Motor Transportation of Livestock

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OHIO

AGRICULTURAL EXPERIMENT STATION

Wooster, Ohio

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MOTOR TRANSPORTATION OF LIVESTOCK

G. F. HENNING AND E. B. POLING

During the past 20 years, transportation within the United States has changed from a system primarily dependent upon railroads to one which at present depends not only on railroads, but also on motor, and, more recently, air carriers. Within this period, motor transportation has increased significantly. In 1920, there were 8,225,000 passenger cars, taxis, and busses and 1,006,000 motor trucks registered in the United States. By 1939, the registration of motor cars and the like had increased to 26,201,000, that of trucks and tractors, to 4,413,000.[1] Trailer registrations increased from 83,000 in 1925 to 1,193,000 in 1939.

With this large increase in motor vehicles during the past 20 years, there has been a decided shift of traffic away from the railroads, and with it, highways have had to be straightened, widened, hard-surfaced, and improved in general to accommodate the increased traffic. These improvements have called for large expenditures of funds on highways. In 1914, the disbursements for highways for the United States, under supervision of state highway departments, amounted to only $24,221,000; but in 1938, they had increased to $1,135,122,000. This sum included only the so-called state roads, no county and township roads.

With the increase of motor vehicles and expenditure of funds, important changes have taken place in the transportation and marketing of agricultural products, especially in the field of livestock marketing. An important development is the rate system in the motor transportation of livestock, important because of the influence rates may have on the system of marketing. Rates of transportation can be favorable or unfavorable to the location of markets, to the type of outlets developed, and to the size and type of market evolved.

The writers will point out some of the important characteristics of livestock marketed by motor truck at the three important Ohio markets, Cleveland, Columbus, and Cincinnati.

INCREASED MOVEMENT OF LIVESTOCK BY TRUCK

Within the past 20 years, the motor truck has changed significantly the transportation of livestock from the farms of this Country.

TRUCK MOVEMENT FOR THE SEVENTEEN PRINCIPAL MARKETS

Table 1 presents the trend of the truck movement at the 17 principal livestock markets of the Country. Both large and small markets are included in the 17, also some western and some eastern. Data are given from 1916, the year when the truck movement was beginning.

A close observation of the 17 markets shows that trucking was used first for calves, and then for hogs, cattle, sheep and lambs. In 1916, 4 per cent of the calf receipts were moved by truck; in 1920, 9.5 per cent. For hogs, truck receipts were less than 2 per cent in 1916 and about 7 per cent by 1920; the

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[1]Source: 1939 Volume of Statistical Abstracts.

biggest swing took place from 1925 to 1935. With cattle, the movement was a gradual increase up to about 1925. It picked up about 1928 and during the following 6 years. Much the same movement took place with sheep and lambs.

TABLE 1.—The number and percentage of livestock received by truck at the 17 principal markets* of the Country

Year	Number of head				Percentage of total receipts			
	Cattle	Calves	Hogs	Sheep	Cattle	Calves	Hogs	Sheep
1916........	163,621	60,821	579,102	181,015	1.38	4.10	1.79	1.28
1920........	289,940	304,130	2,063,212	505,203	2.22	9.49	6.95	3.43
1925........	641,770	568,909	3,504,539	861,854	4.68	13.20	11.08	6.05
1930........	2,035,370	1,322,947	10,512,661	2,545,430	18.60	35.64	35.59	14.03
1935........	5,757,082	2,385,825	9,609,602	4,928,867	51.44	64.51	69.43	31.50
1936........	6,645,277	2,536,011	13,319,753	4,603,549	56.49	67.27	70.74	30.57
1937........	5,859,314	2,649,054	10,917,257	4,733,790	52.39	65.00	70.84	30.06
1938........	6,096,037	2,280,086	12,142,439	4,991,023	59.09	65.10	71.43	30.89
1939........	6,261,000	2,219,250	14,411,000	4,852,000	62.34	64.49	75.34	32.32
1940........	6,809,851	2,258,577	18,265,453	5,095,798	66.65	70.72	74.91	35.25

*The 17 markets include: Chicago, Cincinnati, Denver, East St. Louis, Fort Worth, Indianapolis, Kansas City, Louisville, Milwaukee, Oklahoma City, Omaha, Portland, St. Joseph, St. Paul, Sioux City, Wichita, and Sioux Falls.
Source: Bureau of Agricultural Economics, U. S. D. A.

REGIONAL MOVEMENTS—EASTERN, CENTRAL, AND WESTERN CORN BELT MOVEMENT

That the development of trucking has not been uniform throughout the Country is shown by a comparison of the 17 markets with 5 markets in the eastern Corn Belt, 2 in the central, and 2 in the western Corn Belt. The five eastern markets are Buffalo, Cincinnati, Cleveland, Pittsburgh, and Indianapolis; the two central are East St. Louis and Chicago; and the two western are Omaha and Sioux City. This information, which figures 1, 2, 3, and 4 present, shows the rate of growth by regions.

For cattle, the rate of development for the two western and two central markets has been much the same. The rate is about the same as that for the 17 markets. In the five eastern markets, however, the movement was under way sooner and has shown a slower rate of development. For the past few years, the rate of increase has slowed down perceptibly, indicating that for cattle, the big shift to trucking may have been completed. The influence of the drouth years 1934 and 1936 shows in the years 1935 and 1937 for the two western markets.

For calves, a different rate of increase has taken place in each group of markets. The slowest rate of increase has occurred in the five eastern markets, the fastest in the two central markets. Up to the year 1927, there was little difference between the two western and the two central markets, but after that date, the rate of increase slowed down for the two western Corn Belt markets.

For hogs, the rate of increase was much the same for the 17 markets and the 2 western Corn Belt markets. The two central Corn Belt markets have shown the most rapid increase, starting about 1921 and continuing until 1934. For the eastern Corn Belt, the rate has been much slower, as it was with calves. The decreased number of hogs for market since 1934 has slowed down the rate of increase, but the percentage received by truck has continued to rise during the past 4 years.

NUMBER

Fig. 1.—The number of cattle received by truck at 17 principal
markets of the United States compared with other
selected Corn Belt markets

Fig. 2.—The number of calves received by truck at 17 principal
markets of the United States compared with other
selected Corn Belt markets

Fig. 3.—The number of hogs received by truck at 17 principal
markets of the United States compared with other
selected Corn Belt markets

