042																	
15	-2,712	2.79	2.76	1.77	1.53	1.48	.15	.14	.11	<u>2712</u>	.80	.16	2.09	.98	1.51			-.24
16	2,646																	
17	-22,577	3.16	2.54	.71	1.03	1.34	<u>242</u>	.77	<u>5897</u>	.38	<u>4371</u>	<u>7513</u>	<u>1881</u>	<u>2673</u>	1.08			.45
18	-1,869	2.99	2.79	1.46	1.38	1.54	<u>1869</u>	.38	.16	.14	.69	.43	<u>1.66</u>	<u>1.00</u>	1.52			-.24
19	5,897																	
20	5,406																	
21	4,371																	
22	7,656																	
23	1,881																	
24	2,673																	
25	-456	6.45	7.18	4.59	4.85	4.94	3.10	3.48	2.83	2.01	1.29	<u>143</u>	.12	.21	<u>313</u>			-.02
26	2,666																	
	U _i	.00	.33	.00	.07	.15	-.58	-.62	-.56	-1.41	-.75	-1.72	-1.02	-1.35	-1.43			

*Based on 1960 truck transportation rates. Regions and basing points are identified in Table 1.
Total shipments 523,720,000 pounds.
Total costs \$46,323,521.

Table 9. Regional Price Differences and Optimum Flows of Calves for Slaughter, 26 Regions of the U. S., 1960.*

Deficit Regions	Origins and Quantities of Shipments (10,000 pounds and cents per pound)														V _i
	1	3	6	7	8	14	16	19	20	21	22	23	24	26	
2	.136	6465	.26	.34	.29	.24	.30	.22	2353	.55	.06	.50	.23	.08	.72
4	.94	1.04	.21	.50	.66	1302	.25	.11	.02	.45	.28	.38	.36	.22	.64
5	1.11	1.21	396	1114	.70	193	.28	.13	195	.50	.29	.51	.42	.29	.39
9	1.99	1.53	.76	.43	.54	211	.36	.25	.41	1.07	.55	.96	.71	.57	-.13
10	1.10	1.03	.47	.49	624	2726	.03	.05	.11	.72	.12	.65	.30	.20	.36
11	2.09	1.65	.85	.76	.85	4610	.05	.06	0	1.27	.42	1.01	.64	.53	-.15
12	2.37	1.79	.99	1.08	1.09	.26	2646	.17	388	1.16	.48	1.14	.73	.57	-.23
13	2.06	2.19	1399	1.31	1.55	.60	.94	.66	-.03	.91	.80	.82	.81	.73	-.18
15	2.46	1.96	1.28	1.41	1.61	.28	.28	2712	.11	.88	.74	1.41	.90	1.03	-.56
17	1.94	1.55	.05	.59	1.26	.11	.42	1316	2470	4371	7656	1881	2673	2210	.34
18	2.38	2.15	1.03	1.23	1.55	.01	.40	1869	.24	.69	.70	1.09	.82	.92	-.44
25	3.27	3.35	2.13	2.54	2.82	2.16	2.13	1.76	1.56	1.42	1.00	.89	.69	456	-.52
U _i	0	.23	-.57	-.27	-.04	-.77	-.80	-.90	-1.18	-.82	-1.30	-1.08	-1.22	-1.80	

*Based on 1960 combination truck-rail transportation rate. Regions and basing points are identified in Table 1. Total shipments 523,720,000 pounds. Total cost \$5,699,141.

sequently, in 1960 the surplus of slaughter calves of the Mountain States would have moved into region 17. In addition, Florida and Georgia and Alabama became deficit regions and the only shipments out of the southeast, as determined by the optimum flows, were from region 3 to region 2.

With the changes in the location of the major deficit areas and changes in the relative magnitudes of the deficits, the average cost of moving slaughter calves decreased from \$1.33 per hundred pounds in 1955 to \$1.21 per hundred pounds in 1960 even

though transportation rates had increased approximately 13 percent during this period. In addition, there were considerable changes in equilibrium price differentials.

Only slight modifications occurred in the optimum flow patterns when the alternative rate (truck-rail) for 1960 was used (Table 9 and Figure 6). Due to the lower truck-rail transportation rates on the longer distances, the total transportation cost would have been reduced by \$624,380. In addition, there were slight differences in the magnitude and sign of

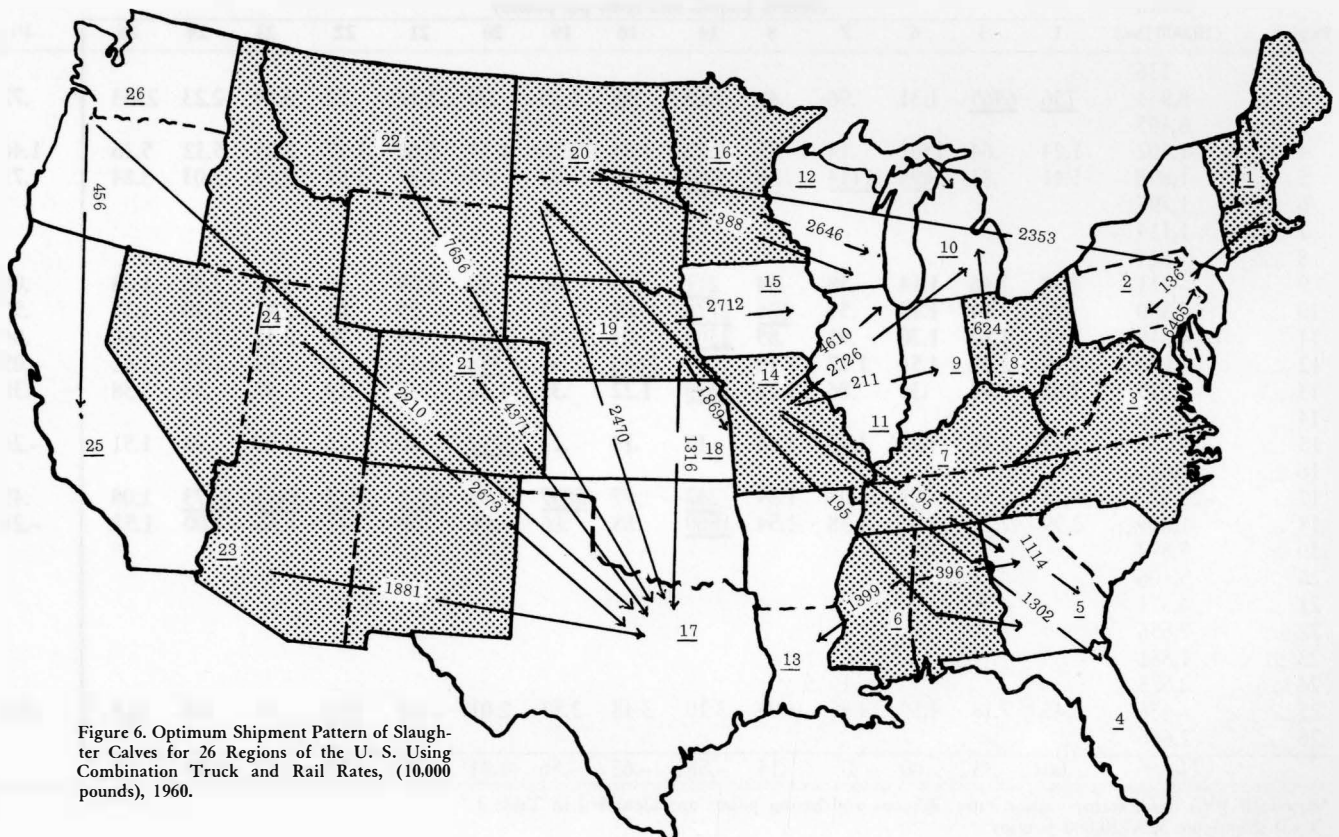


Figure 6. Optimum Shipment Pattern of Slaughter Calves for 26 Regions of the U. S. Using Combination Truck and Rail Rates, (10,000 pounds), 1960.

the price differentials. For example, when the truck rate was used, the equilibrium prices of the western regions (21 to 26) would have ranged from .02 cents to \$1.72 less than region 1. However, when the combination rate was used, the equilibrium prices for these regions ranged from .52 cents to \$1.80 less than that of region 1. Some of the major differences in the optimum flow patterns based on truck rates indicate shipment from region 26 to region 2, whereas, the optimum flows based on truck-rail rates indicate that a major proportion of the Oregon-Washington surplus would have been shipped to region 17 and the remainder to California. Based on truck rates alone, Nebraska would have shipped all of its surplus slaughter calves to region 17. However, the optimum flow patterns based on truck-rail rates show Nebraska shipping to Kansas and Iowa in addition to the Texas and Oklahoma region. Conversely, Missouri would have shipped both east and west in the analysis based on truck rates, while in the alternative analysis, the optimum flows were northeast to other Corn Belt States and to regions in the southeast.

3. Slaughter Hogs

The spatial analyses for slaughter hogs for 1955 and 1960 are presented in Tables 10 and 11 and Figures 7 and 8.

In 1955, an estimated 3.4 billion pounds, or 19.4 percent of commercial slaughter hog production would have been shipped interregionally at a cost of approximately 40.3 million dollars. In 1960, 3.5 billion pounds of slaughter hogs, approximately 18.6 percent, were estimated to have been shipped interregionally at a cost of 39.4 million dollars. In 1955, the average cost of shipping slaughter hogs optimally was \$1.18 per hundred. In 1960 the average cost decreased to approximately \$1.14 per hundred, even though rates were about 7 percent higher in 1960 than in 1955.

In 1955 only seven regions were surplus producers of slaughter hogs while in 1960 eight were surplus. Of these regions, Iowa, Illinois, and Indiana accounted for 83 percent of the surplus in 1955 and 86 percent in 1960. One of the important aspects of the surplus of slaughter hogs is the change that occurred between Illinois and Iowa. In 1955 Iowa had a surplus of 1.5 billion pounds while the surplus in Illinois was 710 million pounds. However, in 1960, Iowa's surplus decreased to 929 million pounds while the surplus in Illinois increased to 1.4 billion pounds. This change is in part a result of two factors. The production of slaughter hogs in Illinois increased approximately 400 million pounds between 1955 and 1960. Also, as was the situation with cattle slaughtering, hog slaughter decreased by 340 million pounds in Illinois and increased over 500 million pounds in Iowa.

The optimum directional flows for 1955 and 1960 in Figures 7 and 8 are quite similar. This is primarily the result of the stability in the surplus and deficit regions between the two years. One of the major changes indicated by the optimum flows was that in 1955 region 15 (Iowa) showed shipments both east and west, whereas in 1960 there were no shipments eastward. This change in the shipping patterns of Iowa was a consequence of the smaller surplus in this region and the increased surplus of Illinois. These changes in the relative surpluses of these two regions (15 and 11) also had an effect on the shipment pattern of Missouri. In 1955 Missouri would have shipped mostly to the Southeastern States (regions 3, 5 and 7) and to Texas and Oklahoma. However, in 1960 Missouri would have shipped to the West Coast, Texas and Oklahoma and only to the Kentucky-Tennessee region of the Southeastern States.

Although the surplus of slaughter hogs in Indiana decreased slightly from 1955 to 1960, the number of regions receiving the surplus production of Indiana under an optimum flow pattern increased. In 1955 Indiana would have shipped only to region 2, but in 1960 the spatial analysis indicated flows to region 3, 7, and 8 in addition to region 2.

The least-cost flows for slaughter hogs for 1960 based on the combination truck-rail transportation rates are presented in Table 12 and Figure 9. A considerable divergence exists between the optimum flows based on the combination rate as compared to those based on truck rates only. With the combination rate, both Illinois and Iowa would ship both east and west, while with truck rates Illinois would ship east and Iowa would ship west. Consequently, when the combination rates are considered instead of truck rates, the deficit regions in the East would receive slaughter hogs from regions located further west while western deficit regions would receive slaughter hogs from regions located farther east. This change is due to lower transportation cost for longer length of shipments when rail transport rates are used.

The estimated minimum cost for the truck-rail combination in terms of total cost was 39.5 million dollars which is slightly higher than that incurred when truck rates were used. The average cost increased only \$0.004 per hundred, from \$1.136 to \$1.14 per hundred.

As was the situation with slaughter cattle, considerable cross-hauling occurred in the actual movements of slaughter hogs in 1960 when compared to the optimum flows in this analysis. For Minnesota and Iowa, the available data, though incomplete, indicated that approximately 1.7 million pounds of slaughter hogs were moved in excess of the movement estimated by the optimum solution. In these

Table 10. Regional Price Differences, Surpluses and Deficits, and Optimum Flows of Hogs for Slaughter, 26 Regions of the U. S., 1955.*

Region	Surplus or Deficit (100,000 lbs.)	Origins and Quantities of Shipments (100,000 pounds and cents per pound)								V _i
		6	9	11	13	14	15	20		
1	-1,745	.49	.09	<u>1745</u>	.60	.23	.13	1.27	.00	
2	-12,524	.47	<u>6770</u>	<u>5358</u>	.60	.05	<u>396</u>	1.20	-.21	
3	-1,537	<u>1137</u>	.06	.12	.03	<u>400</u>	.04	1.11	-.16	
4	-366	.10	.53	.57	<u>366</u>	.26	.45	1.78	-.22	
5	-379	.09	.39	.47	.22	<u>379</u>	.20	1.54	-.59	
6	1,137									
7	-742	.46	.38	.52	.53	<u>742</u>	.14	1.52	-.94	
8	-374	.86	.04	.12	.90	<u>374</u>		1.28	-.85	
9	6,770									
10	-1,355	1.03	.23	.09	1.06	.20	<u>1355</u>	1.17	-.88	
11	7,103									
12	-451	1.31	.57	.15	1.30	.30	<u>451</u>	1.03	-1.23	
13	491									
14	2,728									
15	14,681									
16	-836	1.68	.99	.60	1.60	.32	<u>836</u>	.72	-1.32	
17	-2,413	.55	.78	.69	<u>125</u>	<u>1207</u>	<u>1081</u>	1.01	-.68	
18	-3,352	1.16	.87	.77	1.01	.06	<u>3352</u>	1.05	-1.36	
19	-199	1.49	1.17	.79	1.37	.38	<u>199</u>	.97	-1.38	
20	1,327									
21	-1,138	1.40	.88	.72	.75	.18	<u>1138</u>	.49	-.74	
22	-120	1.92	1.10	.79	.95	.50	<u>120</u>	<u>120</u>	-.52	
23	-288	1.08	.81	.72	.21	.13	<u>288</u>	.49	.03	
24	-519	1.65	.99	.77	.64	.28	<u>519</u>	.36	-.33	
25	-4,166	.65	.81	.73	.25	.04	<u>4166</u>	.31	.42	
26	-1,733	2.15	.99	.77	.80	.30	<u>526</u>	<u>1207</u>	.33	
U_i		-1.21	-1.23	-1.36	-1.44	-1.65	-1.79	-1.28		

*Based on 1955 truck transportation rates. Regions and basing points are identified in Table 1.
 Total shipments 3,423,700,000 pounds.
 Total costs \$40,282,900.

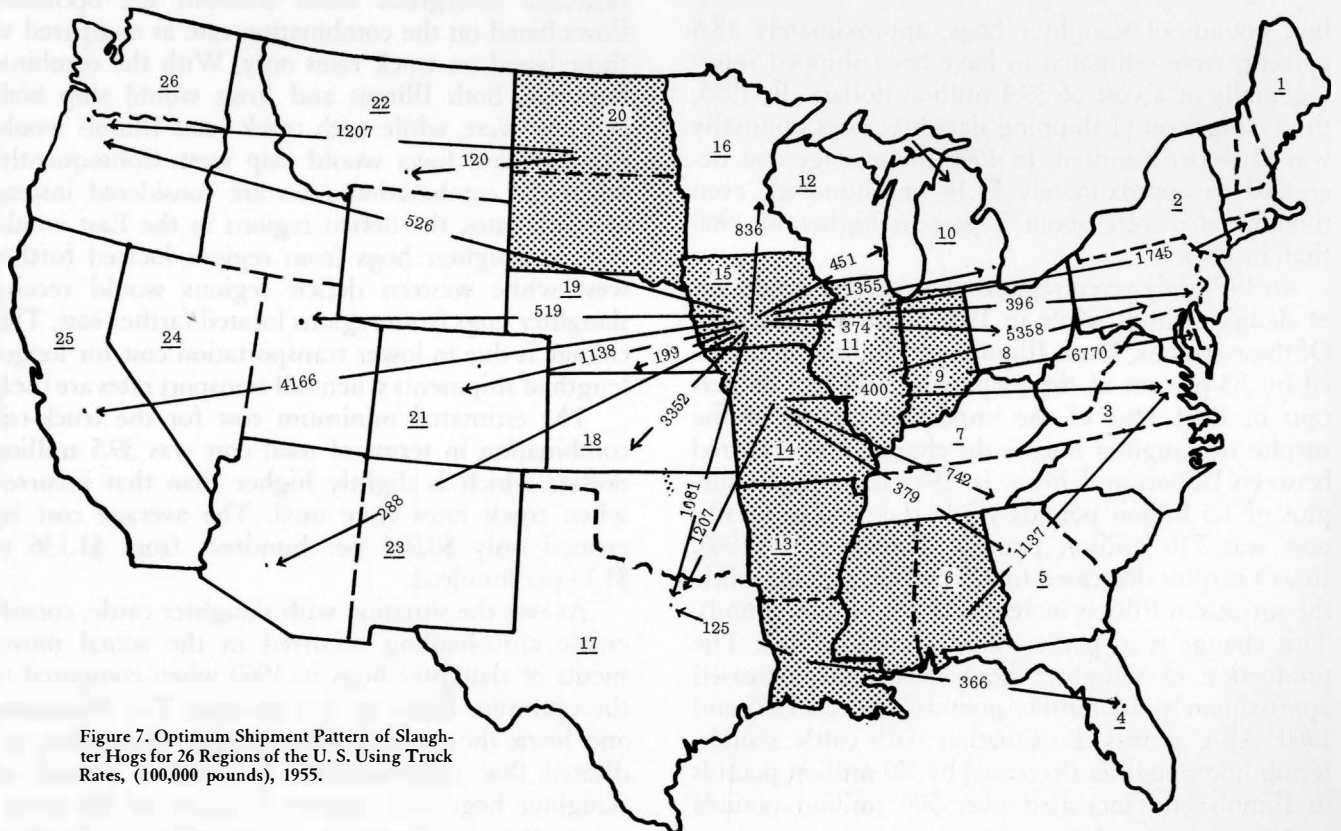


Figure 7. Optimum Shipment Pattern of Slaughter Hogs for 26 Regions of the U. S. Using Truck Rates, (100,000 pounds), 1955.