NUMBER
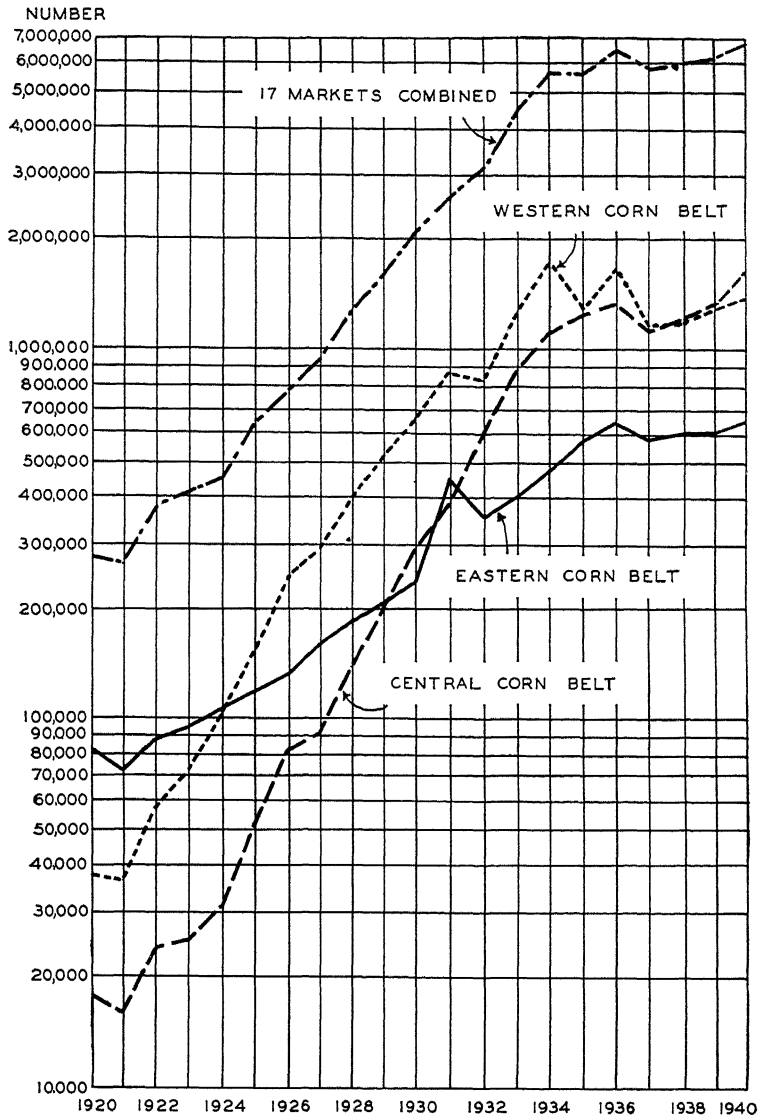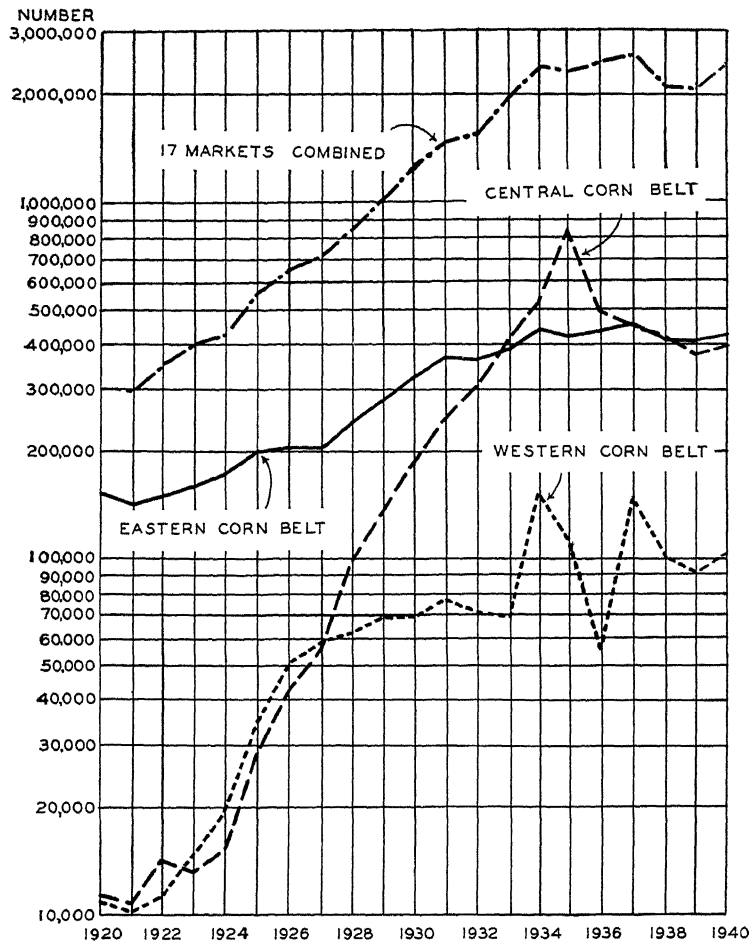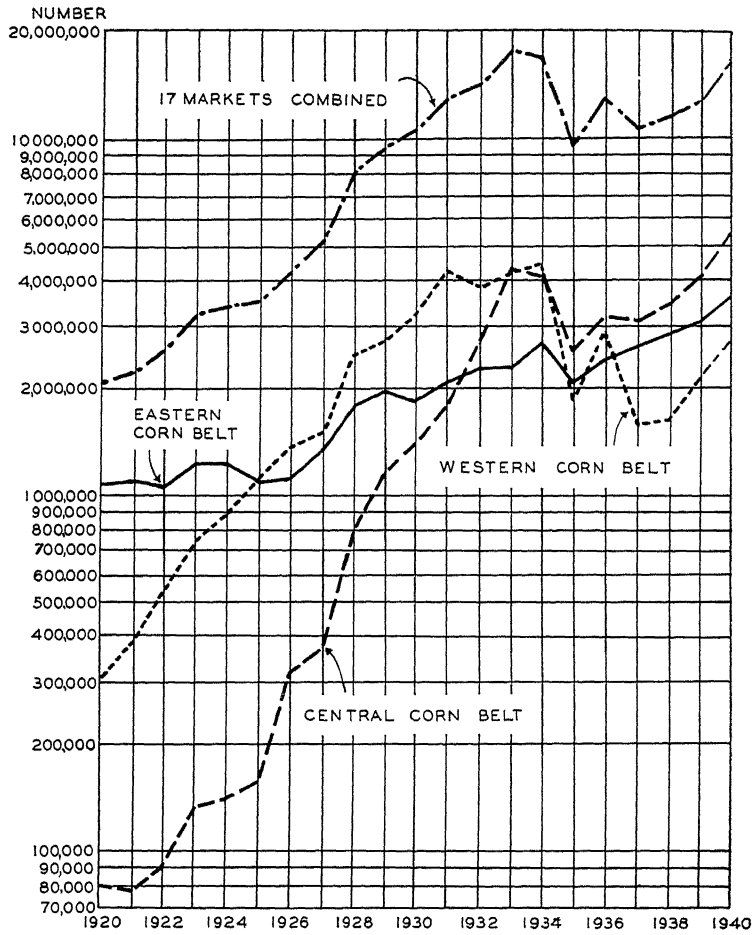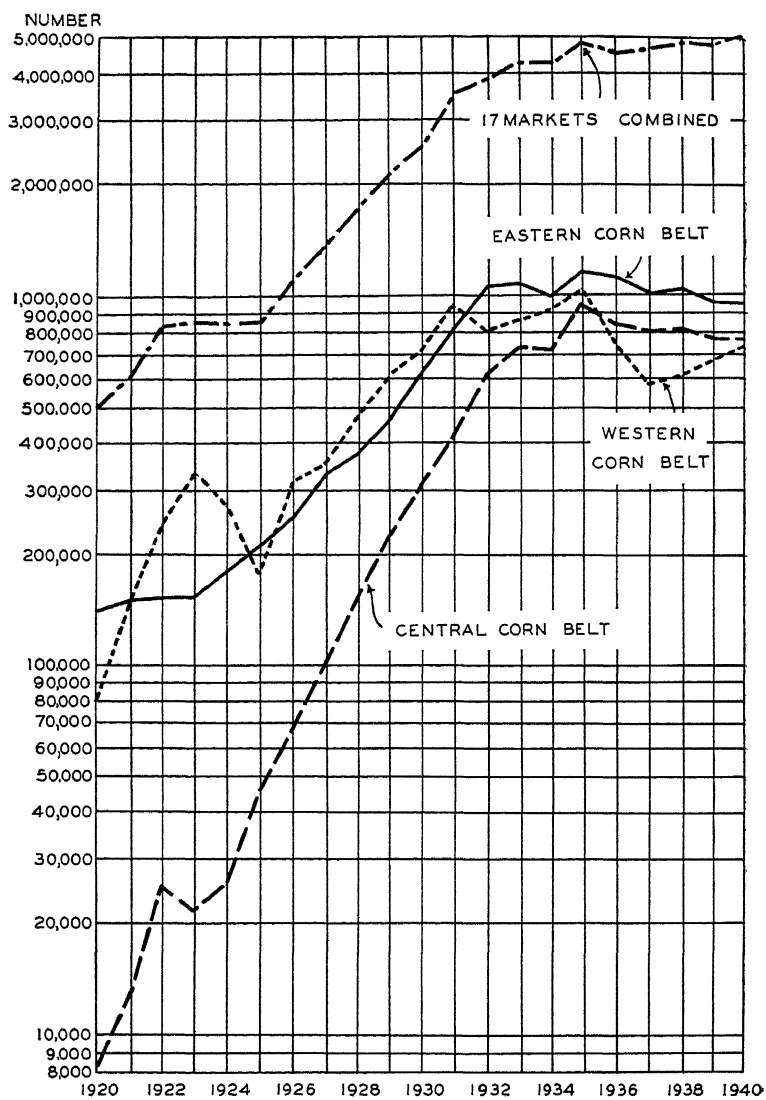

Fig. 4.—The number of sheep and lambs received by truck at 17
principal markets of the United States compared with
other selected Corn Belt markets

For sheep and lambs, the movement has been much the same as for cattle, except that the eastern Corn Belt markets have followed closely the three other groups of markets. The central Corn Belt has shown the greatest rate of increase.

TRUCK MOVEMENT AT FOUR EASTERN MARKETS

Two comparisons can be made to show the relative importance of, and the increased, movement of livestock by truck. One is obtained by using total receipts, and the other, by using market receipts. This information is not available for all markets, but comparisons have been made for the four eastern markets since 1929. Some markets include in total receipts other livestock passing through the yards, such as livestock that was fed while in transit. Most livestock trucked to a market is sent there for sale; therefore, to show the importance of truck transportation, it is better, where they are available, to use only those receipts consigned to the market for sale. Unfortunately, this information is not available on all markets. Table 2 presents this information for the four eastern markets combined.

TABLE 2.—Livestock receipts by truck compared with total receipts and receipts received for sale on the four markets combined, Buffalo, Pittsburgh, Cleveland, and Cincinnati, 1929-1940

Year	Cattle		Calves		Hogs		Sheep	
	Per cent truck of total	Per cent truck of market receipts	Per cent truck of total	Per cent truck of market receipts	Per cent truck of total	Per cent truck of market receipts	Per cent truck of total	Per cent truck of market receipts
1929.........	13.32	23.64	20.07	38.38	12.27	20.32	12.42	22.58
1930..........	14.01	24.73	21.70	43.43	12.83	24.18	12.04	24.44
1931..........	13.37	27.94	26.28	50.88	17.24	29.99	16.07	34.35
1932..........	21.32	39.75	30.42	58.19	26.95	35.41	23.67	43.06
1933..........	26.84	49.64	33.39	66.23	35.79	43.94	29.15	54.84
1934..........	23.26	55.31	32.05	69.79	37.23	45.86	32.12	38.14
1935..........	36.73	64.22	31.49	77.20	47.18	66.53	31.12	65.26
1936..........	36.74	64.22	34.23	77.11	53.52	72.34	29.26	65.94
1937..........	36.89	65.06	35.11	82.31	61.60	78.15	27.72	69.37
1938..........	37.63	72.72	34.56	86.30	60.64	83.03	27.70	71.21
1939..........	41.88	75.72	38.72	87.19	54.88	82.22	30.24	79.50
1940..........	53.06	78.23	38.91	90.33	52.74	80.41	29.60	82.08

An analysis of table 2 shows that the truck movement was much more significant when compared with receipts for sale. More than 75 per cent of the cattle, 80 per cent of the hogs and sheep, and 90 per cent of the calves consigned for sale during the year 1940 arrived by truck at the four eastern markets. There were significant increases in 1939 and 1940 over previous years for all species. Tables 3, 4, 5, and 6 give this same information by markets and by species. The Pittsburgh market shows the greatest difference when the comparison is made on a basis of market receipts rather than total receipts. Slightly more than 80 per cent of the calves sold on the Pittsburgh market in 1940 were received by truck, but only 15 per cent of the total receipts arrived by truck. Rather large receipts by rail passed through the yards but were not consigned for sale. Buffalo ranked next to Pittsburgh in showing the widest variation.

TABLE 3.—Cattle receipts by truck compared with total receipts
and receipts received for sale on the markets, Buffalo,
Pittsburgh, Cleveland, and Cincinnati, 1929-1940

Year	Buffalo		Pittsburgh		Cleveland		Cincinnati	
	Per cent truck of total	Per cent truck of market receipts	Per cent truck of total	Per cent truck of market receipts	Per cent truck of total	Per cent truck of market receipts	Per cent truck of total	Per cent truck of market receipts
1929...	14.24	21.50	2.93	18.38	30.98	31.01	18.28	22.39
1930...	14.43	19.46	4.00	22.14	27.41	27.50	20.68	27.76
1931....	12.64	18.07	3.94	31.07	25.54	25.57	23.85	36.23
1932...	12.76	18.68	6.33	39.59	38.28	38.32	38.90	56.27
1933...	14.57	21.70	7.83	47.56	44.10	55.93	48.05	66.74
1934...	17.81	24.37	6.62	53.70	62.95	63.03	33.20	76.57
1935...	24.61	34.55	13.68	67.76	69.82	70.00	59.62	80.12
1936...	25.44	35.47	11.82	60.59	67.16	67.20	63.79	85.04
1937...	31.77	42.09	12.92	64.36	72.64	72.71	57.95	82.85
1938...	32.32	47.47	12.35	66.38	77.15	78.73	62.53	90.20
1939...	33.10	48.65	15.30	78.73	80.00	81.32	67.50	95.02
1940...	30.86	49.54	15.20	82.90	80.90	82.60	65.50	95.20

TABLE 4.—Receipts of calves by truck compared with total receipts and
receipts received for sale on the markets, Buffalo, Pittsburgh,
Cleveland, and Cincinnati, 1929-1940

Year	Buffalo		Pittsburgh		Cleveland		Cincinnati	
	Per cent truck of total	Per cent truck of market receipts	Per cent truck of total	Per cent truck of market receipts	Per cent truck of total	Per cent truck of market receipts	Per cent truck of total	Per cent truck of market receipts
1929.........	13.49	26.66	3.18	14.32	46.05	46.10	53.48	61.81
1930.........	16.38	30.83	3.92	20.54	49.32	50.38	61.05	67.95
1931.........	16.77	32.42	6.33	28.36	61.80	62.57	66.59	72.18
1932.........	17.22	36.97	7.38	35.10	74.52	74.58	68.21	76.58
1933.........	16.59	40.54	8.94	39.21	79.83	83.27	72.52	84.62
1934.........	14.05	39.32	8.23	45.56	86.17	86.30	75.80	88.55
1935.........	12.53	48.43	10.19	62.12	90.21	90.21	78.98	90.02
1936.........	17.24	57.40	11.70	60.29	85.68	85.68	78.32	92.66
1937.........	20.18	68.54	12.25	66.47	90.16	90.34	68.73	92.89
1938.........	21.21	75.23	10.97	72.76	90.86	91.28	87.97	96.31
1939	24.10	76.66	14.10	79.97	93.70	95.34	79.00	88.96
1940.........	21.40	74.85	15.10	81.62	91.90	97.90	85.90	97.16