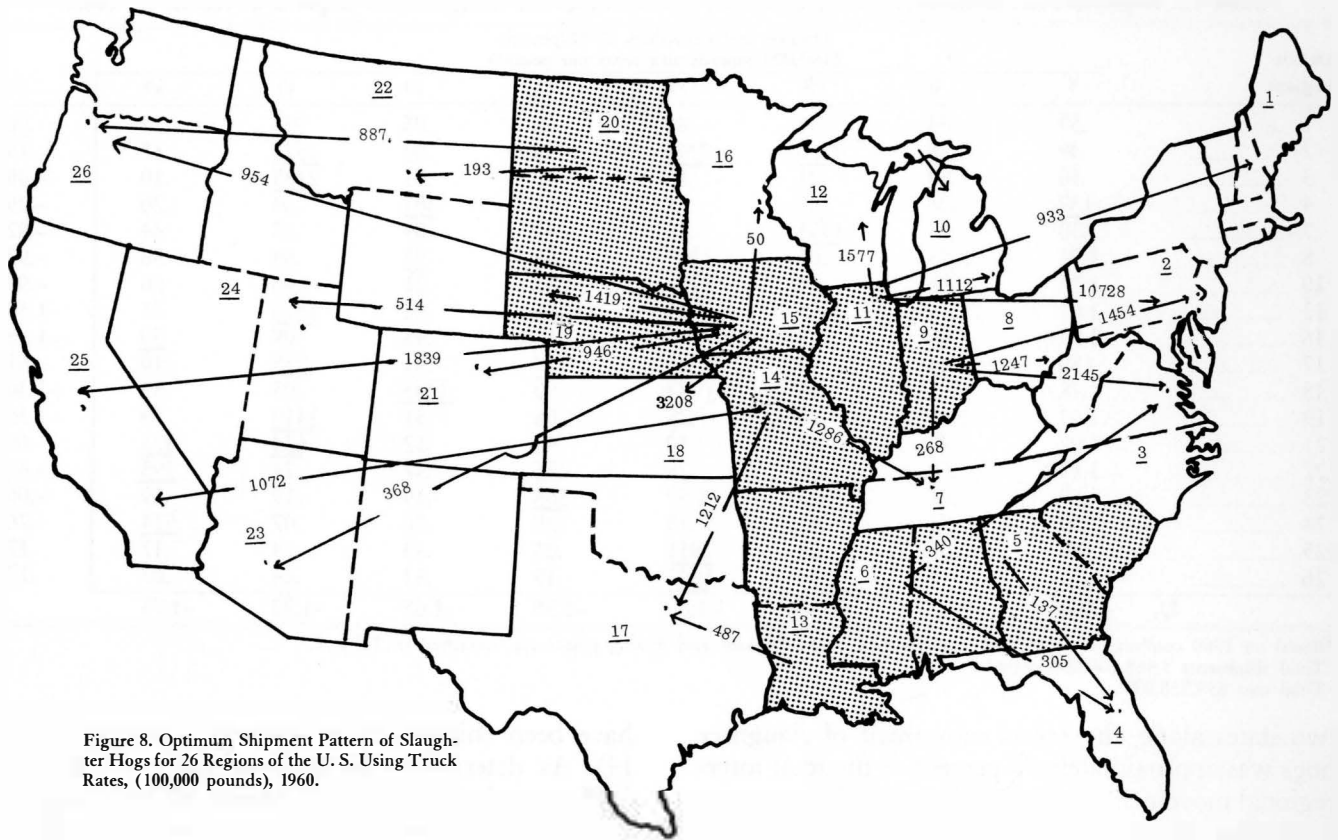


Figure 8. Optimum Shipment Pattern of Slaughter Hogs for 26 Regions of the U. S. Using Truck Rates, (100,000 pounds), 1960.

Table 11. Regional Price Differences, Surpluses and Deficits, Optimum Flows of Hogs for Slaughter, 26 Regions of the U. S., 1960.*

Region	Surplus or Deficit (100,000 lbs.)	Origins and Quantities of Shipments (100,000 pounds and cents per pound)								V_i
		5	6	9	11	13	14	15	20	
1	-933	.43	.35	.09	<u>933</u>	.85	.70	.64	1.85	.00
2	-12,182	.38	.35	<u>1454</u>	<u>10728</u>	.87	.49	.48	1.77	-.23
3	-2,485	.11	<u>340</u>	<u>2145</u>	.04	.45	.39	.47	1.76	-.20
4	-442	<u>137</u>	<u>305</u>	.35	.38	.31	.56	.80	2.19	-.15
5	137									
6	645									
7	-1,554	.23	.11	<u>268</u>	.12	.60	<u>1286</u>	.20	1.64	-.65
8	-1,247	.82	.74	<u>1247</u>	.08	1.17	.42	.40	1.77	-.86
9	5,114									
10	-1,112	.94	.85	.15	<u>1112</u>	1.28	.52	.34	1.59	-.84
11	14,350									
12	-1,577	1.34	1.09	.45	<u>1577</u>	1.48	.55	.26	1.35	-1.15
13	487									
14	3,570									
15	9,298									
16	-50	1.67	1.38	.71	.28	1.71	.31	<u>50</u>	.74	-1.01
17	-1,699	.47	.17	.44	.35	<u>487</u>	<u>1212</u>	.05	1.12	-.33
18	-3,208	1.27	.82	.57	.47	1.07	<u>2</u>	<u>3208</u>	1.09	-1.05
19	-1,419	1.63	1.18	.91	.49	1.47	.38	<u>1419</u>	1.01	-1.08
20	1,083									
21	-946	1.20	1.07	.61	.44	.79	.15	<u>946</u>	.49	-.38
22	-193	1.45	1.61	.76	.43	.99	.49	.16	<u>193</u>	-.13
23	-368	.72	.71	.46	.36	.20	.10	<u>368</u>	.49	.46
24	-514	1.21	1.33	.65	.41	.66	.26	<u>514</u>	.34	.07
25	-2,911	.84	.25	.45	.37	.24	<u>1072</u>	<u>1839</u>	.30	.88
26	-1,841	1.11	1.86	.64	.40	.82	.28	<u>954</u>	<u>887</u>	.79
U_i		-1.13	-1.32	-1.31	-1.45	-1.15	-1.41	-1.52	-1.01	

*Based on 1960 truck transportation rates. Regions and basing points are identified in Table 1.
 Total shipments 3,468,100,000.
 Total costs \$39,405,920.

Table 12. Regional Price Differences and Optimum Flows of Hogs for Slaughter, 26 Regions of the U. S., 1960.*

Deficit Regions	Origins and Quantities of Shipments (100,000 pounds and cents per pound)								V _i
	5	6	9	11	13	14	15	20	
1	.54	.33	.40	.31	.43	.05	933	.17	.00
2	.49	.28	3560	7296	.38	.02	1326	.17	-.19
3	.50	.30	.21	.10	.42	.01	2485	.10	-.40
4	137	.06	.38	.31	.11	305	.04	.20	-.39
7	.30	.03	1554	.10	.41	.09	.17	.34	-.82
8	1.04	.73	.01	1190	.83	.57	.04	.56	-.92
10	1.24	.91	.24	1112	1.01	.21	.06	.60	-.99
12	1.61	1.14	.54	.05	1.24	.22	1577	.25	-1.30
16	1.59	1.08	.68	.17	1.12	.43	.09	50	-1.28
17	.80	645	.47	.30	119	.01	935	.10	-.61
18	1.48	.88	.53	.34	.90	3208	.05	.53	-1.30
19	1.63	1.06	.76	.35	1.08	.51	1419	.19	-1.36
21	1.07	.46	.74	.50	.43	.12	623	323	-.60
22	1.13	.60	.60	.28	.56	.47	.24	193	-.49
23	.69	.01	.29	1.59	368	.19	.19	.19	-.06
24	.92	.31	.41	.15	.29	.26	.07	514	-.26
25	.70	.06	.26	2911	.05	.43	.24	.17	.17
26	.75	.17	.26	1841	.15	.43	.24	.07	.17
U _i	-1.02	-1.52	-1.38	-1.60	-1.55	-1.65	-1.72	-1.75	

*Based on 1960 combination truck-rail transportation rates. Regions and basing points are identified in Table 1. Total shipments 3,468,100,000 pounds. Total cost \$39,538,094.

two states alone, the excess movement of slaughter hogs was approximately 50 percent of the total inter-regional movement in the optimum solution.

4. Slaughter Sheep and Lambs

For both 1955 and 1960 approximately 29 percent of the sheep and lambs slaughtered was estimated to

have been shipped interregionally (Tables 13 and 14). As determined by the optimum solution for 1955, a total of 450 million pounds of live slaughter sheep and lambs were shipped at a cost of 7.8 million dollars. Average shipment costs were approximately \$1.73 per hundred pounds. In 1960, 436 million

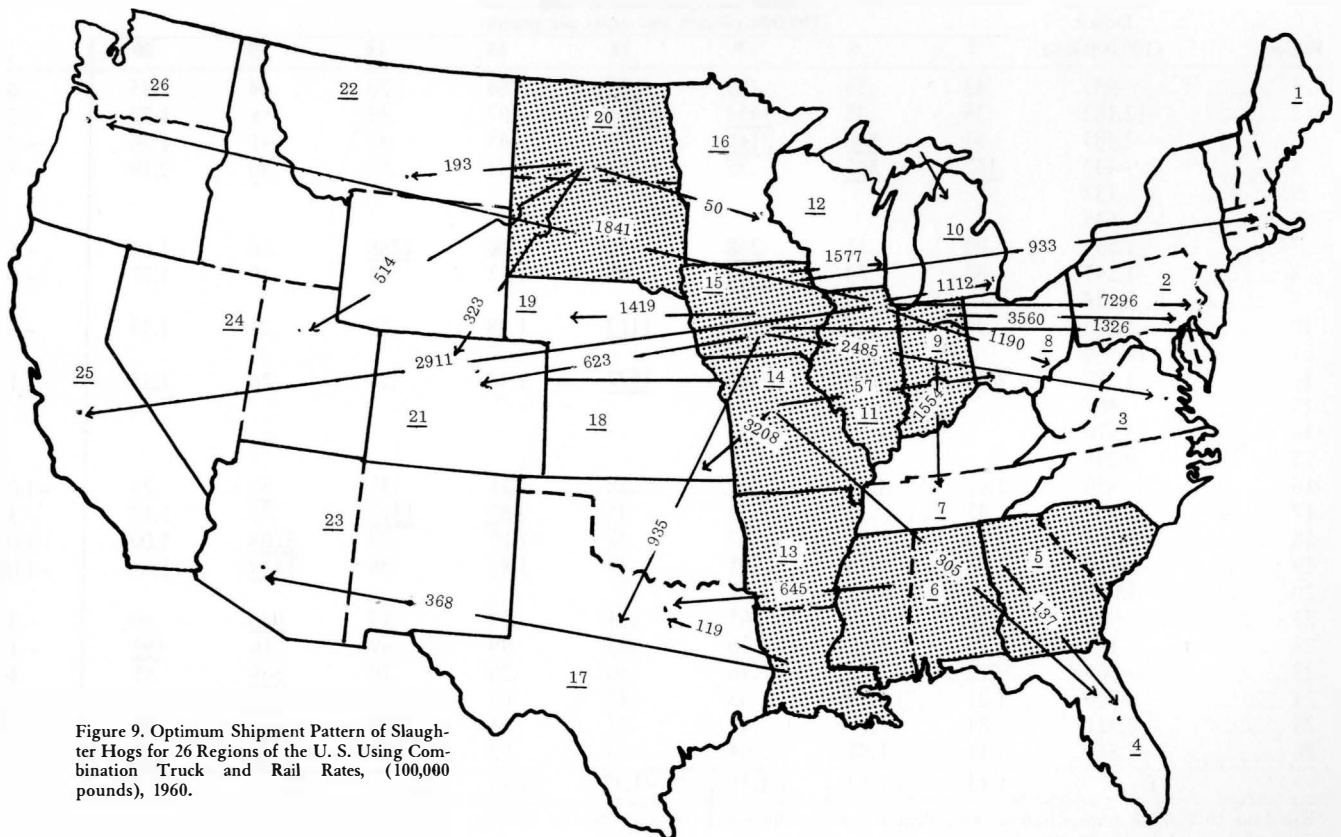


Figure 9. Optimum Shipment Pattern of Slaughter Hogs for 26 Regions of the U. S. Using Combination Truck and Rail Rates, (100,000 pounds), 1960.

Table 13. Regional Price Differences, Surpluses and Deficits, and Optimum Flows of Sheep and Lambs for Slaughter, 26 Regions of the U. S., 1955.*

Region	Surplus or Deficit (1,000 lbs.)	Origins and Quantities of Shipments (1,000 pounds and cents per pound)																		V _i
		3	4	5	6	7	8	9	12	13	15	17	18	20	21	22	23	24	26	
1	-26,824	.28	.35	.34	.37	.34	.18	.24	.33	.41	.48	.50	.40	.50	.10	<u>4083</u>	<u>22741</u>	.62	1.12	.66
2	-226,500	<u>20363</u>	<u>100</u>	<u>1122</u>	<u>4630</u>	<u>20708</u>	<u>37344</u>	<u>21111</u>	.16	.03	.23	.24	.09	.32	<u>41820</u>	<u>63893</u>	1.18	.36	<u>15409</u>	.44
3	20,363																			
4	100																			
5	1,122																			
6	4,630																			
7	20,708																			
8	37,344																			
9	21,111																			
10	-57,423	1.23	.83	.53	.32	.10	.05	.03	<u>4315</u>	.20	<u>410</u>	.21	<u>4037</u>	<u>20348</u>	.19	<u>28313</u>	1.07	.07	1.72	-.19
11	-20,734	2.08	1.34	1.04	.44	.49	.87	.38	<u>.04</u>	<u>1677</u>	<u>.13</u>	<u>18316</u>	.11	<u>741</u>	.40	<u>.23</u>	1.13	.09	2.00	-.71
12	4,315																			
13	4,115																			
14	-2,438	2.83	1.71	1.38	.55	.86	1.51	.95	.93	<u>2438</u>	.47	.02	.08	.55	.79	.69	.90	.08	2.23	-1.15
15	410																			
16	-17,507	3.35	2.57	2.24	1.63	1.66	1.86	1.39	.82	1.20	.59	.80	.54	<u>17508</u>	.73	.21	1.32	.17	1.79	-1.24
17	18,316																			
18	4,037																			
19	-15,861	3.96	2.68	2.52	1.75	2.02	2.44	1.97	1.55	.84	.93	.51	.71	.68	.69	.60	1.02	<u>15861</u>	2.43	-1.66
20	38,597																			
21	41,820																			
22	96,289																			
23	26,818																			
24	94,215																			
25	-82,431	7.80	7.26	5.63	4.44	4.98	5.71	5.08	5.02	1.96	4.01	1.64	3.45	2.84	1.76	1.01	<u>4077</u>	<u>78354</u>	1.51	-1.81
26	15,409																			
U _i		.00	-1.42	-.92	-1.38	-1.01	-.50	-.76	-.92	-1.99	-1.10	-2.01	-1.36	-1.98	-1.84	-2.29	-2.79	-3.16	-1.54	

*Based on 1955 truck transportation rates. Regions and basing points are identified in Table 1.
 Total shipments 449,719,000 pounds.
 Total costs \$7,799,437.

23

Table 14. Regional Price Differences, Surpluses and Deficits, and Optimum Flows of Sheep and Lambs for Slaughter, 26 Regions of the U. S., 1960.*

Region	Surplus or Deficit (1,000 lbs.)	Origins and Quantities of Shipments (1,000 pounds and cents per pound)																V _i	
		3	4	5	6	7	8	9	11	13	15	17	18	20	22	23	24		26
1	-22,692	.32	.39	.39	.41	.39	.21	.28	.14	.43	.32	.53	.36	.34	<u>22692</u>	1.12	1.78	1.21	.73
2	-196,940	<u>12356</u>	<u>169</u>	<u>1305</u>	<u>3806</u>	<u>18639</u>	<u>42988</u>	<u>12561</u>	<u>16082</u>	<u>2539</u>	.02	.22	<u>24997</u>	.13	<u>60701</u>	2.40	1.50	<u>797</u>	.49
3	12,356																		
4	169																		
5	1,305																		
6	3,806																		
7	18,639																		
8	42,988																		
9	12,561																		
10	-51,322	1.62	1.17	.84	.60	.36	.30	.28	.04	.44	<u>12829</u>	.42	.13	<u>38493</u>	.27	2.55	1.45	2.13	-46
11	16,082																		
12	-4,256	2.84	2.05	1.71	1.09	1.07	1.48	.95	.35	.88	.25	.79	.44	<u>4256</u>	.52	2.85	1.64	2.48	-1.14
13	2,539																		
14	-4,117	3.23	2.00	1.61	.67	1.02	1.74	1.11	.27	.03	.31	0	<u>4117</u>	.42	.92	2.30	1.37	2.62	-1.32
15	12,829																		
16	-17,632	4.05	3.19	2.81	2.12	2.15	2.35	1.82	1.27	1.61	.66	1.13	.74	<u>17632</u>	.59	2.99	1.69	2.34	-1.64
17	1,417																		
18	29,114																		
19	-22,374	3.96	2.54	2.35	1.47	1.78	2.24	1.71	1.15	.42	.27	<u>1417</u>	.16	<u>20957</u>	.26	1.88	.72	2.29	-1.34
20	81,948																		
21	-4,212	4.88	3.67	3.31	2.30	2.66	2.93	2.43	2.05	.68	1.19	.23	.92	<u>610</u>	<u>3602</u>	1.05	.17	1.63	-1.38
22	103,105																		
23	18,827																		
24	77,526																		
25	-112,463	7.60	7.02	5.15	3.80	4.41	4.98	4.29	4.11	.96	3.00	.50	2.50	1.67	<u>16110</u>	<u>18827</u>	<u>77526</u>	.52	-77
26	797																		
U_i		0	-1.50	-1.02	-1.54	-1.12	-.56	-.85	-1.07	-2.25	-1.50	-2.35	-1.66	-2.50	-2.47	-1.89	-2.31	-1.66	

*Based on 1960 truck transportation rates. Regions and basing points are identified in Table 1.
 Total shipments 436,008,000 pounds.
 Total costs \$7,603,035.