TABLE 5.—Hog receipts by truck compared with total receipts and
receipts received for sale on the markets, Buffalo, Pittsburgh,
Cleveland, and Cincinnati, 1929-1940

Year	Buffalo		Pittsburgh		Cleveland		Cincinnati	
	Per cent truck of total	Per cent truck of market receipts	Per cent truck of total	Per cent truck of market receipts	Per cent truck of total	Per cent truck of market receipts	Per cent truck of total	Per cent truck of market receipts
1929.........	3.02	3.06	0.41	1.26	18.05	18.43	32.82	53.61
1930.........	2.54	2.58	.37	1.57	22.58	22.81	37.58	62.13
1931.........	2.08	2.11	.39	1.63	30.24	30.69	46.52	72.50
1932.........	2.16	2.20	1.05	1.63	48.26	49.31	48.68	76.06
1933.........	2.42	2.45	2.23	2.97	49.64	66.27	64.39	81.54
1934.........	2.37	2.42	2.19	3.46	73.63	74.56	66.23	86.35
1935.........	9.02	9.18	5.81	22.47	93.55	94.44	74.29	89.88
1936.........	18.09	18.94	11.69	33.28	94.83	96 30	74.23	93.87
1937.........	26.00	26.63	16.87	42.65	96.54	97.96	84.65	96.51
1938.........	22.96	26.30	15.47	55.47	97.63	98.81	84.12	98.01
1939.........	19.30	21.98	11.80	57.91	97.30	97.58	78.80	98.81
1940.........	16.60	17.46	11.78	57.68	97.80	99.00	73.30	99.30

TABLE 6.—Sheep receipts by truck compared with total receipts and receipts received for sale on the markets, Buffalo, Pittsburgh, Cleveland, and Cincinnati, 1929-1940

Year	Buffalo		Pittsburgh		Cleveland		Cincinnati	
	Per cent truck of total	Per cent truck of market receipts	Per cent truck of total	Per cent truck of market receipts	Per cent truck of total	Per cent truck of market receipts	Per cent truck of total	Per cent truck of market receipts
1929....	7.98	13.51	2.26	7.95	26.45	26.53	56.56	66.81
1930....	6.62	12.23	3.29	12.82	32.01	32.13	56.00	72.69
1931....	6.98	14.07	6.14	27.34	43.07	43.77	48.05	60.93
1932....	9.56	18.40	10.62	33.32	54.25	54.25	59.27	72.70
1933....	10.76	21.15	11.60	38.55	70.64	71.90	73.51	95.32
1934....	12.43	26.67	15.33	50.26	83.06	83.06	73.69	94.87
1935....	13.86	32.70	14.06	64.17	86.44	86.50	64.58	76.44
1936....	14.19	32.40	11.37	59.09	87.09	87.20	59.73	93.02
1937....	14.81	37.33	9.77	58.73	87.51	87.51	46.66	94.67
1938....	14.60	39.99	7.77	55.37	88.75	91.37	57.85	93.39
1939....	16.10	45.98	9.20	70.28	94.70	96.05	61.90	99.25
1940....	16.20	55.31	8.30	70.93	92.70	96.80	63.70	92.01

This analysis shows that truck receipts, even on the eastern markets, make up a large portion of the livestock consigned for sale. It shows further that for Cleveland and Cincinnati, the peak has about been reached in trucking, for nearly all the livestock except cattle consigned for sale at Cleveland arrived by truck.

In recent years, nearly all the livestock received at Cleveland has been received for sale on the market. The percentages of truck to total receipts and truck to market receipts show little difference on the Cleveland market. Of all the markets, Cleveland shows the least variation in these percentages.

TRANSPORTATION RATES FOR LIVESTOCK—
EXPLANATION OF DATA

As the volume of trucked livestock increases, the economic importance of this method of transportation becomes more significant, and one of the major economic considerations is the rates charged, or the cost of transporting the livestock to the various destinations.

In order to secure information on rates, data were obtained from Ohio's three principal livestock markets, Cleveland, Columbus, and Cincinnati. The account sales were examined, and data were taken for the months of January, April, July, and October of each year. Table 7 gives the number of head involved in the analysis for the years 1937, 1938, 1939, and 1940. Data were taken on the weight and kind of livestock, the total amount paid for trucking, and the post-office address of the consignor of the livestock. This information was the basis for determining the origin of the livestock and the distance it was transported.

At Cleveland and Cincinnati, the data were obtained from the records of the Producers Cooperative Commission Associations, since the cooperatives had more data on truck rates and their records were more easily obtained than the records from other selling agencies. At Columbus, the records were obtained from the Producers Cooperative Commission Association, which alone operates the Central Ohio Stockyards. Some of the data for the earlier years were taken from a previous investigation.[2]

[2]Ohio Agr. Exp. Sta. Bull. 531, Motor transportation of livestock in Ohio. G. F. Henning. December 1933.

TABLE 7.—The number of head of livestock on which trucking rates were
obtained and the number of points of origin of the same livestock
trucked to three Ohio markets, by species, 1937-1940

	Number of head					Number of towns				
	Cattle	Calves	Hogs	Sheep	Total	Cattle	Calves	Hogs	Sheep	Total
1937:										
Cleveland	3,975	4,600	18,843	14,981	41,999	241	197	216	146	800
Columbus	1,171	869	6,098	3,129	11,267	57	47	59	31	194
Cincinnati										
– Ohio*	1,404	1,880	20,889	3,163	27,336	86	87	91	67	331
1938:										
Cleveland	2,943	3,436	12,419	11,390	30,188	195	186	185	118	684
Columbus	877	843	5,145	3,591	10,456	52	43	47	22	164
Cincinnati										
– Ohio*	1,138	1,152	18,495	3,753	24,538	87	78	89	67	321
– Indiana†.	1,410	1,294	12,851	2,116	17,671	46	55	65	75	241
1939:										
Cleveland	3,797	4,880	18,477	11,224	38,378	200	198	202	131	731
Columbus	1,239	1,268	5,135	1,236	8,878	59	46	56	29	190
Cincinnati										
– Ohio*	1,593	1,902	28,618	4,763	36,876	89	94	106	72	361
– Indiana†.	1,928	1,977	21,355	2,909	28,169	41	31	63	53	188
1940:										
Cleveland	6,097	6,602	29,573	18,505	60,777	222	211	215	127	775
Columbus	1,430	1,457	7,842	2,352	13,081	61	48	59	37	205
Cincinnati										
– Ohio* ..	2,533	2,510	36,708	7,094	48,845	108	106	109	88	411
– Indiana†.	2,506	2,350	28,730	4,499	38,085	80	62	75	51	268

*Rates from Ohio farms to the Cincinnati market.
†Rates from Indiana farms to the Cincinnati market.

For the earlier years, the data were not as extensive for distances over 50
miles as for the later years. This point should be kept in mind as the analysis
proceeds from section to section.

In 1937, trucking rates were obtained on nearly 42,000 head of livestock at
Cleveland, about 11,000 at Columbus, and about 27,000 at Cincinnati, origi-
nating in Ohio only. In 1938, rates were obtained on 30,000 head of livestock
at Cleveland, 10,000 at Columbus, and 24,000 at Cincinnati from Ohio and an
additional 17,000 head of livestock coming from Indiana farms to the Cincin-
nati market.

In 1939, rates were obtained on approximately 38,000 head at Cleveland,
8,800 at Columbus, 36,000 at Cincinnati, and 28,000 more coming to Cincinnati
from Indiana. More rates were obtained at each of the markets in 1940 than
in any of the earlier years, as can be seen in table 7.

It can also be observed that in the Cleveland area, more rates were
obtained on hogs and sheep than on cattle and calves. More rates for hogs
and sheep were studied at the Columbus market in each of the years 1937 and
1938. In 1939 and 1940, the number of rates for hogs was greater than for
any other kind of livestock coming to market. It is important to notice the
total number of head that have been involved in this study. In 1937, 80,602
head were involved; in 1938, 82,853; in 1939, 112,301; and in 1940, 160,788—or
a total of 436,544 for the 4 years.

Table 7 also gives the number of towns from which this livestock was
trucked. In 1940, rates were obtained from 1,659 different towns. An analy-
sis of the total number of towns at each market shows that the Cleveland
market draws its livestock from a much greater area than does the Columbus

market and a somewhat larger area than Cincinnati. To get a true picture of the size of the Cincinnati area, however, the Ohio and Indiana areas must be combined.

Table 8 presents the data for 1940 only. Data for 1937, 1938, and 1939 would show the same general results as the 1940 data; that is, the percentage distribution of the number of head by mile zones has stayed about the same throughout the 4-year period, except for a slight increase in the more distant zones.

The largest part of the livestock coming to the Cleveland market came from distances ranging from 30 to 140 miles. A majority of the livestock in the Columbus area came from distances under 60 miles. A large proportion of the livestock in the Cincinnati market area originated at distances less than 120 miles from the market. This picture clearly shows the relative extent of each of these markets.

AREA FROM WHICH LIVESTOCK WAS TRUCKED

Tables 9, 10, and 11 give the estimated number of head of livestock trucked to the Cleveland, Columbus, and Cincinnati markets and the percentage distribution by mile zones. These tables give an estimate of the areas of greatest truck receipts around each one of the three markets in 1940.

Table 9 gives the estimated number of head of livestock trucked to the Cleveland market by mile zones and the percentage distribution by mile zones. It is significant that the greatest part of the Cleveland trucking receipts came from distances over 40 miles and under 100 miles from the market.

Table 10 gives the same information for the Columbus market. This table shows that the area of greatest receipts for the Columbus market is close to the market. More than 90 per cent of all livestock trucked to the Columbus market came from a distance under 50 miles.

Table 11, which gives the same information for Cincinnati, shows a situation between that which exists at Cleveland and that at Columbus. The majority of truck receipts at Cincinnati came from a distance of over 20 miles and under 80 miles.

An analysis of these tables shows that Cleveland is drawing the greatest part of its livestock from an area 60 miles distant, Columbus from an area 40 miles, and Cincinnati from an area out 60 miles.

Based on the areas of greatest truck receipts, there is very little overlapping of one market area into another, although on the outer edge of the marketing areas there is a little competition between them.

TREND OF MOTOR TRANSPORTATION RATES FOR LIVESTOCK IN OHIO

One of the significant points concerning trucking rates for the livestock industry is their trend over a period of years. As rates are lowered or raised, such change has its influence on the agencies involved and on those interested in the marketing of livestock and meats. It may mean lessened or increased competition; it may mean opening of a new market and a decreased volume at another market.

TABLE 8.—The number of head of livestock on which rates were obtained, by species and by mile zones, trucked to the Cleveland, Columbus, and Cincinnati markets for the year 1940

Mile zone	Cleveland				Columbus				Ohio to Cincinnati				Indiana to Cincinnati			
	Cattle	Calves	Hogs	Sheep	Cattle	Calves	Hogs	Sheep	Cattle	Calves	Hogs	Sheep	Cattle	Calves	Hogs	Sheep
0- 9.9	2	3	6	1	141	122	435	30	24	37	580	156	....	....	....	....
10- 19.9	3	12	21	....	302	451	2,163	410	83	83	282	57	....	....	....	....
20- 29.9	12	15	4	....	558	495	1,844	917	500	714	6,129	1,071	24	63	97	44
30- 39.9	168	185	649	178	361	376	2,766	600	386	517	5,100	847	208	396	1,720	152
40- 49.9	491	966	1,573	978	53	11	491	395	427	548	9,679	1,001	181	418	3,431	504
50- 59.9	577	857	2,966	3,024	....	....	60	....	470	409	11,546	3,151	313	355	7,311	1,253
60- 69.9	797	884	4,101	2,741	....	1	27	....	242	147	2,900	464	371	660	7,169	302
70- 79.9	632	1,407	3,638	3,748	1	1	....	....	25	17	203	192	353	211	4,703	724
80- 89.9	680	1,206	7,161	2,645	9	....	25	....	46	34	275	155	325	208	2,997	234
90- 99.9	563	428	3,665	1,975	....	....	....	....	2	12	9	....	59	13	177	6
100-109.9	592	240	1,802	926	....	....	....	....	1	....	....	....	271	7	822	785
110-119.9	1,095	132	1,780	1,880	....	....	....	....	....	....	....	....	52	9	108	152
120-129.9	304	46	1,213	231	....	....	....	....	....	....	....	....	46	....	....	....
130-139.9	93	177	869	152	....	....	....	....	....	....	....	....	6	3	25	....
140-149.9	49	28	59	....	5	....	....	....	....	....	....	5	14	....	....	....
150-159.9	....	....	....	....	....	....	....	....	....	....	....	....	3	....	....	....
160-169.9	....	....	....	....	....	....	....	....	....	....	....	....	....	....	116	....
170-179.9	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
180-189.9	25	1	66	26	....	....	....	....	....	....	....	....	131	2	32	....
190-199.9	8	....	....	....	....	....	....	....	327	2	....	....	30	2	7	338
200 and over	6	15	....	....	....	....	....	....	....	....	....	....	119	3	15	5
Total	6,097	6,602	29,573	18,505	1,430	1,457	7,842	2,352	2,533	2,510	36,708	7,094	2,506	2,350	28,730	4,499

TABLE 9.—The estimated number of head of livestock trucked to the Cleveland market, by mile zones, by species, 1940

Mile zone	Number of head				Percentage			
	Cattle	Calves	Hogs	Sheep	Cattle	Calves	Hogs	Sheep
0- 19.9... ...	87	200	327	....	0.1	0.2	0.1	....
20- 39.9.......	2,606	3,011	7,190	2,242	3.0	3.0	2.2	0.9
40- 59.9.......	15,288	27,806	50,327	54,059	17.6	27.7	15.4	21.7
60- 79.9.......	20,500	34,932	85,621	87,441	23.6	34.8	26.2	35.1
80- 99.9.......	17,808	24,894	120,262	62,280	20.5	24.8	36.8	25.0
100-119.9.......	24,149	5,722	39,542	37,866	27.8	5.7	12.1	15.2
120-139.9.......	5,734	3,413	22,876	5,231	6.6	3.4	7.0	2.1
140-159.9.......	695	402	654	....	.8	.4	.2	....
160-179.9.......	....	....	....	....	.0	.0	.0	....
Total..........	86,867	100,380	326,799	249,119	100.0	100.0	100.0	100.0