24

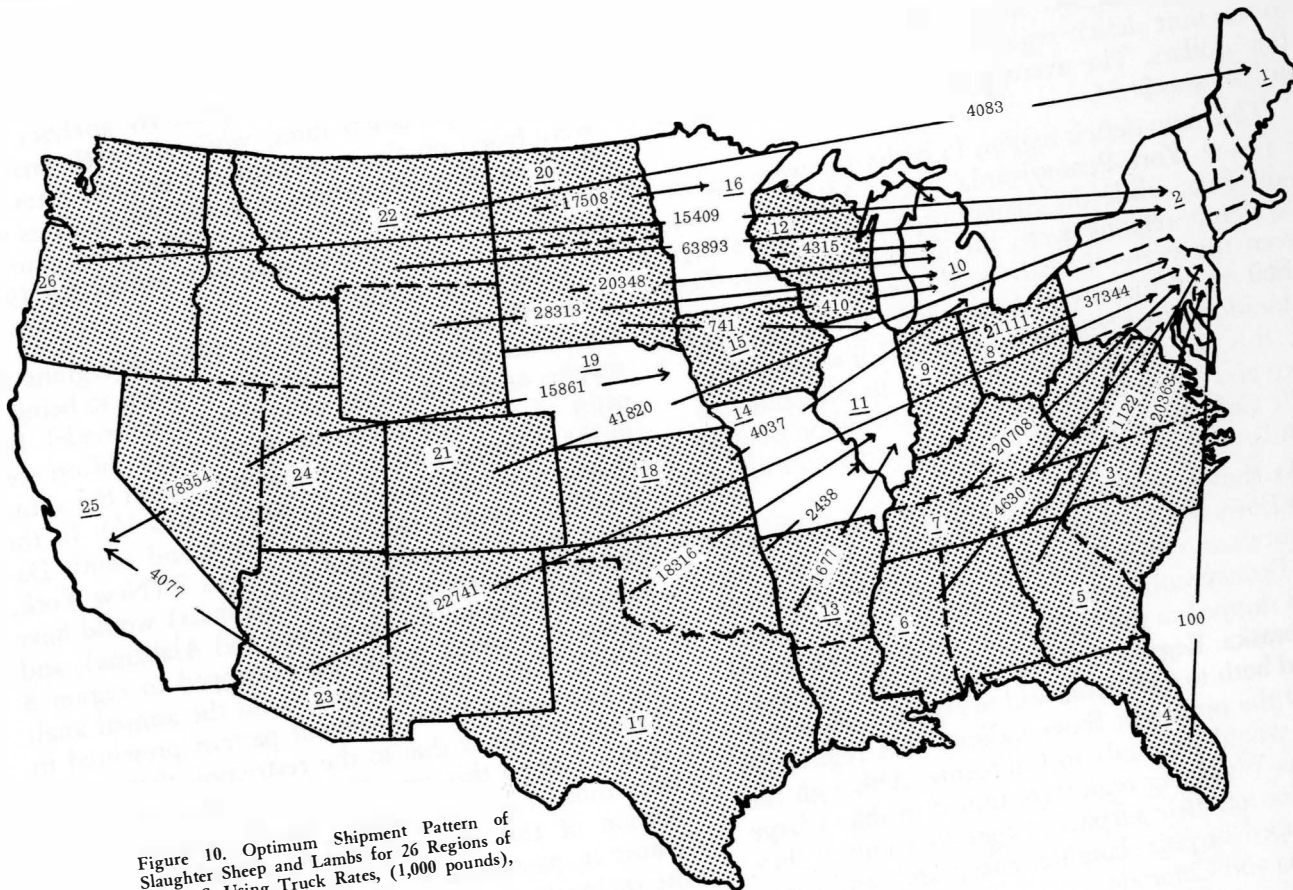


Figure 10. Optimum Shipment Pattern of Slaughter Sheep and Lambs for 26 Regions of the U. S. Using Truck Rates, (1,000 pounds), 1955.

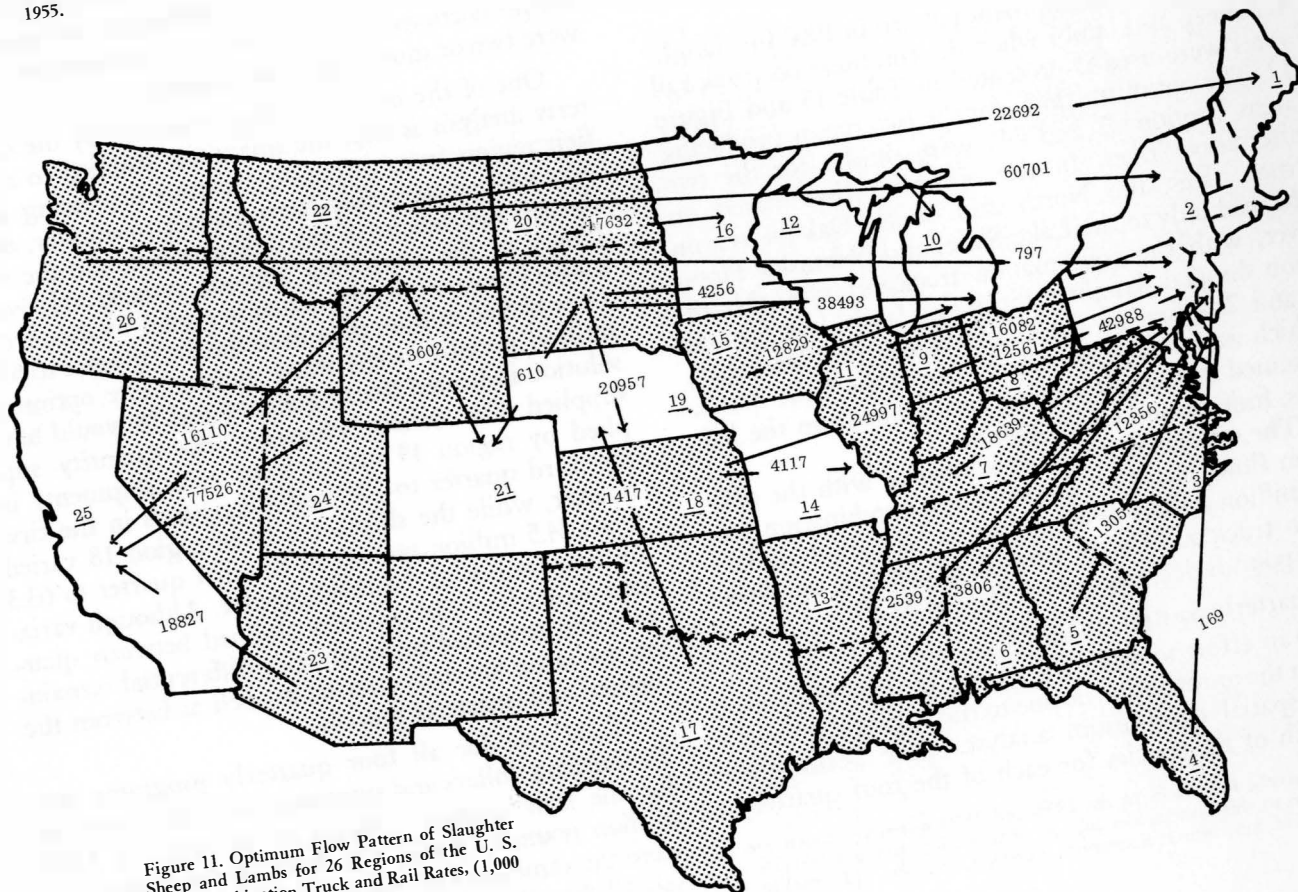


Figure 11. Optimum Flow Pattern of Slaughter Sheep and Lambs for 26 Regions of the U. S. Using Combination Truck and Rail Rates, (1,000 pounds), 1960.

pounds of slaughter sheep and lambs were shipped to the nine deficit regions at a total cost of 7.6 million dollars. The average cost per hundred pounds in 1960 was \$1.74.

The main deficit regions in both years were region 2 (New York-Pennsylvania, etc.), Michigan, and California, while the major surplus slaughter sheep and lamb regions were the Mountain States. Between the years of analysis, Illinois shifted from a deficit to a surplus region, while Wisconsin and Colorado shifted from surplus to deficit regions. During this period, Illinois decreased its slaughter of sheep and lambs by approximately 35 million pounds while Colorado increased its slaughter by 66 million pounds.

As shown in Figures 10 and 11, the 1955 optimum flows from the Montana-Wyoming region were all eastward (Michigan, New England, and New York-Pennsylvania, etc). The Nevada, Utah, Idaho region shipped to the California region and eastward to Nebraska. Region 23 (Arizona and New Mexico) shipped both to California and to region 2. However, in 1960 the optimum flows indicate that regions 23 and 24 would ship only to California. Although the Montana-Wyoming region continued to ship a large proportion of their surplus to regions 1 and 2, they also shipped surplus slaughter sheep and lambs into California and Colorado.

The optimum shipment pattern in 1960 for slaughter sheep and lambs when the combination truck-rail rates were used is presented in Table 15 and Figure 12. The optimum flows for the two major producing areas (region 22 and 24) were similar for the two alternative rates. In the optimum flow based on truck rates, the North and South Dakota region shipped only to the Lake States and Nebraska. However, with the combination truck-rail rate, this region shipped slaughter sheep and lambs into regions 1 and 2. Based on the combination rate, Michigan, which was the largest deficit state of the Lake States, obtained its slaughter sheep and lambs from the Illinois, Indiana and Ohio regions.

The estimated total cost associated with the optimum flows based on the truck-rail combination was 6.0 million dollars as compared to 7.6 million dollars when truck rates were used. Average cost per hundred pounds decreased from \$1.74 to \$1.38.

B. Quarterly Spatial Analyses¹¹

In an effort to assess the degree of distortion present in the annual models due to the aggregation over time, spatial equilibrium analyses were performed for each of the species for each of the four quarters

of 1955 and 1960. The 1955 quarterly analyses used truck transportation rates, while the 1960 analyses were based on the combination truck-rail rates. To facilitate the presentation, only the 1960 analyses will be discussed except when major differences occurred between the annual and quarterly results for 1955.

1. Slaughter Cattle

In the quarterly models for 1960, all regions retained the same classification with regard to being a surplus or deficit region as in the annual model. Because of the magnitudes involved, slight differences in the shipping patterns occurred between the annual and quarterly models (Tables 6 and 16). In the quarterly models region 20 (North and South Dakota) would have shipped to region 2 (New York, Pennsylvania, etc.). Region 18 (Kansas) would have shipped to region 6 (Mississippi and Alabama), and region 15 (Iowa) would have shipped to region 8 (Ohio). Under no conditions could the annual analysis have yielded the shipment pattern presented in Table 16. This is due to the restriction that only $n + m - 1$ or in this case 25 activities may enter in a minimum shipment pattern. In addition to the inclusion of the three additional shipment patterns (those in parenthesis) that would have occurred in the quarterly models, small differences occurred in the proportions shipped to deficit regions when there were two or more supplying regions.

One of the major findings provided by the quarterly analysis is that the quantities shipped to a deficit region from any given surplus producing area may vary considerably from quarter to quarter, even though the deficits of the deficit region and the surpluses of the supplying regions remain relatively stable. For example, the deficit in region 5 varied from a low of 53.6 million pounds in the first quarter to 63.3 million pounds in the third quarter. The optimum solution indicated that regions 14 and 18 would have supplied this deficit. However, the quantity supplied by region 14 varied from zero shipments in the third quarter to 19.0 million pounds in the first quarter, while the shipments from region 18 varied from 34.5 million pounds in the first quarter to 63.3 million pounds in the third quarter. Although variation existed in the quantity shipped between quarters, the estimated regional price differential remained the same for each quarter, as well as between the annual and quarterly models.

Total cost for all four quarterly programs was 57.1 million dollars and summing the total shipments for the four quarters yielded an estimate of 4,552 million pounds (Table 17). Both of these estimates were the same as those obtained for the annual analysis (Table 6). In general, there is a consistency between the quarterly and annual estimates in regard

¹¹Tables giving the results of the 1955 and 1960 quarterly models are not given in this bulletin but may be obtained by writing to the Department of Agricultural Economics, Purdue University, Lafayette, Indiana.

Table 15. Regional Price Differences and Optimum Flows of Sheep and Lambs for Slaughter, 26 Regions of the U. S., 1960.*

Deficit Regions	Origins and Quantities of Shipments (1,000 pounds and cents per pound)																	V _i
	3	4	5	6	7	8	9	11	13	15	17	18	20	22	23	24	26	
150	.09	.09	.08	.09	.32	.41	.51	.09	.09	.06	.02	<u>22692</u>	.02	.60	.51	1.07	.00
2	<u>12356</u>	<u>169</u>	<u>1305</u>	<u>3806</u>	<u>18639</u>	<u>20309</u>	.02	.26	<u>2539</u>	.09	<u>1417</u>	<u>11196</u>	<u>41624</u>	<u>83580</u>	.56	.49	1.04	-1.13
10	1.32	3.03	.62	.50	.45	<u>22679</u>	<u>12561</u>	<u>16082</u>	.50	.01	.87	.19	.40	.36	.99	.85	1.43	-0.78
12	1.91	1.23	1.08	.85	.87	.92	.41	.05	.85	<u>4256</u>	.98	.24	.12	.55	1.32	1.11	1.65	-1.20
14	2.34	1.50	1.33	1.02	1.07	1.38	.77	.77	.98	.26	.58	<u>4117</u>	.62	1.06	1.57	1.47	2.30	-1.58
16	2.49	1.77	1.63	1.34	1.40	1.66	1.15	.84	1.34	.28	.91	.41	<u>17632</u>	.69	1.80	1.45	2.08	-1.57
19	2.39	1.62	1.47	1.10	1.23	1.62	1.03	.84	1.05	<u>8573</u>	.49	<u>13801</u>	.00	.63	1.40	1.08	1.91	-1.46
21	4.41	1.58	1.46	1.03	1.25	1.83	1.47	1.47	1.22	<u>.49</u>	<u>.10</u>	<u>.31</u>	.30	<u>4212</u>	.59	.35	1.21	-1.16
25	2.40	1.46	4.22	.92	1.26	1.58	1.22	1.17	.81	.88	.14	.79	.61	<u>15313</u>	<u>18827</u>	<u>77526</u>	<u>797</u>	-0.42
U _i	-.62	-1.49	-1.41	-1.68	-1.45	-1.18	-1.45	-1.43	-1.79	-1.81	-2.22	-1.92	-2.03	-2.20	-1.87	-1.81	-1.69	

*Based on 1960 combination truck-rail transportation rate. Regions and basing points are identified in Table 1.
Total shipments 436,008,000 pounds.
Total cost \$6,029,356.

Table 17. Quantity and Cost of Optimum Shipments of Cattle for Slaughter, Quarterly and Annual, for Truck-Rail Transport Centers, 26 Regions of the U. S., 1960.

Time Period	Quantity Shipped (Million lbs.)	(Percent)	Total Cost \$1,000	Average Cost per 100 Pounds
Jan. - March	1,110	24	13,954	1.26
Apr. - June	1,107	24	13,790	1.24
July - Sept.	1,188	26	14,930	1.25
Oct. - Dec.	1,146	26	14,391	1.26
Total Quarterly	4,552		57,065	1.25
Annual	4,552		57,065	1.25

Table 16. Summation of Optimum Quarterly Shipments of Slaughter Cattle, 26 Regions of the U. S., 1960.*

Receiving Regions	Shipping Regions (10,000 pounds)												
	3	9	11	14	15	16	17	18	19	20	21	22	23
1					3,738					1,990			
2	16,226				66,783			38,070		(653)			
4								13,800					
5				4,050				19,554					
6							15,073	(55)					
7								9,988					
8		9,535	35,291	12,524	(283)								
10			32,327										
12					41,394	12,855							
13							5,349						
24											7,196		
25							5,805		945	6,111	6,522		46,702
26										13,874		28,136	

*Based on 1960 combination truck-rail transportation rates. Regions and basing points are identified in Table 1.

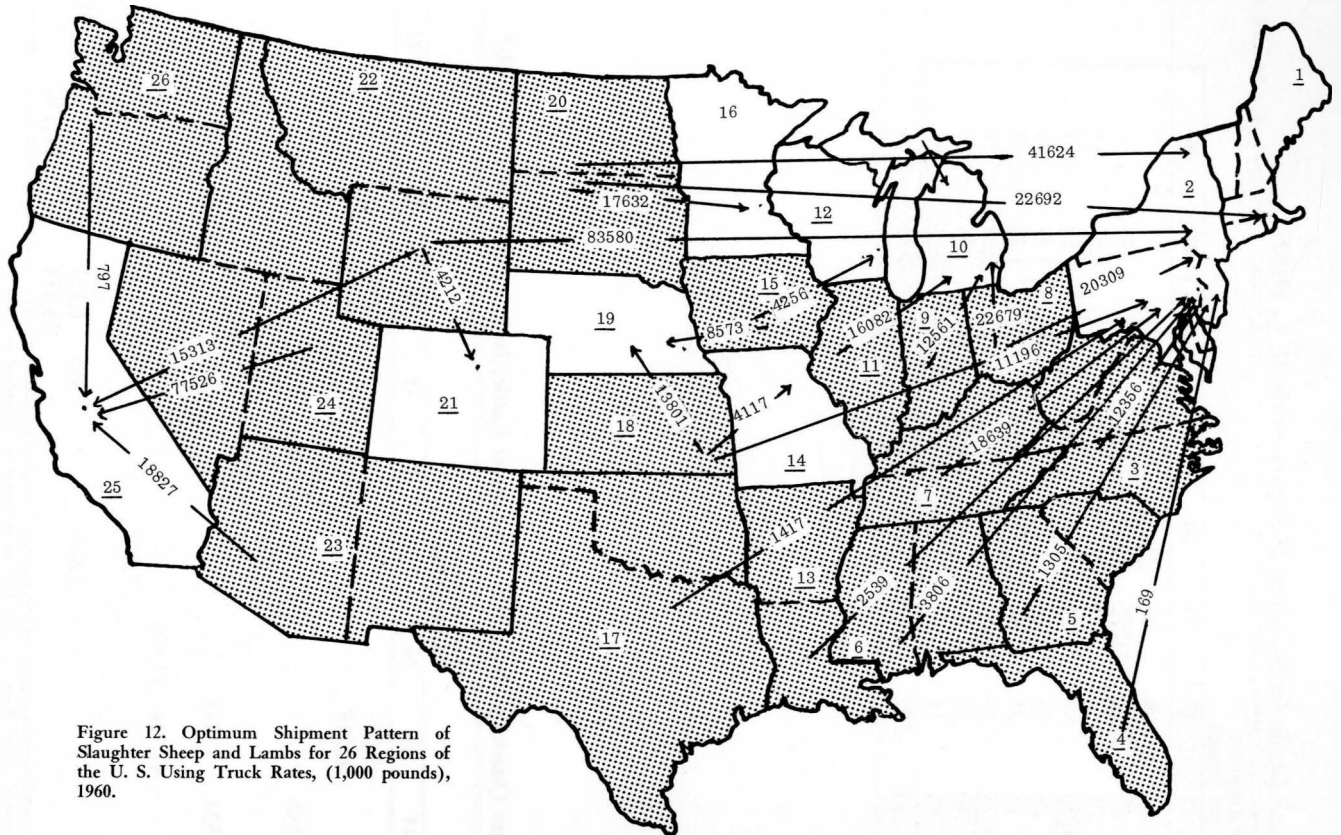


Figure 12. Optimum Shipment Pattern of Slaughter Sheep and Lambs for 26 Regions of the U. S. Using Truck Rates, (1,000 pounds), 1960.

to the magnitudes of total shipments and cost. While quarterly models provide some additional information about the variability of shipments from any given region during the four quarters and include additional shipping routes, the alternative analysis suggests that for live cattle, minimum-cost flows based on the aggregative annual model differ only slightly from those based on the quarterly models.