TABLE 10.—The estimated number of head of livestock trucked to the Columbus market, by mile zones and by species, 1940

Mile zone	Number of head				Percentage			
	Cattle	Calves	Hogs	Sheep	Cattle	Calves	Hogs	Sheep
0-19.9.........	6,289	6,209	39,249	9,261	31.1	39.3	33.3	18.7
20-39.9.........	13,043	9,448	69,540	31,942	64.5	59.8	59.0	64.5
40-59.9.........	748	110	8,250	8,319	3.7	.7	7.0	16.8
60-79.9.........	20	32	472	....	.1	.2	.4	....
80-99.9.........	122	....	354	....	.6	....	.3	....
Total..........	20,222	15,799	117,865	49,522	100.0	100.0	100.0	100.0

TABLE 11.—The estimated number of head of livestock trucked to the Cincinnati market from Ohio, by mile zones and by species, 1940

Mile zone	Number of head				Percentage			
	Cattle	Calves	Hogs	Sheep	Cattle	Calves	Hogs	Sheep
0-19.9.........	2,928	1,626	10,823	1,608	4.8	4.4	2.4	3.0
20-39.9.........	24,518	18,142	137,985	14,530	40.2	49.1	30.6	27.1
40-59.9.........	24,823	14,114	260,639	31,365	40.7	38.2	57.8	58.5
60-79.9.........	7,380	2,402	37,878	4,933	12.1	6.5	8.4	9.2
80-99.9.........	1,342	665	3,608	1,180	2.2	1.8	.8	2.2
Total*.........	60,991	36,949	450,933	53,616	100.0	100.0	100.0	100.0

*Total represents the truck receipts originating in Ohio only and not the total truck receipts received on the market. These totals represent approximately 42 per cent of the cattle, 45 per cent of the calves, 54 per cent of the hogs, and 32 per cent of the sheep that come to the Cincinnati market by truck.

In order to obtain comparable data for a number of years, certain representative well-located areas by markets were selected, and the rates in these areas were obtained for the years 1929 to date by distances over and under 50 miles. For Cleveland, 11 towns were selected; for Columbus, 10; and for Cincinnati, 14. When rates for the selected towns[3] were not available, the rate for that year was derived on the basis of the comparable rate for the preceding year of the remaining towns that had rates. Thus a rate by species was obtained for each market. The years 1935 to 1937 then were used as a base,

[3]In a few instances rates were not available.

TABLE 12.—Rates and index of rates to Cleveland, by two distance groups, for years 1929 to 1940

(1935-1937=100)

Year	Cattle				Calves				Hogs				Sheep			
	Rate in cents		Rate index		Rate in cents		Rate index		Rate in cents		Rate index		Rate in cents		Rate index	
	0 to 49.9 miles	50 to 99.9 miles	0 to 49.9 miles	50 to 99.9 miles	0 to 49.9 miles	50 to 99.9 miles	0 to 49.9 miles	50 to 99.9 miles	0 to 49.9 miles	50 to 99.9 miles	0 to 49.9 miles	50 to 99.9 miles	0 to 49.9 miles	50 to 99.9 miles	0 to 49.9 miles	50 to 99.9 miles
1929	49.2*	59.9*	170.2	196.4	83.5*	69.6	164.0	163.4	66.6*	55.6*	197.6	170.6	64.8*	†	162.8	†
1930	48.1*	54.4*	166.4	178.4	78.1*	71.6*	153.4	168.1	67.8*	55.3*	201.2	168.6	62.6*	†	157.3	†
1931	38.3	44.9	132.6	147.2	74.6	58.9*	146.6	138.3	47.9	47.8*	142.1	146.6	48.8*	55.7	122.6	150.9
1932	35.8	36.8	123.9	120.6	59.8	50.2*	117.5	117.8	39.1	38.1*	116.0	116.9	46.3*	45.0	116.3	121.9
1933	30.6	30.8	105.9	100.9	59.2	43.2	116.3	101.4	34.7	31.2	102.9	95.7	39.8	40.2	100.0	108.9
1934	27.5	33.6	95.2	110.2	52.8	45.8	103.7	107.5	34.2	31.8	101.5	97.5	39.7	39.6	99.7	107.3
1935	29.6	28.6	102.4	93.8	49.2	42.9	96.6	100.7	32.6	32.3	96.7	99.1	42.3	37.6	106.3	101.9
1936	28.0	31.4	96.9	103.0	51.2	43 0	100.6	100.9	34.2	32.9	101.5	100.9	41.0	37.1	103.0	100.5
1937	29.2	31.6	101.0	103.6	52.2	42.0	102.6	98.6	34.2	32.6	101.5	100.0	36.0	36.1	90.4	97.8
3-year average, 1935-1937	28.9	30.5	100.0	100.0	50.9	42.6	100.0	100.0	33.7	32.6	100.0	100.0	39.8	36.9	100.0	100.0
1938	29.9	32.5	103.5	106.6	49.0	42.4	96.3	99.5	35.0	31.2	103.9	95.7	32.2	35.7	80.9	96.7
1939	26.2	29.5	90.7	96.7	48.2	43.9	94.7	103.1	34.7	29.6	103.0	90.8	38.2	32.8	95.1	88.9
1940	23.0	29.0	79.6	95.2	49.8	43.6	97.8	102.3	32.3	29.7	95.9	91.1	35.4	27.9	88.9	75.6

*Rates for years thus indicated obtained from Ohio Agr. Exp. Sta. Bull. 531.
†Insufficient data.

TABLE 13.—Rate and index of rates to Columbus up to 50 miles,
for years 1930-1940

Year	Cattle		Calves		Hogs		Sheep	
	Rate in cents	Rate index	Rate in cents	Rate index	Rate in cents	Rate index	Rate in cents	Rate index
	0 to 49.9 miles	0 to 49.9 miles	0 to 49.9 miles	0 to 49.9 miles	0 to 49.9 miles	0 to 49.9 miles	0 to 49.9 miles	0 to 49.9 miles
1929*								
1930	20.5	139.8	43.1	130.9	18.2	133.5	*	*
1931	22.7	154.8	38.3	116.3	20.5	150.4	*	*
1932	17.3	118.0	38.3	116.3	14.5	106.4	18.6	107.9
1933	14.2	96.9	31.6	96.0	14.8	108.6	17.4	101.0
1934	14.2	96.9	32.7	99.3	13.3	97.6	16.0	92.9
1935	15.2	103.7	32.0	97.2	12.2	89.5	16.2	94.0
1936	13.9	94.8	30.7	93.2	14.4	105.7	18.9	109.7
1937	14.8	101.6	36.1	109.6	14.3	104.9	16.6	96.3
3-year average, 1935-1937	14.6	100.0	32.9	100.0	13.6	100.0	17.2	100.0
1938	16.5	112.6	33.1	100.5	15.3	112.2	16.4	105.1
1939	13.9	94.8	31.9	96.9	12.9	95.1	19.5	113.2
1940	13.2	90.0	32.0	97.1	13.7	100.5	16.7	96.9

*Insufficient data.

and an index for each of the species, by markets, was calculated. This procedure gave the index of rates by markets, by species, shown in tables 12, 13, and 14.