Except for the inclusion of three additional shipping routes, the results of the 1955 quarterly analyses were approximately the same as those of the annual

solution, with respect to quantities shipped and total cost of shipments (Table 4).

2. Slaughter Calves

A summation of the four quarterly shipments for 1960 is presented in Table 18. Except for region 1, which was a deficit region in the second quarter, the classification of regions remained the same in the first, third and fourth quarters as in the annual model. However, because of the magnitudes involved, slight differences occurred in the shipping patterns between the annual and quarterly models. The major

Table 18. Summation of Optimum Quarterly Shipments of Slaughter Calves, 26 Regions of the U. S., 1960.*

Receiving Regions	Shipping Regions (1,000 pounds)														
	1	3	6	7	8	14	16	19	20	21	22	23	24	26	
1									(88)						
2	1,536	64,366							23,386						
4						10,411			(2,506)						
5			3,813	11,131		1,183			2,836						
9						2,098									
10					6,253	23,785	(3,472)								
11						46,084									
12							23,116		7,005						
13			13,060						(846)						
15								26,925							
17			(993)					20,052	16,599	43,748	76,413	18,783	26,796	22,360	
18						(7,028)		11,620							
25														4,365	

*Based on 1960 combination truck-rail transportation rates. Regions and basing points are identified in Table 1.

difference was that six more additional flows were included in the quarterly models than were in the annual model: region 20 (North and South Dakota) shipped to regions 1, 4 and 13 (New England, Florida, Arkansas and Louisiana); region 6 (Mississippi and Alabama) shipped to region 17 (Texas and Oklahoma); region 14 (Missouri) shipped to region 18 (Kansas); and region 16 (Minnesota) shipped to region 10 (Michigan). Due to the restriction on the number of activities that can enter in the programming analysis, the shipping patterns as shown in Table 18 would not have been possible in the annual model. As a result of the additional flows and the varying magnitudes of the surpluses and deficits between quarters, there were slight variations in the quantities shipped to the alternative deficit regions.

The price differentials between the alternative regions were the same for the first, third, and fourth quarters as for the annual model. However, in the second quarter with the base region (region 1) changing from a surplus to a deficit area, the alternative price differentials all became negative with respect to the base region. In general, most of the price differentials decreased by approximately 80-85 cents in comparison with the base region.

As shown in Table 19, the average cost of \$1.09 per hundred pounds was the same as that of the annual model. However, the average cost per hundred pounds did vary from a low of \$1.06 in the first quarter to a high of \$1.12 in the second quarter.

In the 1955 quarterly analyses, the classifications of surplus and deficit regions remained the same as

Table 19. Quantity and Cost of Optimum Shipments of Calves for Slaughter, Quarterly and Annual, for Truck-Rail Transport Costs, 26 Regions of the U. S., 1960.

Time Period	Quantity Shipped (1,000 lbs.)	(Percent)	Total Cost (Dollars)	Average Cost per 100 Pounds (Dollars)
Jan. - March	108,867	21	1,153,564	1.06
Apr. - June	130,372	25	1,461,574	1.12
July - Sept.	143,109	27	1,568,833	1.10
Oct. - Dec.	140,309	27	1,513,974	1.08
Quarterly Total	522,657		5,697,945	1.09
Annual	523,720		5,699,141	1.09

in the annual model. Except for the inclusion of nine additional flows which produced changes in the magnitudes of shipments, the results of the quarterly analyses were quite similar to those of the annual model.

3. Slaughter Hogs

The summation of the four quarterly shipments of live hogs in 1960 is presented in Table 20. Even though hog slaughter and production varied considerably from quarter to quarter, all regions retained the same surplus or deficit classification in the quarterly models as in the annual model. As shown in Tables 12 and 20, no additional flows were included in the quarterly models, nor were there any changes in the patterns derived by the annual model or changes in the quantities shipped between the alternative surplus and deficit regions. In addition, the regional price differentials were approximately the same for all five models.

Total cost for all four quarterly models was 39.5

Table 20. Summation of Optimum Quarterly Shipments of Slaughter Hogs, 26 Regions of the U. S., 1960.*

Receiving Regions	Shipping Regions (10,000 pounds)							
	5	6	9	11	13	14	15	20
1							9,336	
2			35,586	72,928			13,307	
3							24,849	
4	1,379					3,035		
7			15,555					
8				11,900		574		
10				11,125				
12							15,766	
16								487
17		6,444			1,193		9,052	
18						32,082		
19							14,195	
21							6,203	3,256
22								1,927
23					3,683			
24								5,142
25				29,113				
26				18,405				

*Based on 1960 combination truck-rail transportation rate. Regions and basing points are identified in Table 1.

million dollars and summing the total shipments for the four quarters yielded a total of 3,468 million pounds. Both of these estimates were approximately the same as those of the annual estimates. Although the average costs per hundred pounds varied from \$1.12 in the second quarter to \$1.15 in the third and fourth quarters, the average for the four quarters was the same as for the annual model (Table 21). Since the results between the quarterly and annual models were the same, this suggests that the annual model for the hog sector for 1960 affords a satisfactory approximation to quarterly time periods within the year.

Table 21. Quantity and Costs of Optimum Shipments of Hogs for Slaughter, Quarterly and Annual, for Truck-Rail Transport Costs, 1960.

Time Period	Quantity Shipped (1,000 lbs.) (Percent)		Total Cost (Dollars)	Average Cost per 100 Pounds (Dollars)
Jan. - March	953,600	27	10,852,178	1.14
Apr. - June	854,900	25	9,591,199	1.12
July - Sept.	780,400	23	8,954,277	1.15
Oct. - Dec.	879,200	25	10,141,875	1.15
Quarterly Total	3,468,100		39,539,529	1.14
Annual	3,468,100		39,538,094	1.14

Except for one additional flow, region 9 shipping to region 8 in the third quarter, the 1955 quarterly analyses did not reveal any information in addition to that provided by the annual model.

4. Slaughter Sheep and Lambs

The optimum quarterly shipment pattern is presented in Table 22 and is given to facilitate comparisons with the annual shipment pattern for sheep and lambs (Table 15). Except for regions 17 (Texas and Oklahoma), 21 (Colorado), and 26 (Oregon and Washington) the classification of the regions with respect to surplus and deficit remained the same in all four quarters as in the annual model. Regions 17 and 26 were surplus for the year but deficit in the third and fourth quarters while region 21 was deficit for the year but surplus in both the first and second quarters. These changes in classification between the quarters of the year represent an obscurity that would not have been detected in the annual model. As shown in Table 22, 13 more additional shipping activities (those in parenthesis) were included in the quarterly models than were in the annual model. Because one of the requisites for a minimum solution for a given problem is that only $n + m - 1$ shipments occur, the annual analysis could not have yielded the set of flows that appear in Table 22.

The changes in classification from surplus to deficit area between quarters in regions 17, 21, and 26 had considerable effect on the price differentials of these regions as well as those in adjoining regions

Table 22. Summation of Optimum Quarterly Shipments of Slaughter Sheep and Lambs, 26 Regions of the U. S., 1960.*

Receiving Regions	Shipping Regions (1,000 pounds)																	
	3	4	5	6	7	8	9	11	13	15	17	18	20	21	22	23	24	26
1																		
2	12,323	174	1,294	3,882	18,578	21,476			1,957	(557)	4,150	17,010	17,959		(4,719)			
10						21,912	12,735	16,105		3,071			41,294		71,967		(2,677)	
12								(68)					(940)					
14												3,669						
16													18,182					
17									(589)			(1,191)			(527)			
19										9,302		7,704						
21													(4,800)					
25														(2,613)	4,377		(2,021)	
26															17,410	18,583	71,412	1,349
															(525)		(116)	

*Based on 1960 combination truck-rail transportation rates. Regions and basing points are identified in Table 1.

(regions 23, 24, and 25). For example, regions 17 and 26 which were surplus areas for the year were deficit in the third and fourth quarters. The equilibrium prices in these regions were estimated to be \$2.22 and \$1.69 less than that of the base region in the annual model as well as the first and second quarters. However, when these regions became deficit areas in the third and fourth quarters, the equilibrium price in region 17 was only 93 cents less than the base region in the third quarter and 79 cents less in the fourth quarter. For region 26, the equilibrium price changed to 85 and 67 cents less than the base region in the third and fourth quarters respectively.

Total cost for all four quarterly models was 6.08 million dollars and summing the total shipments for the four quarters yielded an estimate of 439 million pounds (Table 23). Both of these estimates were slightly higher than those estimated by the annual

Table 23. Quantity and Cost of Optimum Shipments of Sheep and Lambs for Slaughter, Quarterly and Annual, for Truck-Rail Transport Costs, 26 Regions of the U. S., 1960.

Time Period	Quantity Shipped (1,000 lbs.)	(Percent)	Total Cost (Dollars)	Average Cost per 100 Pounds (Dollars)
Jan. - March	105,694	24	1,488,848	1.41
Apr. - June	98,210	22	1,368,055	1.39
July - Sept.	111,776	26	1,497,791	1.34
Oct. - Dec.	123,538	28	1,726,577	1.40
Quarterly Total	439,118		6,081,271	1.38
Annual	436,008		6,029,356	1.38

solution. However, in terms of average cost per hundred pounds, the average for the four quarters was the same as that obtained for the annual model. While there is a general consistency between the quarterly and annual estimates with regard to total quantity shipped and costs, it appears that the quarterly models do provide additional information relative to the time assumption, price differential, and additional shipping activities.

As in the 1960 quarterly analyses, the 1955 quarterly analyses indicated that three regions changed from surplus to deficit and vice versa during the year. Region 14 was surplus during the first quarter and deficit during the remaining quarters; region 15 was surplus the first two quarters and deficit during the last two; while region 18 had slight deficit in the third quarter. Otherwise, except for the inclusion of eight additional shipping activities, the 1955 quarterly analyses were quite similar to the more aggregative annual analysis.

IV SUMMARY

Minimum-cost flows of slaughter cattle, calves, hogs, and sheep and lambs from production to slaughtering among 26 component regions of the

U.S. were determined by a linear-programming transportation model for 1955 and 1960. Annual and quarterly spatial and price equilibrium analyses were performed for each of the four types of slaughter livestock. Truck transportation rates were used for all of the 1955 analyses. Both truck and truck-rail combination transportation rates were used in the 1960 annual models and only the truck-rail combination rates were used in the 1960 quarterly analyses.

Estimates of regional production which reflect a region's production contribution to total commercial slaughter of the U.S. were generated for each of the four types of livestock for 1955 and 1960. The estimates of regional production for commercial slaughter consist of three major components: (a) live weight of inshipments and weight added to inshipments, (b) live weight of a decrease in inventory numbers, and (c) live weight of production occurring in the region during the calendar year.

Optimum shipment patterns of slaughter animals from location of production to slaughter were estimated for cattle, calves, hogs, and sheep and lambs for 1955 and 1960. About 18-20 percent of slaughter cattle and slaughter hogs and approximately 29 percent of slaughter sheep and lambs would have moved interregionally in both 1955 and 1960. In 1955 approximately 22 percent and in 1960 about 29 percent of calf production for slaughter would have entered into interregional trade while concurrently calf production for slaughter dropped substantially.

Major surplus regions of slaughter cattle in 1955 and 1960 were located in the western part of the Corn Belt and in addition to these in 1960 the Arizona-New Mexico region was one of the major surplus regions. In both years region 2 (New York, Pennsylvania, etc.), California, Ohio, Wisconsin, and Michigan were major deficit areas. In 1955 region 3 (North Carolina, Virginia, West Virginia), Alabama-Mississippi, Indiana, and Arkansas-Louisiana were surplus regions with the greatest comparative price advantage for slaughter cattle while regions in the Plains area tended to have the least comparative price advantage. In 1960 region 3, Indiana, Arkansas-Louisiana, and Arizona-New Mexico were regions with the greatest comparative price advantage. From 1955 to 1960 surplus regions with the least comparative price advantage changed from regions in the Plains area to regions in the western portion of the Corn Belt. Regions located along the Atlantic Coast and in 1960, also California and Oregon-Washington were deficit regions with the highest relative prices. Regions with the lowest relative cattle prices were located adjacent to the surplus regions of the Corn Belt.

There were rather marked differences between the 1955 and the 1960 estimated optimum flow pat-

terns for slaughter calves. This can be largely attributed to the large decrease in the U.S. aggregate production and in different rates of decrease among regions. In 1955 the Dakotas, Missouri and the Montana-Wyoming regions continued to be major surplus areas and the North Carolina-Virginia-West Virginia region became a major surplus region. For the two years considered, surplus regions with the greatest comparative price advantage were located in the South and Southeast while regions with the least comparative price advantage were located in the Plains area and in the West. In 1955 the deficit regions with the highest relative prices were in the Northeast (regions 1 and 2) and region 2 continued to have high relative prices in 1960. Also, in 1960 the Florida and Georgia-South Carolina regions were deficit regions with high relative prices.

Major surplus regions of live slaughter hogs were Iowa, Illinois, Indiana, and Missouri and major deficit regions were region 2 (New York, Pennsylvania, etc.), California, and Kansas in both 1955 and 1960. Surplus regions with the greatest comparative price advantage in 1955 were Mississippi-Alabama, Indiana, and the Dakotas, and in 1960 they were the Dakotas, Georgia-South Carolina, Arkansas-Louisiana, and Indiana. Iowa and Missouri in 1955 and Iowa, Illinois, and Missouri in 1960 were surplus regions with the least comparative price advantage. In 1955 and 1960 deficit regions with the highest relative prices of live slaughter hogs were regions along the West Coast, Arizona-New Mexico and the New England area while deficit regions with the lowest relative prices were Nebraska, Kansas, Minnesota, and Wisconsin.

The four major surplus regions of live slaughter sheep and lambs in 1955 and 1960 were Montana-Wyoming, Idaho-Utah-Nevada, North Dakota-South Dakota, and Ohio. In both 1955 and 1960 Ohio, Indiana, and North Carolina-Virginia-West Virginia were surplus regions with the greatest price advantage while the Idaho-Utah-Nevada, Arizona-New Mexico, and Montana-Wyoming in 1955 and Montana-Wyoming, Dakotas, and Idaho-Utah-Nevada regions in 1960 had the least comparative price advantage.

In general, the quarterly analyses performed did provide some seasonal information over and above the annual analysis, particularly with respect to calves and sheep and lambs. In all species the quantities shipped from any one region to another varied considerably from quarter to quarter even though the relative supplies and demands remained quite stable. With respect to calves and sheep and lambs, the quarterly analyses indicated that some regions changed from surplus to deficit regions between quarters of the year. These changes in the demand and sup-

ply positions were not revealed by the annual analysis. However, the results of the quarterly analyses suggested that only slight distortion was induced by aggregation over time.

Except for slaughter calves, only moderate changes occurred in the flow patterns between the two years analyzed. The changes which occurred were due mainly to regional shifts in the location of production and slaughter facilities moving closer to areas of production. For the time period considered, relative increases in production occurred in the western part of the Corn Belt and in some of the regions in southwestern United States. Although actual slaughter and not slaughter capacities were restrictions in the spatial models, the structural change in the location of meat packing facilities is exemplified by the westward shift in the regional demand for slaughter livestock. The demand for slaughter livestock between 1955 and 1960 decreased in eastern United States and in the central and eastern parts of the Corn Belt. The magnitude of the changes was not the same in all major livestock producing areas. These changes resulted in a slight reduction in the total quantities which entered interregional trade and in the percent of total commercial production shipped interregionally. Also the average length of haul tended to be shorter. If these kinds of changes in the location of production and location of slaughtering facilities continue, then the changes in the flow patterns and relative price patterns among regions suggested by this study will be more pronounced in the future.

Truck-rail combination transportation rates were lower for longer hauls than were truck transportation rates. Use of truck-rail combination rates affected the spatial flows of slaughter calves the least. These lower rates for longer hauls resulted in an increased average length of haul, a change in the magnitude and directional flows of livestock from some regions, and a lower total transportation cost for all species except hogs. The greatest impact occurred in the western part of the Corn Belt and regions further west. The lower rates for longer hauls made it feasible for these regions to ship slaughter livestock both east and west whereas with truck rates alone these regions shipped in only one direction. These results suggest that changes in the transportation rate structure, particularly a decrease, would alter the direction of shipments and competitive position of surplus producing regions. The greatest impact would probably occur in the western part of the Corn Belt and Western States in terms of east and west shipments and length of haul.

The spatial analyses provide information for

decision making at various structural levels. In particular, the results from these analyses suggest how changes in transportation costs of live animals, geographical location of slaughtering facilities, and regional location of production might alter the regional flows and prices of live slaughter animals. Also, information is provided about competitive price position for slaughter livestock of one region relative to another. From the standpoint of processing firms the information provided by these analyses should be helpful in assessing the consequences

of alternative geographical locations of processing facilities.

The results of these analyses provide one standard for judging the efficiency of the pricing and distribution system for slaughter livestock. Until more complete data become available on regional production and interregional flows of slaughter livestock, analyses of this type provide an operational way of ascertaining the probable consequences of alternative courses of action or disturbances in the slaughter livestock sector of the economy.

APPENDIX A
Estimated Transport Rates for Livestock

Table A.1—Estimates of Truck Transport Rates for Slaughter Cattle, Calves, Sheep and Lambs Between Specified Points, 26 Regions of the U. S., 1955.

Region	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
	(Cents per pound or dollars per 100 pounds)																										
1	0																										
2	.64	0																									
3	.94	.44	0																								
4	2.43	1.86	1.63	0																							
5	1.92	1.36	1.14	.96	0																						
6	2.41	1.82	1.63	1.35	.67	0																					
7	2.01	1.45	1.31	1.41	.61	.71	0																				
8	1.34	.94	.83	1.85	1.04	1.26	.71	0																			
9	1.66	1.20	1.07	1.70	.92	1.08	.51	.40	0																		
10	1.31	1.10	1.04	2.06	1.26	1.51	.92	.36	.60	0																	
11	1.73	1.39	1.37	2.05	1.25	1.11	.79	.66	.43	.58	0																
12	1.91	1.52	1.53	2.24	1.43	1.34	.94	.80	.59	.73	.25	0															
13	3.06	2.46	.95	1.50	1.13	.71	1.08	1.34	1.18	2.00	1.20	1.79	0														
14	1.64	2.18	1.68	1.98	1.15	.78	.72	.86	.56	.99	.55	.70	.84	0													
15	2.24	1.77	1.92	2.39	1.58	1.34	1.07	.96	.75	.91	.52	.54	1.08	.42	0												
16	2.43	1.95	2.11	2.75	1.92	1.77	1.43	1.12	.91	1.05	.62	.50	1.95	.69	.45	0											
17	3.17	2.69	2.42	2.08	1.55	1.05	1.28	1.44	1.26	2.03	1.30	1.76	.53	.88	1.00	1.57	0										
18	2.42	1.89	1.95	2.21	1.39	1.07	.94	1.01	.73	1.17	.76	.84	.88	.29	.40	.66	.76	0									
19	2.57	2.15	2.30	2.44	1.78	1.47	1.37	1.28	1.07	1.28	.77	.81	1.17	.70	.37	.65	.86	.41	0								
20	3.14	2.74	2.89	3.51	2.71	2.47	2.18	1.99	1.64	1.79	1.27	1.20	2.61	1.38	1.01	.74	1.92	1.13	1.00	0							
21	2.60	2.28	3.07	3.40	2.59	2.16	2.11	1.86	1.67	1.84	1.53	1.63	1.36	1.48	1.13	1.33	1.03	1.04	.87	.97	0						
22	2.95	2.73	3.79	4.33	3.62	3.15	3.10	2.27	2.09	2.10	1.81	1.71	2.01	1.83	1.45	1.20	1.92	1.69	1.23	.69	.97	0					
23	3.45	4.41	4.39	3.98	3.42	2.78	3.10	3.47	3.13	3.67	3.21	3.32	1.64	2.54	2.54	2.87	1.35	2.16	2.15	2.57	1.38	1.60	0				
24	4.44	3.96	4.06	7.13	3.61	3.10	3.06	3.06	2.55	3.04	2.54	2.59	1.86	2.09	1.85	2.09	1.60	1.87	1.50	1.60	.97	1.02	1.08	0			
25	5.93	5.36	5.99	6.87	4.74	4.01	4.18	4.40	4.03	4.60	4.06	4.13	2.14	3.24	3.30	3.61	1.84	3.00	2.99	3.01	1.79	1.49	.98	1.35	0		
26	3.32	1.98	6.14	7.15	5.27	4.76	4.57	3.07	2.92	3.07	2.83	2.76	4.55	2.62	2.39	2.09	2.62	2.40	2.31	1.36	1.69	1.36	2.28	1.27	1.24	0	

Table A.2—Estimates of Truck Transport Rates for Slaughter Hogs Between Specified Points, 26 Regions of the U. S., 1955.

Region	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
	(Cents per pound or dollars per 100 pounds)																										
1	0																										
2	.62	0																									
3	1.04	.58	0																								
4	1.90	1.63	1.25	0																							
5	1.59	1.31	.97	.92	0																						
6	1.70	1.47	1.05	1.09	.71	0																					
7	1.63	1.36	1.05	1.16	.66	.73	0																				
8	1.11	.84	.96	1.63	1.11	1.22	.87	0																			
9	1.32	1.02	1.13	1.54	1.03	1.13	.67	.42	0																		
10	1.08	.95	1.11	1.71	1.25	1.36	1.03	.38	.58	0																	
11	1.36	1.15	1.32	1.71	1.24	1.13	.94	.63	.44	.57	0																
12	1.47	1.22	1.40	1.81	1.35	1.29	1.05	.73	.57	.69	.28	0															
13	2.04	1.83	1.31	1.22	1.07	.79	1.03	1.49	1.34	1.62	1.44	1.51	0														
14	1.88	1.49	1.49	1.69	1.06	.81	.71	.86	.59	.97	.57	.72	1.02	0													
15	1.92	1.58	1.67	2.02	1.40	1.21	1.00	.94	.77	.91	.54	.56	1.34	.45	0												
16	2.06	1.72	1.81	2.29	1.67	1.57	1.27	1.08	.90	1.02	.64	.53	1.72	.65	.47	0											
17	2.80	2.37	1.37	1.38	1.18	1.08	1.10	1.49	1.33	1.60	1.37	1.44	.76	.97	1.11	1.38	0										
18	2.06	1.66	1.67	1.88	1.26	1.01	.88	.99	.74	1.12	.77	.85	1.09	.35	.43	.63	.81	0									
19	2.15	1.85	1.96	2.05	1.56	1.32	1.23	1.20	1.02	1.19	.77	.81	1.43	.65	.41	.63	.97	.45	0								
20	2.55	2.27	2.39	2.84	2.23	2.07	1.86	1.71	1.46	1.57	1.15	1.08	2.15	1.12	.87	.68	1.61	.97	.87	0							
21	2.87	2.49	2.59	2.78	1.81	1.87	1.83	1.54	1.37	1.59	1.34	1.36	1.45	1.09	1.05	1.22	1.14	.97	.85	1.03	0						
22	3.35	3.00	3.01	3.41	2.28	2.61	2.51	1.95	1.81	1.89	1.63	1.54	1.87	1.63	1.43	1.19	2.03	1.52	1.25	.76	.92	0					
23	3.94	2.62	3.49	3.18	2.15	2.32	2.50	2.23	2.07	2.32	2.11	2.17	1.68	1.81	1.82	1.98	1.55	1.63	1.58	1.80	1.26	1.77	0				
24	3.59	3.27	3.24	3.43	2.24	2.53	2.48	2.04	1.89	2.04	1.80	1.81	1.75	1.60	1.46	1.60	1.87	1.47	1.27	1.31	.80	.83	1.00	0			
25	5.48	4.23	4.17	4.06	2.65	2.28	2.40	2.61	2.46	2.74	2.51	2.55	2.11	2.11	2.21	2.34	2.41	1.99	2.04	2.01	2.02	1.82	.93	1.17	0		
26	5.50	4.31	4.30	4.54	2.82	3.69	3.62	2.68	2.55	2.68	2.46	2.40	2.57	2.28	2.12	2.07	3.00	2.13	2.05	1.61	1.94	1.36	1.95	1.18	1.07	0	

Table A.3—Estimates of Truck Transport Rates for Slaughter Cattle, Calves, Sheep and Lambs Between Specified Points, 26 Regions of the U. S., 1960.

Region	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
	(Cents per pound or dollars per 100 pounds)																									
1	0																									
2	.72	0																								
3	1.05	.49	0																							
4	2.70	2.07	1.77	0																						
5	2.14	1.51	1.24	1.04	0																					
6	2.68	2.03	1.77	1.46	.73	0																				
7	2.24	1.61	1.42	1.53	.66	.77	0																			
8	1.50	1.05	.92	2.06	1.16	1.40	.79	0																		
9	1.86	1.34	1.19	1.89	1.02	1.20	.57	.45	0																	
10	1.46	1.23	1.16	2.29	1.40	1.68	1.02	.40	.67	0																
11	1.94	1.56	1.53	2.28	1.39	1.24	.88	.74	.48	.65	0															
12	2.14	1.70	1.70	2.49	1.59	1.49	1.05	.90	.66	.82	.28	0														
13	3.41	2.74	1.03	1.62	1.22	.77	1.17	1.49	1.31	2.23	1.42	1.99	0													
14	1.86	2.48	1.91	2.26	1.31	.89	.82	.98	.64	1.13	.62	.80	.96	0												
15	2.55	2.01	2.19	2.72	1.80	1.53	1.22	1.09	.85	1.04	.59	.61	1.23	.49	0											
16	2.76	2.22	2.41	3.13	2.19	2.02	1.63	1.27	1.03	1.19	.70	.57	2.22	.80	.52	0										
17	3.61	3.06	2.66	2.29	1.70	1.16	1.41	1.64	1.43	2.31	1.48	2.00	.58	1.03	1.17	1.84	0									
18	2.75	2.15	2.22	2.52	1.58	1.22	1.07	1.15	.83	1.33	.87	.96	1.00	.34	.46	.76	.89	0								
19	2.92	2.44	2.62	2.78	2.03	1.67	1.56	1.46	1.22	1.46	.88	.92	1.33	.81	.43	.75	1.01	.48	0							
20	3.57	3.12	3.29	4.00	3.09	2.82	2.48	2.26	1.87	2.04	1.45	1.36	2.97	1.60	1.17	.86	2.24	1.31	1.16	0						
21	2.96	2.59	3.50	3.87	2.95	2.46	2.40	2.11	1.90	2.09	1.74	1.85	1.55	1.71	1.31	1.54	1.20	1.20	1.01	1.12	0					
22	3.20	2.96	4.32	4.93	4.12	3.59	3.53	2.46	2.27	2.28	1.96	1.85	2.29	2.07	1.64	1.42	2.17	1.91	1.39	.78	1.09	0				
23	3.74	4.78	5.00	4.53	3.90	3.17	3.53	3.77	3.40	3.98	3.48	3.60	1.87	2.87	2.87	3.24	1.52	2.44	2.43	2.90	1.56	1.83	0			
24	4.82	4.30	4.63	8.10	4.11	3.53	3.49	3.32	2.77	3.30	2.76	2.81	2.12	2.36	2.09	2.36	1.80	2.11	1.69	1.81	1.10	1.16	1.23	0		
25	6.43	5.82	6.83	7.83	5.40	4.57	4.76	4.77	4.37	4.99	4.41	4.48	2.44	3.66	3.73	4.08	2.08	3.39	3.37	3.40	2.02	1.70	1.12	1.54	0	
26	3.60	2.15	7.00	8.15	6.00	5.42	5.21	3.33	3.17	3.33	3.07	3.00	5.19	2.96	2.70	2.36	2.96	2.71	2.61	1.54	1.91	1.55	2.60	1.45	1.41	0

Table A.4—Estimates of Truck Transport Rates for Slaughter Hogs Between Specified Points, 26 Regions of the U. S., 1960.

Region	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
	(Cents per pound or dollars per 100 pounds)																										
1	0																										
2	.66	0																									
3	1.02	.57	0																								
4	1.86	1.60	1.34	0																							
5	1.56	1.28	1.04	.98	0																						
6	1.67	1.44	1.12	1.17	.76	0																					
7	1.60	1.33	1.12	1.24	.71	.78	0																				
8	1.18	.89	.94	1.60	1.09	1.20	.85	0																			
9	1.40	1.08	1.11	1.51	1.01	1.11	.66	.45	0																		
10	1.15	1.01	1.09	1.68	1.23	1.33	1.01	.40	.62	0																	
11	1.45	1.22	1.29	1.68	1.22	1.11	.92	.67	.47	.61	0																
12	1.56	1.30	1.37	1.77	1.32	1.26	1.03	.78	.61	.73	.30	0															
13	2.00	1.79	1.40	1.31	1.14	.84	1.10	1.46	1.31	1.59	1.41	1.48	0														
14	2.11	1.67	1.60	1.82	1.14	.87	.76	.97	.66	1.09	.64	.81	1.10	0													
15	2.16	1.77	1.79	2.17	1.50	1.30	1.07	1.06	.86	1.02	.61	.63	1.44	.49	0												
16	2.31	1.93	1.94	2.46	1.79	1.69	1.37	1.21	1.01	1.14	.72	.59	1.85	.71	.51	0											
17	2.99	2.53	1.47	1.48	1.27	1.16	1.18	1.59	1.42	1.71	1.47	1.54	.82	1.08	1.24	1.54	0										
18	2.31	1.86	1.80	2.02	1.35	1.09	.95	1.11	.83	1.26	.87	.95	1.17	.38	.47	.68	.90	0									
19	2.42	2.08	2.11	2.20	1.68	1.42	1.32	1.35	1.14	1.34	.86	.91	1.54	.71	.44	.68	1.08	.49	0								
20	2.86	2.55	2.57	3.05	2.40	2.22	2.00	1.92	1.64	1.76	1.29	1.21	2.31	1.22	.95	.74	1.80	1.05	.94	0							
21	3.22	2.80	2.78	2.99	1.95	2.01	1.97	1.73	1.54	1.78	1.51	1.53	1.56	1.18	1.14	1.32	1.27	1.05	.92	1.12	0						
22	3.60	3.22	3.23	3.67	2.45	2.80	2.70	2.10	1.94	2.03	1.75	1.66	2.01	1.77	1.55	1.29	2.18	1.65	1.36	.83	1.00	0					
23	4.23	2.82	3.75	3.42	2.31	2.49	2.69	2.40	2.23	2.49	2.27	2.33	1.81	1.97	1.98	2.15	1.67	1.77	1.72	1.96	1.37	2.04	0				
24	3.86	3.51	3.48	3.69	2.41	2.72	2.67	2.19	2.03	2.19	1.93	1.95	1.88	1.74	1.59	1.74	2.01	1.60	1.38	1.42	.87	.96	1.15	0			
25	5.89	4.55	4.48	4.36	2.85	2.45	2.58	2.80	2.64	2.94	2.70	2.74	2.27	2.29	2.40	2.55	2.59	2.16	2.22	2.19	2.20	2.10	1.08	1.35	0		
26	5.91	4.63	4.62	4.88	3.03	3.97	3.89	2.88	2.74	2.88	2.64	2.58	2.76	2.48	2.31	2.25	3.22	2.32	2.23	1.75	2.11	1.57	2.25	1.36	1.24	0	

Table A.5—Estimates of Truck-Rail Transport Rates for Slaughter Cattle, Calves, Sheep and Lambs Between Specified Points, 26 Regions of the U. S., 1960.

Region	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
	(Cents per pound or dollars per 100 pounds)																										
1	0																										
2	.72	0																									
3	1.12	.49	0																								
4	1.58	1.37	1.46	0																							
5	1.50	1.29	1.37	.79	0																						
6	1.76	1.55	1.67	1.42	.96	0																					
7	1.54	1.33	1.44	1.41	.66	.94	0																				
8	1.50	1.05	1.06	1.34	1.13	1.30	.79	0																			
9	1.86	1.34	1.17	1.32	1.10	1.20	.57	.45	0																		
10	1.46	1.23	1.16	1.47	1.25	1.40	1.12	.40	.67	0																	
11	1.94	1.56	1.27	1.46	1.23	1.27	.88	.74	.48	.65	0																
12	2.14	1.70	1.33	1.52	1.29	1.33	1.12	.90	.66	.82	.28	0															
13	1.08	1.66	1.78	1.52	1.32	.39	1.40	1.41	1.31	1.51	1.38	1.44	0														
14	1.88	1.73	1.38	1.41	1.16	1.12	.94	.98	.64	1.13	.62	.80	1.19	0													
15	1.90	1.77	1.47	1.56	1.33	1.29	1.12	1.09	.85	1.04	.59	.61	1.36	.49	0												
16	1.94	1.82	1.54	1.69	1.47	1.45	1.28	1.27	1.03	1.19	.70	.57	1.56	.80	.52	0											
17	2.28	2.09	1.66	1.44	1.31	.96	1.20	1.64	1.43	2.31	1.48	2.00	.97	1.22	1.32	1.56	0										
18	1.94	1.80	1.48	1.50	1.28	1.16	1.06	1.15	.83	1.33	.87	.96	1.23	.34	.46	.76	1.13	0									
19	1.97	1.84	1.55	1.65	1.42	1.32	1.22	1.34	1.02	1.31	.81	.84	1.38	.79	.35	.67	1.25	.46	0								
20	2.03	1.90	1.65	1.84	1.57	1.53	1.39	1.67	1.46	1.65	1.03	.95	1.58	1.06	.73	.46	1.52	.98	.57	0							
21	2.24	2.09	1.87	1.91	1.71	1.55	1.54	1.85	1.76	1.90	1.74	1.75	1.55	1.19	1.14	1.29	1.16	1.07	1.02	1.16	0						
22	2.22	2.08	2.09	2.22	1.98	1.93	1.86	1.80	1.72	1.80	1.56	1.54	1.92	1.68	1.48	1.32	1.64	1.56	1.37	1.23	1.05	0					
23	2.47	2.30	2.27	2.10	1.98	1.72	1.88	2.02	1.91	2.08	1.94	1.99	1.72	1.86	1.93	2.10	1.43	1.73	1.80	1.98	1.30	1.83	0				
24	2.32	2.17	2.16	2.22	2.03	1.85	1.86	1.88	1.80	1.88	1.71	1.72	1.85	1.70	1.56	1.69	1.57	1.58	1.45	1.51	1.00	1.16	1.23	0			
25	2.75	2.61	2.60	2.53	2.39	2.18	2.29	2.34	2.24	2.34	2.18	2.19	2.18	2.41	2.27	2.41	1.94	2.29	2.14	2.22	1.73	1.78	1.45	1.39	0		
26	2.76	2.60	2.60	2.66	2.48	2.35	2.33	2.34	2.24	2.34	2.18	2.14	2.35	2.41	2.27	2.20	2.14	2.26	2.14	2.10	1.74	1.55	2.60	1.45	1.27	0	

Table A.6—Estimates of Truck-Rail Transport Rates for Slaughter Hogs Between Specified Points, 26 Regions of the U. S., 1960.