In order to get an index representing the rate situation in the State, it was necessary to combine the three markets. This was done by species, both for distances under 50 miles and from 50 to 100 miles. For example, for the year 1939, for cattle for distances under 50 miles, the rate index was: for Cleveland, 90.7; for Columbus, 94.8; and for Cincinnati, 89.4. A simple average of these gives 91.6, the combined index for cattle for distances under 50 miles. Similarly, the index was determined for other years, for distances from 50 to 100 miles, and for the other species, as given in table 15.

In order to combine the rate index thus obtained for cattle, calves, hogs, and sheep into one, two methods were used. One was the simple average of the four species. The other was the weighted average. The weighted average was based on the pounds by species marketed at the three markets, Cleveland, Columbus, and Cincinnati, for the 3 years 1936, 1937, and 1938. On the basis of 100, it was found that the rate index should be weighted 44 for cattle, 7 for calves, 41 for hogs, and 8 for sheep and lambs. This procedure gave two combined rate indexes for all species. The rates over 100 miles were insufficient for the period to include them. Thus, two indexes are given in table 16 for distances under 50 miles and two for distances from 50 to 100 miles.

An examination of table 16 shows the trend of rates for the combined three markets and for all four species for 1929 to date. The significant point, however, is that the rates for 1929 and 1930 were from 70 to 80 per cent higher than those during the past several years, while railroad transportation rates remained the same for all practical purposes during this period. Motor rates dropped rapidly during the depression. They did not make their low in 1932, when general business activity was at the bottom, but several years later. For the distances under 50 miles, a first low was made in 1934, a second, in 1940. From 1934 to 1938, rates showed a tendency to rise slightly, but they dropped in 1939 and 1940. For the distances over 50 miles, the trend has remained downward. The rates for 1935, 1936, and 1937 were practically the

TABLE 14.—Rates and index of rates to Cincinnati, by two distance groups, for years 1929 to 1940

(1935-1937=100)

Year	Cattle				Calves				Hogs				Sheep			
	Rate in cents		Rate index		Rate in cents		Rate index		Rate in cents		Rate index		Rate in cents		Rate index	
	0 to 49.9 miles	50 to 99.9 miles	0 to 49.9 miles	50 to 99.9 miles	0 to 49.9 miles	50 to 99.9 miles	0 to 49.9 miles	50 to 99.9 miles	0 to 49.9 miles	50 to 99.9 miles	0 to 49.9 miles	50 to 99.9 miles	0 to 49.9 miles	50 to 99.9 miles	0 to 49.9 miles	50 to 99.9 miles
1929*	36.2	32.9	162.6	156.4	65.9	87.3	132.8	184.6	34.7	36.2	172.7	180.1	52.1	60.9	152.1	203.7
1930*	34.5	32.5	155.0	154.5	69.4	78.5	139.8	166.0	33.8	33.9	168.2	168.7	55.2	61.8	161.1	206.7
1931*	33.4	30.7	150.0	146.0	62.6	66.1	126.1	139.7	31.1	30.2	154.7	150.2	44.3	57.8	129.3	193.3
1932*	22.9	21.1	102.9	100.3	50.4	52.5	101.6	111.0	19.6	18.6	97.5	92.5	28.7	34.2	83.8	114.4
1933	21.7	26.2	97.5	124.6	53.2	52.3	107.2	110.6	18.7	21.2	93.0	105.5	34.7	30.3	101.6	101.3
1934	20.1	21.5	90.3	102.2	46.7	51.2	94.1	108.2	19.6	20.4	97.5	101.5	33.7	33.7	98.6	112.7
1935	23.6	21.0	106.0	99.9	46.7	47.2	94.1	99.8	18.9	20.7	94.0	103.0	36.7	30.8	107.1	103.0
1936	23.2	20.9	104.2	99.4	50.2	48.9	101.1	103.4	19.9	20.2	99.0	100.5	33.2	26.6	96.9	89.1
1937	20.0	21.2	89.9	100.8	52.0	45.8	104.8	96.9	21.5	19.4	106.9	96.5	32.9	32.3	96.0	108.0
3-year average, 1935-1937	22.2	21.0	100.0	100.0	49.6	47.3	100.0	100.0	20.1	20.1	100.0	100.0	34.2	29.9	100.0	100.0
1938	21.0	20.6	94.4	97.9	54.1	54.1	109.0	114.4	20.5	20.0	102.0	99.5	32.3	23.1	94.3	77.2
1939	19.9	19.2	89.4	91.3	49.6	46.7	99.9	98.7	18.9	17.9	94.0	89.1	35.4	25.8	103.3	86.4
1940	19.0	18.1	85.4	86.1	49.6	42.9	99.9	90.7	19.0	17.7	94.5	88.1	32.2	27.7	94.0	92.6

*All rates for years 1929-1932 inclusive obtained from Ohio Agr. Exp. Sta. Bull. 531.

TABLE 15.—Index of trucking rates, by species, to Cleveland, Columbus, and Cincinnati, combined by a simple average, for years 1929 to 1940

(1935 to 1937=100)

Year	Cattle		Calves		Hogs		Sheep	
	0-49.9 miles	50-99.9 miles*	0-49.9 miles	50-99.9 miles‡	0-49.9 miles	50-99.9 miles*	0-49.9 miles	50-99.9 miles*
1929....	166.4*	176.4	148.4*	174.0	185.1*	175.6	157.4*	†
1930....	153.4	166.4	141.2	167.0	167.6	169.1	159.2*	†
1931....	145.8	146.6	129.6	139.0	149.4	148.4	125.9*	†
1932....	114.9	110.4	111.8	114.4	106.6	104.7	103.0	†
1933...	100.1	112.7	106.5	106.6	101.5	100.6	100.8	105.1
1934...	94.8	106.2	99.0	107.8	98.8	99.5	97.1	110.0
1935...	104.0	96.8	95.9	100.7	93.4	101.0	102.3	102.4
1936...	98.6	101.2	98.3	102.1	102.1	100.7	103.2	94.8
1937...	97.5	102.2	105.4	97.7	104.4	98.2	94.2	102.9
1938....	103.5	102.2	101.9	106.9	106.0	97.6	93.4	86.9
1939...	91.6	94.0	97.2	100.9	97.4	89.9	103.8	87.6
1940...	85.0	90.6	98.3	96.5	96.9	89.6	93.3	84.1

‡Columbus not included; no data.
†Insufficient data.

TABLE 16.—Index of trucking rates to Cleveland, Columbus, and Cincinnati combined, for all species by a simple and weighted* average for years 1929 to 1940

(1935 to 1937=100)

Year	0 to 49.9 miles		50 to 99.9 miles	
	Simple average	Weighted average	Simple average	Weighted average
1929	164.3	172.1	175.3	175.8
1930	155.3	158.8	167.5	167.6
1931	137.7	144.5	143.6	146.8
1932	109.1	110.8	109.8	108.1
1933	102.2	101.2	106.2	106.6
1934	97.2	96.9	105.9	103.7
1935	98.9	98.9	100.2	99.1
1936	100.5	100.4	99.7	100.4
1937	100.4	100.6	100.2	100.2
1938	101.2	103.6	98.4	99.3
1939	97.5	95.3	93.3	92.3
1940	93.4	91.5	90.2	90.1

*The weighted average was based upon the pounds by species marketed at the respective markets for the 3 years 1936 to 1938, inclusive. On the basis of 100, it was found that rates should be weighted for cattle, 44, calves, 7, hogs, 41, and sheep and lambs, 8. Table 16 was thus derived from data in table 15.