Region	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
	(Cents per pound or dollars per 100 pounds)																										
1	0																										
2	.66	0																									
3	1.13	.48	0																								
4	1.66	1.42	1.24	0																							
5	1.56	1.32	1.12	.63	0																						
6	1.85	1.61	1.42	1.19	.73	0																					
7	1.60	1.36	1.19	1.18	.50	.72	0																				
8	1.67	.93	1.06	1.39	1.14	1.32	.79	0																			
9	1.78	1.19	1.18	1.37	1.10	1.22	.56	.47	0																		
10	1.32	1.09	1.17	1.54	1.27	1.44	1.13	.41	.63	0																	
11	1.91	1.42	1.30	1.52	1.26	1.30	.88	.68	.49	.61	0																
12	2.19	1.58	1.37	1.59	1.32	1.36	1.13	.81	.62	.74	.35	0															
13	1.98	1.74	1.57	1.27	1.05	.30	1.14	1.46	1.35	1.57	1.43	1.49	0														
14	1.70	1.48	1.26	1.26	1.10	1.07	.92	.73	.44	.87	.43	.57	1.12	0													
15	1.72	1.54	1.33	1.37	1.23	1.20	1.06	.84	.62	.79	.40	.42	1.25	.50	0												
16	1.80	1.61	1.38	1.46	1.33	1.32	1.19	1.01	.78	.93	.49	.39	1.39	.80	.53	0											
17	2.11	1.90	1.46	1.28	1.21	.91	1.13	1.44	1.24	2.05	1.29	1.75	.94	1.05	1.12	1.25	0										
18	1.80	1.58	1.33	1.32	1.20	1.10	1.02	.90	.61	1.06	.64	.72	1.15	.35	.47	.76	.98	0									
19	1.83	1.64	1.38	1.43	1.29	1.22	1.14	1.08	.78	1.04	.59	.61	1.26	.80	.36	.68	1.07	.47	0								
20	1.92	1.73	1.45	1.56	1.40	1.38	1.27	1.39	1.17	1.36	.78	.70	1.40	1.06	.74	.47	1.24	.98	.58	0							
21	2.22	2.01	1.59	1.59	1.49	1.38	1.37	1.66	1.52	1.70	1.50	1.51	1.38	1.17	1.12	1.26	1.16	1.06	1.01	1.15	0						
22	1.80	1.71	1.72	1.78	1.66	1.63	1.58	1.55	1.49	1.53	1.39	1.38	1.62	1.63	1.46	1.33	1.43	1.53	1.37	1.26	1.09	0					
23	1.93	1.84	1.82	1.71	1.65	1.47	1.59	1.68	1.61	1.72	1.63	1.65	1.49	1.78	1.84	1.99	1.29	1.68	1.74	1.88	1.31	2.21	0				
24	1.85	1.77	1.76	1.77	1.68	1.57	1.58	1.60	1.53	1.60	1.49	1.50	1.58	1.65	1.53	1.64	1.38	1.54	1.42	1.49	1.07	1.35	1.32	0			
25	2.08	2.01	2.00	1.95	1.89	1.75	1.84	1.86	1.81	1.86	1.78	1.78	1.77	2.25	2.13	2.25	1.60	2.15	2.02	2.09	1.67	1.83	1.52	1.47	0		
26	2.09	2.00	2.00	2.01	1.94	1.86	1.86	1.86	1.81	1.86	1.77	1.75	1.87	2.25	2.13	2.07	1.71	2.14	2.02	1.99	1.68	1.60	2.69	1.52	1.36	0	

APPENDIX B

Annual Estimates of Live Weight Farm Slaughter and Quarterly Liveweight Commercial Slaughter, 26 Regions of the U.S., 1955 and 1960.

Table B.1 — Farm Slaughter of Cattle, Calves, Hogs and Sheep and Lambs, 26 Regions of the U. S., 1955 and 1960.

Region	Cattle		Calves		Hogs		Sheep and Lambs	
	1955	1960	1955	1960	1955	1960	1955	1960
	(1000 pounds liveweight)							
1	12,860	10,988	1,087	852	10,312	8,285	149	2-0
2	56,286	54,676	5,975	4,233	86,221	63,960	1,019	909
3	17,153	14,824	3,641	3,719	234,727	182,176	877	824
4	2,439	2,089	953	873	24,134	21,807	0	0
5	5,197	6,786	4,796	4,030	144,144	116,517	77	76
6	5,577	5,098	8,234	8,731	110,168	83,905	134	169
7	12,668	12,424	3,103	3,146	169,859	144,032	580	604
8	42,173	37,637	2,027	1,638	48,280	32,342	581	693
9	33,786	31,624	2,877	1,360	51,480	32,643	326	445
10	29,553	21,405	2,628	1,720	28,204	20,178	507	455
11	46,240	45,804	3,025	1,854	69,717	48,312	171	172
12	51,372	47,658	2,613	1,720	64,600	42,180	326	360
13	6,388	5,555	10,705	10,874	74,712	56,122	401	371
14	26,239	24,279	8,039	5,351	84,942	64,518	519	540
15	68,377	64,200	3,311	1,827	90,236	62,657	346	460
16	60,601	60,127	3,221	2,380	76,096	56,990	438	460
17	21,309	24,215	43,873	48,116	106,812	71,651	1,326	1,579
18	30,428	33,208	9,318	7,441	34,242	22,106	334	528
19	33,829	32,124	4,127	4,540	38,918	27,983	269	282
20	38,643	39,697	5,714	5,721	56,574	41,838	702	752
21	9,785	11,287	3,118	3,400	8,717	7,382	1,151	1,128
22	17,566	18,089	3,046	2,828	13,944	11,612	1,945	1,857
23	5,446	6,967	4,797	3,654	6,035	5,167	10,305	10,486
24	16,941	16,904	5,148	4,226	11,299	9,802	3,375	3,286
25	12,656	12,933	3,611	4,081	7,632	6,202	2,239	2,161
26	35,408	38,696	9,288	6,821	15,735	13,513	971	1,083
U. S. Total	698,920	679,294	158,275	145,136	1,667,740	1,253,880	29,068	29,920

Table B.2—Quarterly Commercial Slaughter of Cattle, 26 Regions of the U. S., 1955.

Regions	Jan.- March	April- June	July- Sept.	Oct.- Dec.	Total
(1000 pounds liveweight)					
1	67,374	61,445	61,879	71,166	261,864
2	514,098	524,242	578,960	573,022	2,190,322
3	77,243	80,189	96,749	92,662	346,843
4	82,712	79,172	74,775	66,429	303,088
5	96,435	106,885	123,434	111,568	438,322
6	64,060	80,875	81,124	70,618	296,677
7	133,588	143,600	179,558	159,336	616,082
8	262,566	265,585	288,126	288,543	1,104,820
9	151,922	156,742	170,884	173,179	652,727
10	187,499	195,939	210,295	201,258	794,991
11	483,279	499,659	524,692	527,029	2,034,659
12	201,957	203,223	217,485	247,294	869,959
13	55,365	64,419	66,604	59,982	246,370
14	220,334	233,828	249,461	247,916	951,539
15	434,430	441,668	506,867	529,403	1,912,368
16	349,281	349,226	368,327	404,679	1,471,513
17	370,744	472,660	469,705	406,210	1,719,319
18	262,396	253,122	308,772	319,497	1,143,787
19	441,768	453,768	487,309	497,242	1,880,087
20	106,996	106,292	121,064	133,226	467,578
21	213,921	213,188	211,472	212,971	851,552
22	20,138	21,818	24,394	21,854	88,204
23	35,341	36,201	37,530	34,472	143,544
24	85,531	72,622	78,707	81,209	318,069
25	567,671	590,737	637,756	619,650	2,415,814
26	160,682	163,857	185,796	170,388	680,723
Total	5,647,331	5,870,962	6,361,725	6,320,803	24,200,821

Table B.3—Quarterly Commercial Slaughter of Cattle, 26 Regions of the U. S., 1960.

Regions	Jan.- March	April- June	July- Sept.	Oct.- Dec.	Total
(1000 pounds liveweight)					
1	52,464	45,275	48,277	61,166	207,182
2	532,252	514,354	531,684	517,847	2,096,137
3	83,059	83,470	95,451	96,051	358,031
4	67,503	73,484	70,304	69,934	281,225
5	76,116	82,570	89,843	86,671	335,200
6	83,854	107,109	123,615	118,348	432,926
7	117,927	117,215	141,014	137,079	513,235
8	287,971	284,503	312,174	280,435	1,165,083
9	160,423	162,514	168,812	158,502	650,251
10	180,082	182,450	191,779	177,615	731,926
11	380,369	372,975	374,507	355,242	1,483,093
12	264,952	253,661	255,944	266,062	1,040,619
13	57,934	60,852	68,070	59,445	246,301
14	281,606	273,089	282,381	268,048	1,105,124
15	654,182	635,195	696,015	682,401	2,667,793
16	357,893	361,928	389,315	383,388	1,492,524
17	339,065	413,547	433,041	412,971	1,598,624
18	292,698	267,836	307,213	291,705	1,159,452
19	539,226	526,491	585,050	554,089	2,204,856
20	104,651	108,150	125,460	125,409	463,670
21	250,332	275,757	265,549	288,215	1,079,853
22	25,999	28,881	34,448	31,623	120,951
23	49,149	51,121	52,898	50,526	203,694
24	104,408	107,927	121,105	113,348	446,788
25	621,236	604,127	668,995	646,214	2,540,572
26	164,160	169,122	192,078	180,524	705,884
Total	6,129,511	6,163,603	6,625,022	6,412,858	25,330,994

Table B.4—Quarterly Commercial Slaughter of Calves, 26 Regions of the U. S., 1955.

Regions	Jan.- March	April- June	July- Sept.	Oct.- Dec.	Total
(1000 pounds liveweight)					
1	11,293	8,765	9,871	11,042	40,971
2	87,629	88,600	99,375	94,111	369,715
3	12,697	19,106	22,375	14,658	68,836
4	8,151	8,799	12,819	11,979	41,748
5	12,075	14,474	19,717	15,665	61,931
6	20,130	24,531	28,934	25,416	99,011
7	17,754	23,789	31,439	24,169	97,151
8	13,249	14,683	14,323	12,420	54,675
9	9,866	12,740	13,614	11,163	47,383
10	25,991	31,175	37,370	27,368	121,904
11	39,106	40,542	46,734	44,410	170,792
12	48,627	41,531	33,512	52,900	176,570
13	30,940	33,939	37,228	35,496	137,603
14	12,364	15,091	19,163	15,948	62,566
15	29,690	27,176	29,708	39,630	126,204
16	23,767	22,587	19,385	32,552	98,291
17	118,925	133,276	169,312	145,921	567,434
18	16,083	17,873	23,994	18,872	76,822
19	4,575	4,318	4,237	5,240	18,370
20	1,653	1,912	2,831	3,420	9,816
21	5,524	4,768	5,692	5,825	21,809
22	887	798	953	780	3,418
23	3,278	3,390	3,399	3,241	13,308
24	3,147	2,864	3,542	3,331	12,884
25	38,381	40,199	40,755	34,526	153,861
26	6,927	7,433	11,645	9,538	35,543
Total	602,709	644,359	741,927	699,621	2,688,616

Table B.5—Quarterly Commercial Slaughter of Calves, 26 Regions of the U. S., 1960.

Regions	Jan.- March	April- June	July- Sept.	Oct.- Dec.	Total
(1000 pounds liveweight)					
1	9,238	7,903	9,436	9,569	36,146
2	64,680	61,199	72,099	67,121	265,099
3	11,023	16,612	17,973	16,279	61,887
4	8,430	8,144	16,131	14,886	47,591
5	9,253	10,927	15,076	12,995	48,251
6	14,876	19,815	23,712	19,567	77,970
7	10,010	12,845	17,822	16,624	57,301
8	6,980	7,072	7,186	7,046	28,284
9	6,395	6,687	7,467	6,845	27,394
10	14,628	16,870	19,383	19,200	70,081
11	15,590	14,582	15,624	18,228	64,024
12	38,750	30,566	29,403	40,592	139,311
13	22,829	23,361	27,520	24,736	98,446
14	4,203	4,448	6,940	6,905	22,496
15	24,025	16,851	18,676	23,066	82,618
16	15,023	11,574	8,920	13,874	49,391
17	94,200	111,352	142,073	121,127	468,752
18	8,232	8,322	12,367	11,475	40,396
19	822	1,398	916	1,112	4,248
20	38	121	38	77	274
21	1,371	1,292	1,212	1,169	5,044
22	210	369	489	387	1,455
23	1,669	1,913	1,829	1,630	7,041
24	1,671	1,546	1,851	1,677	6,745
25	25,249	23,009	27,656	23,133	99,047
26	3,539	3,466	4,755	4,442	16,202
Total	412,934	422,244	506,554	483,762	1,825,494

Table B.6—Quarterly Commercial Slaughter of Hogs, 26 Regions of the U. S., 1955.

Regions	Jan.- March	April- June	July- Sept.	Oct.- Dec.	Total
(1000 pounds liveweight)					
1	60,273	45,682	41,657	72,300	219,912
2	401,974	346,261	337,018	452,730	1,537,983
3	131,491	115,876	111,931	143,003	502,301
4	32,783	17,012	19,675	36,788	106,258
5	108,044	78,124	83,845	128,985	398,998
6	55,910	42,623	41,404	58,935	198,872
7	149,952	133,963	123,678	173,650	581,243
8	255,669	202,276	218,849	278,969	955,763
9	224,145	188,879	214,505	252,442	879,971
10	97,237	83,612	87,559	104,320	372,728
11	446,159	367,438	351,343	479,913	1,644,853
12	194,784	157,384	142,728	239,846	734,742
13	24,746	20,135	18,070	26,849	89,800
14	217,885	170,610	171,989	333,523	894,007
15	795,453	626,868	640,057	968,876	3,031,254
16	367,089	299,371	302,910	487,085	1,456,455
17	165,612	122,277	113,196	217,608	618,693
18	151,579	127,585	127,094	232,109	638,367
19	237,503	201,229	199,279	341,514	979,525
20	161,159	138,660	133,790	200,439	634,048
21	42,779	35,529	31,959	47,722	157,989
22	13,859	13,493	13,513	14,711	55,576
23	11,073	10,247	9,363	13,305	43,988
24	23,813	21,449	20,875	26,561	92,698
25	141,103	118,357	109,311	148,983	517,754
26	65,227	57,704	55,804	80,881	259,616
Total	4,577,301	3,742,644	3,721,402	5,562,047	17,603,394

Table B.7—Quarterly Commercial Slaughter of Hogs, 26 Regions of the U. S., 1960.

Regions	Jan.- March	April- June	July- Sept.	Oct.- Dec.	Total
(1000 pounds liveweight)					
1	38,712	35,244	29,466	37,824	141,246
2	400,341	346,015	330,088	391,397	1,467,841
3	202,691	183,503	170,956	183,153	740,303
4	35,826	22,859	22,332	32,970	113,987
5	139,267	122,117	101,371	121,405	484,160
6	89,721	82,379	73,584	81,022	326,706
7	228,345	223,253	203,434	215,799	870,831
8	270,780	245,909	239,120	245,079	1,000,888
9	335,317	304,202	282,240	296,792	1,218,551
10	98,430	85,803	84,266	85,337	353,836
11	350,992	335,015	304,000	312,346	1,302,353
12	244,883	201,649	162,177	199,803	808,512
13	28,169	24,665	23,693	27,233	103,760
14	264,546	244,009	197,469	230,797	936,821
15	959,312	846,771	785,761	956,553	3,548,397
16	364,405	312,834	311,935	361,278	1,350,452
17	161,193	141,120	117,910	140,778	561,001
18	196,928	182,100	146,044	173,750	698,822
19	271,196	260,188	225,938	264,446	1,021,768
20	147,242	132,995	117,699	167,776	565,712
21	43,958	39,151	34,734	33,362	151,205
22	17,592	17,268	17,087	16,719	68,666
23	16,358	13,526	13,232	13,868	56,984
24	30,860	26,880	25,273	25,673	108,686
25	102,643	95,009	90,504	93,785	381,941
26	78,697	63,938	63,523	68,413	274,571
Total	5,118,404	4,588,402	4,173,836	4,777,358	18,658,000

Table B.8—Quarterly Commercial Slaughter of Sheep and Lambs, 26 Regions of the U. S., 1955.

Regions	Jan.- March	April- June	July- Sept.	Oct.- Dec.	Total
(1000 pounds liveweight)					
1	6,874	7,180	7,692	7,966	29,712
2	65,603	59,758	60,056	61,697	247,114
3	207	446	531	316	1,500
4	8	0	17	32	57
5	8	19	28	16	71
6	25	31	30	8	94
7	1,669	5,921	7,093	4,064	18,747
8	5,682	5,424	5,579	5,198	21,883
9	3,117	3,389	4,044	4,919	15,469
10	21,833	17,688	16,595	24,491	80,607
11	20,154	20,222	18,181	21,573	80,130
12	4,333	3,008	2,577	3,024	12,942
13	31	54	36	35	156
14	19,367	18,020	12,653	14,278	64,318
15	37,482	33,761	34,341	38,312	143,896
16	28,585	17,918	20,183	29,320	96,006
17	18,623	39,256	21,904	15,385	95,168
18	14,137	16,407	10,149	10,893	51,586
19	36,608	27,940	26,766	25,081	116,395
20	19,000	11,950	15,447	23,185	69,582
21	25,635	15,040	23,517	23,763	87,955
22	183	180	422	540	1,325
23	1,120	1,133	961	946	4,160
24	6,651	9,947	16,983	11,219	44,800
25	58,324	63,207	59,564	52,117	233,212
26	7,291	8,608	15,223	7,739	38,861
Total	402,550	386,507	380,572	386,117	1,555,746

Table B.9—Quarterly Commercial Slaughter of Sheep and Lambs, 26 Regions of the U. S., 1960.

Regions	Jan.- March	April- June	July- Sept.	Oct.- Dec.	Total
(1000 pounds liveweight)					
1	7,005	5,674	6,408	6,823	25,910
2	59,994	52,522	52,604	53,302	218,422
3	324	510	725	465	2,024
4	14	42	25	15	96
5	8	41	62	28	139
6	54	53	39	31	177
7	3,909	6,253	9,112	5,311	24,585
8	4,328	3,480	3,966	3,690	15,464
9	5,015	4,569	5,471	4,560	19,615
10	17,109	16,264	18,792	20,116	72,281
11	11,734	9,935	10,576	13,254	45,499
12	5,443	4,648	4,590	3,727	18,408
13	31	50	46	43	170
14	15,698	15,130	14,310	13,966	59,104
15	37,705	32,312	34,732	44,217	148,966
16	29,595	16,609	22,970	39,272	108,446
17	16,976	39,572	33,598	26,755	116,901
18	8,166	7,066	6,479	7,293	29,004
19	31,977	25,322	24,264	29,675	111,238
20	16,829	13,524	15,032	13,199	58,584
21	42,641	31,165	37,333	42,497	153,636
22	199	194	338	1,148	1,879
23	1,395	1,494	1,216	1,128	5,233
24	6,144	6,827	16,939	10,252	40,162
25	62,461	67,213	65,448	56,780	251,902
26	6,575	9,592	14,614	8,866	39,647
Total	391,329	370,061	399,689	406,413	1,567,492

APPENDIX C

Quarterly Estimates of Farm and Commercial Production for Slaughter of Cattle, Calves, Hogs and Sheep and Lambs, 26 Regions of the U.S., 1955 and 1960.

Table C.1—Quarterly Estimates of Cattle Production for Slaughter, 26 Regions of the U. S., 1955.

Region	January-March			April-June		
	Farm Slaughter	Comm'l Slaughter	Total	Farm Slaughter	Comm'l Slaughter	Total
	(1000 pounds liveweight)					
1	3,309	47,600	50,909	3,018	43,412	46,429
2	13,211	213,243	226,454	13,472	217,452	230,924
3	3,820	106,417	110,237	3,966	110,476	114,441
4	666	35,134	35,800	637	33,631	34,268
5	1,143	35,034	36,177	1,267	38,830	40,097
6	1,204	65,268	66,472	1,520	82,400	83,921
7	2,747	89,586	92,333	2,953	96,300	99,253
8	10,023	146,532	156,555	10,138	148,217	158,355
9	7,864	177,014	184,877	8,113	182,629	190,743
10	6,970	102,816	109,786	7,284	107,444	114,728
11	10,983	460,439	471,422	11,355	476,046	487,401
12	11,926	132,198	144,124	12,000	133,027	145,028
13	1,436	68,418	69,852	1,670	79,606	81,275
14	6,076	267,752	273,828	6,448	284,151	290,599
15	15,533	725,234	740,767	15,792	737,314	753,106
16	14,384	291,256	305,641	14,382	291,210	305,592
17	4,595	398,850	403,445	5,858	508,494	514,352
18	6,980	405,660	412,640	6,734	391,323	398,057
19	7,949	558,358	566,307	8,165	573,526	581,691
20	8,843	213,813	222,655	8,785	212,407	221,191
21	2,458	236,928	239,387	2,450	236,115	238,565
22	4,011	129,056	133,066	4,345	139,822	144,167
23	1,341	112,724	114,065	1,373	115,467	116,840
24	4,556	119,399	123,954	3,868	101,379	105,247
25	2,974	390,021	392,995	3,095	405,868	408,963
26	8,358	100,570	108,928	8,523	102,557	111,080
Total ..	163,360	5,629,320	5,792,676	167,211	5,849,103	6,016,313

Table C.2—Quarterly Estimates of Cattle Production for Slaughter, 26 Regions of the U. S., 1955.

Region	July-September			October-December		
	Farm Slaughter	Comm'l Slaughter	Total	Farm Slaughter	Comm'l Slaughter	Total
	(1000 pounds liveweight)					
1	3,039	43,718	46,757	3,495	50,279	53,774
2	14,878	240,147	255,025	14,725	237,684	252,409
3	4,784	133,290	138,075	4,583	127,659	132,242
4	602	31,763	32,365	535	28,218	28,752
5	1,464	44,843	46,306	1,323	40,531	41,854
6	1,525	82,654	84,179	1,327	71,950	73,277
7	3,692	120,414	124,106	3,276	106,853	110,129
8	10,998	160,797	171,795	11,014	161,029	172,044
9	8,845	199,107	207,952	8,964	201,781	210,745
10	7,818	115,316	123,134	7,482	110,361	117,843
11	11,924	499,895	511,820	11,977	502,123	514,100
12	12,843	142,363	155,206	14,603	161,875	176,478
13	1,727	82,306	84,032	1,555	74,123	75,677
14	6,879	303,148	310,027	6,836	301,270	308,107
15	18,123	846,159	864,282	18,929	883,779	902,708
16	15,169	307,138	322,307	16,666	337,451	354,117
17	5,821	505,313	511,134	5,034	437,005	442,039
18	8,214	477,356	485,571	8,500	493,936	502,435
19	8,768	615,919	624,687	8,947	628,472	637,419
20	10,005	241,925	251,931	11,010	266,229	277,240
21	2,430	234,215	236,645	2,447	235,875	238,322
22	4,858	156,330	161,188	4,352	140,053	144,405
23	1,424	119,707	121,131	1,308	109,952	111,260
24	4,192	109,873	114,066	4,325	113,366	117,691
25	3,341	438,175	441,516	3,246	425,733	428,979
26	9,664	116,289	125,954	8,863	106,645	115,508
Total ..	183,027	6,368,160	6,551,191	185,322	6,354,232	6,539,554

Table C.3—Quarterly Estimates of Cattle Production for Slaughter, 26 Regions of the U. S., 1960.

Region	January-March			April-June		
	Farm Slaughter	Comm'l Slaughter	Total	Farm Slaughter	Comm'l Slaughter	Total
	(1000 pounds liveweight)					
1	2,782	37,962	40,745	2,401	32,760	35,161
2	13,883	222,225	236,109	13,416	214,753	228,169
3	3,439	120,707	124,146	3,456	121,304	124,761
4	501	34,372	34,873	546	37,417	37,964
5	1,541	22,516	24,057	1,672	24,425	26,097
6	987	54,557	55,545	1,261	69,687	70,949
7	2,855	94,797	97,652	2,837	94,225	97,062
8	9,303	145,517	154,820	9,191	143,764	152,955
9	7,802	183,936	191,738	7,904	186,334	194,237
10	5,266	100,542	105,809	5,336	101,864	107,200
11	11,747	553,764	565,511	11,519	543,003	554,522
12	12,134	126,821	138,955	11,617	121,417	133,034
13	1,307	45,352	46,658	1,372	47,636	49,008
14	6,187	323,824	330,011	6,000	314,032	320,031
15	15,743	929,315	945,058	15,286	902,343	917,629
16	14,418	388,720	403,138	14,580	393,104	407,684
17	5,136	394,712	399,848	6,264	481,418	487,682
18	8,383	499,475	507,858	7,671	457,049	464,720
19	7,856	541,542	549,398	7,671	528,752	536,423
20	8,960	155,732	164,692	9,259	160,940	170,199
21	2,617	281,900	284,517	2,882	310,532	313,414
22	3,888	86,485	90,373	4,319	96,071	100,391
23	1,681	161,833	163,514	1,749	168,326	170,075
24	3,950	87,830	91,780	4,083	90,790	94,874
25	3,162	459,641	462,802	3,075	446,982	450,057
26	8,999	66,460	75,459	9,271	68,469	77,741
Total ..	164,527	6,120,537	6,285,066	164,638	6,157,397	6,322,039

Table C.4—Quarterly Estimates of Cattle Production for Slaughter, 26 Regions of the U. S., 1960.

Region	July-September			October-December		
	Farm Slaughter	Comm'l Slaughter	Total	Farm Slaughter	Comm'l Slaughter	Total
	(1000 pounds liveweight)					
1	2,560	34,932	37,493	3,244	44,259	47,502
2	13,869	221,988	235,856	13,508	216,211	229,719
3	3,952	138,717	142,669	3,977	139,589	143,565
4	522	35,798	36,320	519	35,610	36,129
5	1,819	26,576	28,394	1,755	25,638	27,393
6	1,456	80,427	81,882	1,394	77,000	78,393
7	3,414	113,356	116,769	3,318	110,192	113,511
8	10,084	157,747	167,831	9,059	141,709	150,768
9	8,210	193,555	201,766	7,709	181,734	189,442
10	5,609	107,072	112,680	5,194	99,165	104,359
11	11,566	545,233	556,799	10,971	517,185	528,157
12	11,722	122,509	134,231	12,185	127,352	139,537
13	1,535	53,286	54,822	1,341	46,534	47,875
14	6,204	324,717	330,921	5,889	308,234	314,123
15	16,749	988,739	1,005,488	16,422	969,399	985,821
16	15,684	422,850	438,534	15,445	416,412	431,857
17	6,560	504,113	510,673	6,255	480,748	487,003
18	8,799	524,245	533,045	8,355	497,782	506,136
19	8,524	587,562	596,086	8,073	556,469	564,542
20	10,741	186,699	197,442	10,737	186,623	197,360
21	2,776	299,037	301,812	3,013	324,562	327,575
22	5,152	114,590	119,741	4,729	105,192	109,922
23	1,809	174,177	175,986	1,728	166,367	168,095
24	4,582	101,876	106,458	4,288	95,351	99,639
25	3,406	494,975	498,380	3,290	478,121	481,411
26	10,530	77,763	88,292	9,896	73,085	82,981
Total ..	177,834	6,632,589	6,810,370	172,294	6,420,523	6,592,815

Table C.5—Quarterly Estimates of Calf Production for Slaughter, 26 Regions of the U. S., 1955.

Region	January-March			April-June		
	Farm Slaughter	Comm'l Slaughter	Total	Farm Slaughter	Comm'l Slaughter	Total
	(1000 pounds liveweight)					
1	299.6	10,756.0	11,055.6	232.5	8,348.3	8,580.8
2	1,416.1	45,909.0	47,325.1	1,431.9	46,418.0	47,849.5
3	671.6	24,822.0	25,493.4	1,010.6	37,351.0	38,361.6
4	186.1	13,097.0	13,283.0	200.9	14,138.0	14,339.0
5	935.1	12,221.0	13,156.5	1,120.9	14,650.0	15,770.4
6	1,674.1	27,530.0	29,203.6	2,040.1	33,548.0	35,588.2
7	567.1	20,426.0	20,992.6	759.8	27,369.0	28,128.5
8	491.2	11,395.0	11,886.7	544.4	12,629.0	13,173.2
9	599.0	5,940.0	6,539.3	773.5	7,671.0	8,444.2
10	560.3	8,813.0	9,373.7	672.1	10,571.0	11,243.3
11	692.6	8,214.5	8,907.1	718.1	8,516.1	9,234.2
12	719.6	43,553.6	44,273.3	614.6	37,198.0	37,812.6
13	2,407.0	32,760.6	35,167.7	2,640.3	35,936.0	38,576.4
14	1,588.6	29,399.8	30,988.4	1,939.0	35,884.2	37,823.2
15	778.9	16,326.2	17,105.1	713.0	14,943.7	15,656.7
16	778.8	22,562.8	23,341.6	740.2	21,442.6	22,182.8
17	9,195.1	110,144.6	119,339.6	10,304.7	123,436.0	133,740.6
18	1,950.8	7,237.2	9,187.9	2,167.9	8,042.7	10,210.5
19	1,027.8	9,977.1	11,004.9	970.1	9,416.6	10,386.7
20	962.2	18,515.0	19,477.2	1,113.0	21,415.9	22,528.9
21	789.8	13,780.5	14,570.3	681.7	11,894.5	12,576.2
22	790.5	20,607.8	21,398.3	711.1	18,540.1	19,251.2
23	1,181.6	20,563.1	21,744.7	1,222.0	21,265.7	22,487.7
24	1,257.4	9,240.7	10,498.1	1,144.4	8,409.7	9,554.1
25	900.8	42,402.1	43,302.9	943.4	44,410.6	45,354.0
26	1,810.1	8,005.1	9,815.3	1,942.4	8,589.9	10,532.3
Total ..	34,231.8	594,199.7	628,431.9	37,352.6	642,035.6	679,386.8

Table C.6—Quarterly Estimates of Calf Production for Slaughter, 26 Regions of the U. S., 1955.

Region	July-September			October-December		
	Farm Slaughter	Comm'l Slaughter	Total	Farm Slaughter	Comm'l Slaughter	Total
	(1000 pounds liveweight)					
1	261.9	9,401.7	9,663.6	293.0	10,517.0	10,810.0
2	1,606.0	52,063.0	53,668.6	1,521.0	49,305.0	50,825.7
3	1,183.5	43,742.0	44,925.2	775.0	28,655.0	29,430.8
4	292.6	20,597.0	20,889.9	273.5	19,248.0	19,521.1
5	1,527.0	19,956.0	21,483.0	1,213.1	15,855.0	17,068.1
6	2,406.2	39,570.0	41,975.9	2,113.7	34,759.0	36,872.2
7	1,004.2	36,170.0	37,174.1	772.0	27,806.0	28,577.9
8	531.0	12,319.0	12,850.2	460.5	10,682.0	11,142.9
9	826.6	8,197.0	9,023.5	677.8	6,721.0	7,399.0
10	806.0	12,672.0	13,477.6	590.0	9,280.0	9,870.4
11	827.7	9,816.8	10,644.5	786.6	9,328.6	10,115.2
12	495.9	30,015.5	30,511.5	782.8	47,380.8	48,163.7
13	2,896.2	39,418.7	42,314.9	2,761.5	37,584.6	40,346.1
14	2,462.2	45,566.9	48,029.2	2,049.1	37,922.1	39,971.2
15	779.4	16,336.1	17,115.5	1,040.0	21,792.0	22,831.7
16	635.2	18,402.8	19,038.0	1,067.0	30,902.8	31,969.6
17	13,090.9	156,811.4	169,902.3	11,282.3	135,147.1	146,429.4
18	2,910.3	10,797.0	13,707.3	2,289.1	8,492.2	10,781.2
19	952.0	9,240.0	10,191.9	1,177.2	11,427.3	12,604.5
20	1,648.0	31,709.5	33,357.4	1,991.0	38,306.6	40,297.4
21	813.8	14,199.6	15,013.4	832.8	14,531.4	15,364.2
22	849.3	22,141.2	22,990.5	695.1	18,121.9	18,817.0
23	1,225.2	21,322.1	22,547.3	1,168.3	20,331.0	21,499.3
24	1,415.3	10,400.6	11,815.8	1,331.0	9,781.0	11,112.0
25	956.5	45,025.1	45,981.6	810.3	38,143.2	38,953.5
26	3,043.0	13,457.4	16,500.5	2,492.4	11,022.5	13,515.0
Total ..	45,445.9	749,348.4	794,793.2	41,246.1	703,043.1	744,289.1

Table C.7—Quarterly Estimates of Calf Production for Slaughter, 26 Regions of the U. S., 1960.

Region	January-March			April-June		
	Farm Slaughter	Comm'l Slaughter	Total	Farm Slaughter	Comm'l Slaughter	Total
	(1000 pounds liveweight)					
1	217.7	9,586.9	9,804.6	186.3	8,201.4	8,387.7
2	1,032.8	42,831.4	43,864.2	977.2	40,526.2	41,503.4
3	662.4	22,539.2	23,201.6	998.3	33,967.3	34,965.6
4	154.6	6,124.1	6,278.7	149.4	5,916.3	6,065.7
5	772.8	5,613.4	6,386.3	912.6	6,629.0	7,541.6
6	1,665.8	18,300.9	19,966.7	2,218.9	24,377.0	26,595.8
7	549.6	11,955.4	12,505.0	705.2	15,341.3	16,046.5
8	404.2	8,519.9	8,924.2	409.6	8,632.2	9,041.8
9	317.5	5,902.2	6,219.7	332.0	6,171.7	6,503.7
10	359.0	7,634.9	7,993.9	414.0	8,805.1	9,219.1
11	451.5	4,364.0	4,815.5	422.3	4,081.9	4,504.1
12	478.4	30,311.4	30,789.8	377.4	23,909.5	24,286.9
13	2,521.6	19,586.5	22,108.1	2,580.4	20,042.9	22,623.3
14	999.7	21,096.6	22,096.4	1,058.0	22,326.4	23,384.4
15	531.3	16,139.2	16,670.5	372.6	11,319.9	11,692.6
16	723.9	23,071.2	23,795.1	557.7	17,774.5	18,332.2
17	9,669.3	48,825.4	58,494.7	11,430.0	57,715.6	69,145.6
18	1,516.3	4,424.1	5,940.5	1,532.9	4,472.5	6,005.4
19	878.5	12,233.5	13,112.0	1,494.1	20,805.8	22,299.9
20	793.4	7,535.2	8,328.6	2,526.4	23,993.8	26,520.2
21	924.1	13,251.5	14,175.6	870.9	12,487.9	13,358.8
22	408.2	11,260.9	11,669.1	717.2	19,787.0	20,504.2
23	866.1	6,126.3	6,992.4	992.8	7,022.0	8,014.7
24	1,046.9	8,294.8	9,341.7	968.6	7,674.3	8,642.9
25	1,040.3	24,087.8	25,128.1	948.0	21,950.9	22,898.9
26	1,489.9	9,361.0	10,850.9	1,459.2	9,167.9	10,627.1
Total ..	30,475.8	398,977.7	429,453.9	35,612.0	443,100.3	478,712.1

Table C.8—Quarterly Estimates of Calf Production for Slaughter, 26 Regions of the U. S., 1960.

Region	July-September			October-December		
	Farm Slaughter	Comm'l Slaughter	Total	Farm Slaughter	Comm'l Slaughter	Total
	(1000 pounds liveweight)					
1	222.4	9,792.3	10,014.7	225.6	9,930.4	10,155.9
2	1,151.2	47,744.3	48,895.6	1,071.8	44,448.0	45,519.8
3	1,080.1	36,750.1	37,830.2	978.3	33,286.4	34,264.6
4	295.9	11,718.6	12,014.5	273.1	10,814.1	11,087.2
5	1,259.2	9,146.0	10,405.2	1,085.4	7,883.6	8,968.9
6	2,655.3	29,171.3	31,826.6	2,191.1	24,071.9	26,262.9
7	978.5	21,285.5	22,264.0	912.7	19,854.7	20,767.4
8	416.2	8,771.4	9,187.5	408.1	8,600.5	9,008.5
9	370.7	6,891.6	7,262.3	339.8	6,317.5	6,657.3
10	475.7	10,116.7	10,592.5	471.2	10,021.2	10,492.5
11	452.4	4,373.6	4,826.0	527.8	5,102.5	5,630.4
12	363.0	22,999.8	23,362.9	501.2	31,752.2	32,253.4
13	3,039.8	23,611.0	26,650.8	2,732.3	21,222.6	23,954.9
14	1,650.8	34,834.9	36,485.7	1,642.5	34,659.1	36,301.5
15	413.0	12,545.9	12,958.9	510.1	15,495.0	16,005.1
16	429.8	13,698.7	14,128.5	668.5	21,306.6	21,975.2
17	14,583.4	73,638.9	88,222.2	12,433.3	62,782.1	75,215.4
18	2,278.0	6,646.4	8,924.4	2,113.7	6,167.0	8,280.7
19	979.0	13,632.4	14,611.4	1,188.4	16,549.4	17,737.8
20	793.4	7,535.2	8,328.6	1,607.7	15,268.8	16,876.5
21	817.0	11,714.6	12,531.6	788.0	11,299.0	12,087.0
22	950.4	26,221.8	27,172.2	752.2	20,752.3	21,504.5
23	949.2	6,713.6	7,662.8	845.9	5,983.1	6,829.0
24	1,159.7	9,188.3	10,348.0	1,050.7	8,324.6	9,375.3
25	1,139.5	26,384.2	27,523.7	953.1	22,069.2	23,022.3
26	2,001.8	12,577.5	14,579.3	1,870.1	11,749.6	13,619.6
Total ..	40,905.4	497,704.6	538,610.1	38,142.6	485,711.4	523,853.6

Table C.9—Quarterly Estimates of Hog Production for Slaughter, 26 Regions of the U. S., 1955.

Region	January-March			April-June		
	Farm Slaughter	Comm'l Slaughter	Total	Farm Slaughter	Comm'l Slaughter	Total
	(1000 pounds liveweight)					
1	2,826.3	12,447.8	15,274.1	2,142.1	9,434.4	11,576.5
2	22,535.1	74,657.6	97,192.6	19,411.8	64,310.3	83,722.1
3	61,446.1	91,260.2	152,706.3	54,149.2	80,422.7	134,571.9
4	7,445.9	21,498.5	28,944.4	3,863.9	11,156.2	15,020.0
5	39,032.5	97,792.6	136,825.1	28,223.4	70,711.4	98,934.8
6	30,972.2	87,870.7	118,842.9	23,611.6	66,988.3	90,599.9
7	43,821.1	130,801.5	174,622.6	39,148.6	116,854.6	156,003.2
8	12,915.0	245,663.0	258,578.0	10,217.9	194,359.0	204,576.9
9	13,112.9	396,599.3	409,712.2	11,049.8	334,199.1	345,248.9
10	7,357.8	61,870.1	69,227.9	6,326.8	53,200.7	59,527.5
11	18,910.5	638,785.7	657,696.1	15,573.9	526,077.5	541,651.4
12	17,125.8	182,816.4	199,942.2	13,837.5	147,714.4	161,551.9
13	20,588.2	38,287.4	58,875.7	16,751.9	31,153.1	47,905.1
14	20,701.8	284,361.9	305,064.0	16,210.1	222,663.1	238,873.0
15	23,679.5	1,180,666.3	1,204,346.0	18,661.0	930,443.4	949,104.0
16	19,179.5	346,039.4	365,219.0	15,641.4	282,204.7	297,846.0
17	28,591.4	101,029.4	129,621.0	21,110.1	74,593.7	95,704.0
18	8,130.7	71,993.5	80,124.0	6,843.7	60,597.6	67,441.0
19	9,436.4	232,673.0	242,109.0	7,995.1	197,136.0	205,131.0
20	14,379.7	194,874.7	209,254.0	12,372.2	167,668.5	180,041.0
21	2,360.3	11,979.8	14,340.0	1,960.3	9,949.5	11,910.0
22	3,477.2	10,882.8	14,360.0	3,385.4	10,595.4	13,981.0
23	1,519.2	3,829.5	5,349.0	1,405.9	3,543.9	4,950.0
24	2,902.6	10,483.9	13,386.0	2,614.4	9,443.1	12,058.0
25	2,079.9	27,578.3	29,658.0	1,744.7	23,132.6	24,877.0
26	3,953.3	21,688.1	25,641.0	3,497.4	19,186.8	22,684.0
Total ..	438,480.9	4,578,431.4	5,016,911.1	35,775.0	3,717,739.9	4,075,490.1

Table C.10—Quarterly Estimates of Hog Production for Slaughter, 26 Regions of the U. S., 1955.

Region	July-September			October-December		
	Farm Slaughter	Comm'l Slaughter	Total	Farm Slaughter	Comm'l Slaughter	Total
	(1000 pounds liveweight)					
1	1,953.4	8,603.2	10,556.5	3,390.2	14,931.6	18,321.9
2	18,893.6	62,593.6	81,487.2	25,380.5	84,084.5	109,465.0
3	52,305.9	77,685.0	129,990.8	66,825.8	99,250.2	166,076.0
4	4,468.7	12,902.5	17,371.3	8,355.5	24,124.8	32,480.3
5	30,290.3	75,889.8	106,180.1	46,597.9	116,747.1	163,345.0
6	22,936.3	65,072.3	88,008.6	32,647.8	92,624.7	125,272.6
7	36,142.9	107,883.0	144,026.0	50,746.4	151,472.9	202,219.3
8	11,055.1	210,283.3	221,338.4	14,092.0	268,050.7	282,142.7
9	12,549.0	379,542.3	392,091.2	14,768.3	446,666.4	461,434.7
10	6,625.5	55,712.2	62,337.7	7,893.8	66,377.1	74,270.9
11	14,891.6	503,031.4	517,923.0	20,341.1	687,110.4	707,451.4
12	12,548.9	133,958.9	146,507.9	21,087.8	225,110.3	246,198.0
13	15,033.9	27,958.2	42,992.1	22,337.9	41,541.3	63,879.2
14	16,341.1	224,463.4	240,805.0	31,689.0	435,282.6	466,972.0
15	19,053.6	950,019.4	969,073.0	28,842.0	1,438,070.0	1,466,912.0
16	15,826.3	285,540.9	301,367.0	25,448.9	459,153.0	484,602.0
17	19,542.3	69,053.9	88,596.0	37,568.1	132,749.0	170,317.0
18	6,817.3	60,364.1	67,181.0	12,450.3	110,241.8	122,692.0
19	7,917.7	195,226.4	203,144.0	13,568.8	334,567.5	348,136.0
20	11,937.6	161,779.5	173,717.0	17,884.5	242,372.2	260,257.0
21	1,763.3	8,949.7	10,713.0	2,633.0	13,364.0	15,997.0
22	3,390.4	10,611.1	14,002.0	3,691.0	11,551.8	15,243.0
23	1,284.6	3,238.1	4,523.0	1,825.4	4,601.4	6,427.0
24	2,544.5	9,190.4	11,735.0	3,237.5	11,693.7	14,931.0
25	1,611.3	21,364.6	22,976.0	2,196.1	29,118.5	31,315.0
26	3,382.2	18,555.0	21,937.0	4,902.1	26,893.2	31,795.0
Total ..	351,107.3	3,739,472.2	4,090,579.8	520,401.7	5,567,750.7	6,088,153.0

Table C.11—Quarterly Estimates of Hog Production for Slaughter, 26 Regions of the U. S., 1960.

Region	January-March			April-June		
	Farm Slaughter	Comm'l Slaughter	Total	Farm Slaughter	Comm'l Slaughter	Total
	(1000 pounds liveweight)					
1	2,271	13,122	15,393	2,067	11,946	14,014
2	17,445	68,078	85,522	15,077	58,840	73,917
3	49,879	134,661	184,540	45,157	121,914	167,071
4	6,854	21,943	28,797	4,373	14,001	18,374
5	33,516	143,228	176,744	29,388	125,590	154,979
6	23,042	107,419	130,461	21,157	98,629	119,785
7	37,767	187,580	225,347	36,925	183,397	220,322
8	8,750	237,047	245,797	7,946	215,275	223,222
9	8,983	476,068	485,051	8,149	431,890	440,039
10	5,613	67,486	73,099	4,893	58,829	63,722
11	13,020	737,743	750,763	12,428	704,160	716,588
12	12,776	197,111	209,886	10,520	162,311	172,831
13	15,236	41,404	56,640	13,341	36,253	49,594
14	18,219	365,344	383,563	16,805	336,983	353,788
15	16,939	1,210,672	1,227,611	14,952	1,068,643	1,083,595
16	15,378	363,065	378,443	13,202	311,683	324,885
17	20,588	112,375	132,963	18,024	98,381	116,405
18	6,229	106,523	112,752	5,760	98,502	104,262
19	7,427	233,532	240,959	7,126	224,053	231,179
20	10,889	175,357	186,246	9,836	158,390	168,225
21	2,146	16,461	18,607	1,911	14,661	16,572
22	2,975	12,656	15,631	2,920	12,423	15,343
23	1,483	5,789	7,272	1,226	4,786	6,013
24	2,783	16,259	19,042	2,424	14,162	16,586
25	1,667	24,404	26,071	1,543	22,589	24,132
26	3,873	25,945	29,818	3,147	21,079	24,226
Total	345,748	5,101,272	5,447,018	310,297	4,609,370	4,919,669

Table C.12—Quarterly Estimates of Hog Production for Slaughter, 26 Regions of the U. S., 1960.

Region	July-September			October-December		
	Farm Slaughter	Comm'l Slaughter	Total	Farm Slaughter	Comm'l Slaughter	Total
	(1000 pounds liveweight)					
1	1,728	9,988	11,716	2,219	12,821	15,040
2	14,383	56,131	70,514	17,055	66,557	83,611
3	42,069	113,578	155,647	45,071	121,681	166,752
4	4,272	13,678	17,950	6,308	20,194	26,501
5	24,396	104,254	128,650	29,217	124,858	154,075
6	18,898	88,099	106,997	20,808	97,004	117,812
7	33,647	167,116	200,763	35,692	177,274	212,966
8	7,727	209,332	217,059	7,919	214,549	222,468
9	7,561	400,710	408,270	7,951	421,370	429,320
10	4,805	57,775	62,580	4,866	58,509	63,376
11	11,277	638,972	650,249	11,587	656,513	668,100
12	8,461	130,539	139,000	10,424	160,825	171,249
13	12,815	34,825	47,640	14,730	40,028	54,758
14	13,600	272,711	286,310	15,895	318,737	334,632
15	13,875	991,646	1,005,520	16,891	1,207,188	1,224,078
16	13,164	310,789	323,953	15,246	359,950	375,196
17	15,059	82,201	97,260	17,980	98,143	116,123
18	4,620	78,998	83,618	5,496	93,985	99,482
19	6,188	194,560	200,748	7,242	227,720	234,962
20	8,705	140,173	148,878	12,408	199,812	212,220
21	1,696	13,007	14,703	1,629	12,493	14,122
22	2,890	12,293	15,182	2,827	12,028	14,855
23	1,200	4,682	5,882	1,257	4,907	6,165
24	2,279	13,315	15,595	2,315	13,526	15,842
25	1,470	21,518	22,988	1,523	22,298	23,821
26	3,126	20,942	24,068	3,367	22,554	25,921
Total	279,911	4,181,832	4,461,740	317,923	4,765,524	5,083,447

Table C.13—Quarterly Estimates of Sheep and Lamb Production for Slaughter, 26 Regions of the U. S., 1955.

Region	January-March			April-June		
	Farm Slaughter	Comm'l Slaughter	Total	Farm Slaughter	Comm'l Slaughter	Total
	(1000 pounds liveweight)					
1	34	668	703	36	698	734
2	271	5,473	5,743	246	4,985	5,231
3	121	3,017	3,138	261	6,501	6,761
4	—	22	22	—	—	0
5	9	134	143	21	319	340
6	36	1,256	1,292	44	1,558	1,602
7	52	3,513	3,564	183	12,461	12,645
8	151	15,378	15,529	144	14,680	14,824
9	66	7,371	7,437	71	8,014	8,085
10	137	6,280	6,417	111	5,087	5,199
11	43	14,939	14,982	43	14,989	15,033
12	109	5,778	5,887	76	4,011	4,087
13	80	849	928	139	1,478	1,617
14	156	18,633	18,789	145	17,337	17,482
15	90	37,589	37,679	81	33,857	33,938
16	130	23,372	23,503	82	14,650	14,732
17	259	22,207	22,467	547	46,811	47,358
18	92	15,243	15,335	106	17,691	17,797
19	85	31,619	31,704	65	24,133	24,197
20	192	29,539	29,731	121	18,579	18,699
21	335	37,824	38,159	197	22,191	22,388
22	269	13,482	13,750	264	13,261	13,525
23	2,774	8,340	11,115	2,807	8,437	11,244
24	501	20,638	21,139	749	30,866	31,615
25	560	37,709	38,269	607	40,866	41,473
26	182	10,182	10,364	215	12,021	12,237
Total	6,734	371,055	377,789	7,361	375,481	382,843

Table C.14—Quarterly Estimates of Sheep and Lamb Production for Slaughter, 26 Regions of the U. S., 1955.

Region	July-September			October-December		
	Farm Slaughter	Comm'l Slaughter	Total	Farm Slaughter	Comm'l Slaughter	Total
	(1000 pounds liveweight)					
1	39	748	786	40	774	814
2	248	5,010	5,257	254	5,147	5,401
3	310	7,740	8,050	185	4,606	4,791
4	—	47	47	—	88	88
5	30	470	501	17	269	286
6	43	1,508	1,550	11	402	413
7	219	14,928	15,147	126	8,553	8,679
8	148	15,100	15,248	138	14,069	14,207
9	85	9,563	9,648	104	11,632	11,736
10	104	4,773	4,877	154	7,044	7,198
11	39	13,477	13,515	46	15,991	16,037
12	65	3,436	3,501	76	4,032	4,108
13	93	986	1,078	90	958	1,048
14	102	12,173	12,276	115	13,737	13,852
15	83	34,439	34,521	92	38,421	38,513
16	92	16,502	16,594	134	23,973	24,107
17	305	26,120	26,425	214	18,346	18,560
18	66	10,943	11,009	71	11,745	11,816
19	62	23,119	23,180	58	21,663	21,721
20	156	24,015	24,171	234	36,046	36,280
21	308	34,699	35,006	311	35,062	35,373
22	619	31,089	31,709	793	39,782	40,575
23	2,381	7,156	9,537	2,343	7,045	9,388
24	1,279	52,699	53,978	845	34,813	35,658
25	572	38,511	39,082	500	33,696	34,196
26	380	21,259	21,640	193	10,808	11,001
Total	7,828	410,510	418,333	7,144	398,702	405,846

Table C.15—Quarterly Estimates of Sheep and Lamb Production for Slaughter, 26 Regions of the U. S., 1960.

Region	January-March			April-June		
	Farm Slaughter	Comm'l Slaughter	Total	Farm Slaughter	Comm'l Slaughter	Total
	(1000 pounds liveweight)					
1	65	870	935	53	705	757
2	250	5,900	6,150	219	5,166	5,384
3	132	2,302	2,434	208	3,623	3,831
4	—	39	39	—	116	116
5	4	83	87	22	426	448
6	52	1,215	1,267	51	1,193	1,243
7	96	6,873	6,969	154	10,994	11,147
8	194	16,359	16,553	156	13,154	13,310
9	114	8,226	8,340	104	7,495	7,599
10	108	4,961	5,069	102	4,716	4,818
11	44	15,881	15,926	38	13,447	13,484
12	106	4,185	4,291	91	3,573	3,664
13	68	494	562	109	797	906
14	143	14,605	14,748	138	14,076	14,214
15	116	40,952	41,069	100	35,095	35,195
16	126	24,783	24,909	70	13,909	13,979
17	229	17,182	17,411	534	40,052	40,586
18	149	16,363	16,512	129	14,159	14,287
19	81	25,545	25,626	64	20,229	20,293
20	216	40,370	40,586	174	32,442	32,615
21	313	41,472	41,785	229	30,311	30,539
22	197	11,119	11,315	192	10,839	11,031
23	2,795	6,414	9,209	2,994	6,869	9,863
24	503	18,004	18,507	559	20,005	20,564
25	536	34,575	35,111	577	37,205	37,782
26	180	6,707	6,887	262	9,785	10,047
Total ..	6,817	365,479	372,297	7,329	350,381	357,702

Table C.16—Quarterly Estimates of Sheep and Lamb Production for Slaughter, 26 Regions of the U. S., 1960.

Region	July-September			October-December		
	Farm Slaughter	Comm'l Slaughter	Total	Farm Slaughter	Comm'l Slaughter	Total
	(1000 pounds liveweight)					
1	59	796	855	63	847	911
2	219	5,174	5,393	222	5,242	5,464
3	295	5,151	5,446	189	3,304	3,493
4	—	69	69	—	41	41
5	34	644	678	15	291	306
6	37	878	915	30	698	727
7	224	16,020	16,244	130	9,338	9,468
8	178	14,991	15,169	165	13,948	14,113
9	124	8,974	9,099	103	7,480	7,584
10	118	5,449	5,567	127	5,833	5,960
11	40	14,314	14,354	50	17,939	17,989
12	90	3,529	3,619	73	2,865	2,938
13	100	733	833	94	685	779
14	131	13,313	13,444	128	12,993	13,121
15	107	37,723	37,830	137	48,025	48,162
16	97	19,235	19,333	167	32,887	33,053
17	454	34,005	34,459	361	27,079	27,441
18	118	12,983	13,101	133	14,614	14,746
19	62	19,384	19,445	75	23,706	23,781
20	193	36,059	36,252	169	31,662	31,831
21	274	36,309	36,584	312	41,332	41,644
22	334	18,885	19,219	1,135	64,141	65,276
23	2,437	5,591	8,027	2,260	5,186	7,447
24	1,386	49,637	51,023	839	30,042	30,881
25	561	36,228	36,790	487	31,430	31,917
26	399	14,908	15,307	242	9,044	9,286
Total ..	8,071	410,982	419,055	7,706	440,652	448,359