The simple average was merely adding the index for each of the four species and dividing by 4.

same, but a further drop occurred in 1939 and 1940. From present indications, it would seem that rates have about reached bottom, unless new improvements can lower costs of motor transportation.

Table 15 shows the same information, only detailed as to species. The rates for shorter distances as compared with the longer, show much the same trend as those for all species combined. Calves are the exception; the rates for calves have declined less for the shorter distances. Rates for sheep declined more. Hog rates have declined the most.

There was a tendency for truck rates, except thóse for lambs, to stabilize or rise slightly for the years 1936 to 1938. It would seem that motor transportation rates for livestock in Ohio will probably stabilize around present levels. Of course, factors that would cause a raising or lowering of costs, such as a change in taxes or an abrupt change in the price level, wages, and the like, would no doubt have a decided influence on rates.

METHODS OF CHARGING RATES FOR TRUCKING LIVESTOCK

There are two common methods of charging for trucking livestock. One is to charge a certain amount for each 100 pounds hauled. The other is to charge a given amount per head or for the lot (a given amount per load). An analysis of the rates charged in Ohio shows that a definite method is not followed between areas or within any one area. This information is given in table 17.

TABLE 17.—Percentagè of livestock trucking rateš that wefe determined on a hundredweight basis, for cattle, calves, hogs, and sheep, at Cleveland, Columbus, and Cincinnati, 1940

Market	Cattle	Calves	Hogs	Sheep
Cleveland	83.5	43.8	95.8	89.8
Columbus	36.9	2.9	55.9	53.5
Cincinnati-Ohio	64.9	2.9	79.7	47.9
–Indiana	94.4	9.5	97.0	19.0

Table 17 shows that in the Cleveland area, 83.5 per cent of the cattle rates were charged on a hundredweight basis. In the Columbus area, only about 37 per cent of the cattle rates were on a hundredweight basis; the other 63 per cent were on a per-head or per-lot basis. In the Cincinnati area, 65 per cent of the rates for cattle coming from Ohio farms to the Cincinnati market were determined on a hundredweight basis, but the percentage increased to 95 for cattle coming from Indiana farms.

The significant fact in analyzing calf rates is that most calf rates, except those at Cleveland, are on a per-head basis. At Cleveland, 43.8 per cent of the calf rates are now on a weight basis.

In the Cleveland area, practically all hog and sheep rates are determined on a weight basis. In the Cincinnati area, only 19 per cent of the rates for sheep coming from Indiana farms are on a weight basis; 81 per cent are determined on a head or lot charge.

In table 18 the number of rates is given. In this table, all rates have been converted to a hundredweight basis, regardless of the method of charging actually used. For example, if a rate of $3.00 was charged for trucking a 1,000-pound steer, this charge has been put on a basis of $0.30 per hundred. The range of rates charged for each species at the various markets can be observed.

Table 19 gives the percentage of rates charged at the mid-value of a class interval in table 18. For example, in table 18, 278 cattle rates at Cleveland were trucked for a charge somewhere between $0.175 and $0.224. In table 19, it can be seen that 88.5 per cent of these 278 rates were trucked for $0.20 per hundredweight, or the mid-value of the class interval. An examination of all the Cleveland data for cattle, hogs, and sheep shows that a big majority of

TABLE 18.—The distribution of the number of rates charged, by class
intervals, for cattle, hogs, and sheep, at Cleveland,
Columbus, and Cincinnati, 1940

Rates in cents per hundred-weight	Cattle			Hogs			Sheep		
	Cleve-land	Colum-bus	Cincin-nati	Cleve-land	Colum-bus	Cincin-nati	Cleve-land	Colum-bus	Cincin-nati
2.5– 7.4.......	0	20	1	0	14	4	0	4	1
7.5–12.4.......	4	182	25	3	148	173	2	13	8
12.5–17.4.......	30	316	289	13	505	985	4	39	191
17.5–22.4.......	278	44	404	74	86	835	24	38	80
22.5–27.4.......	274	18	272	769	34	637	97	11	29
27.5–32.4.......	1,314	8	39	1,800	15	87	384	8	93
32.5–37.4.......	394	4	16	812	8	27	267	8	61
37.5–42.4.......	86	2	4	242	5	19	222	2	41
42.5–47 4.......	16	1	0	30	4	3	15	2	22
Over 47.5......	9	1	8	11	1	28	36	2	30
Total..........	2,405	596	1,058	3,785	820	2,798	1,051	127	656

the rates are charged at the mid-value of the class interval, or at the even
values of $0.20, $0.25, or $0.30. A large majority of the Cleveland and Cin-
cinnati rates are of the even values, $0.15, $0.20, or $0.25, rather than $0.16,
$0.18, or $0.22. In the Columbus area, the percentage occurring at the even
rates is somewhat smaller than at either Cleveland or Cincinnati. The reason
for this fact can be found in table 17, where it is shown that a great many
rates in the Columbus area are on a per-head basis. These rates, when con-
verted to a hundredweight, give uneven values.

TABLE 19.—The percentage of rates for each class interval in table 18 that
were at the mid-value of the class intervals,* cattle, hogs, and sheep
at Cleveland, Columbus, and Cincinnati, 1940

Mid-value of class interval, cents	Cattle			Hogs			Sheep		
	Cleve-land	Colum-bus	Cincin-nati	Cleve-land	Colum-bus	Cincin-nati	Cleve-land	Colum-bus	Cincin-nati
10..............	75.0	30.8	72.0	0.0	24.3	41.6	50.0	46.2	37.5
15..............	53.3	73.7	74.0	7.7	82.6	91.3	50.0	56.4	70.2
20..............	88.5	25.0	81.4	85.1	24.5	93.9	79.2	78.9	65.0
25..............	79.9	11.1	86.0	96.4	32.3	95.4	88.6	36.4	56.6
30..............	95.7	12.5	61.5	97.4	46.6	68.9	97.6	12.5	63.4
35..............	91.4	25.0	31.2	96.5	62.6	70.4	94.1	00.0	67.2
40..............	98.8	00.0	75.0	87.7	20.0	78.9	95.4	00.0	68.3

*The class interval was chosen so that the mid-value would be at 5, 10, 15, etc., cents,
or in multiples of 5.

Table 20 gives the information for calves, the same as is given in table 18
for cattle, hogs, and sheep. The number of calf rates is given by 10-cent
intervals. In 1940, nearly 5,000 rates were studied at Cleveland, 1,000 at Col-
umbus, and 2,000 at Cincinnati, for Ohio. A majority of rates came within the
range of $0.25 to $0.75. Although not shown in the table, a majority of the
rates occurred at values divisible by 5, such as 30, 35, 40, 45, etc.

An analysis of the rates charged the farmer on a per-head basis shows
that a large majority of calves were trucked for $0.50, $0.75, or $1.00 per head.
In the Cleveland area, 27.8 per cent of the calves were trucked for $0.75 per
head, and another 23.8 per cent for $1.00 per head. In the Columbus area, 72.2
per cent of the calves were trucked for $0.50, and 14.3 per cent, for $0.75.

TABLE 20.—The distribution of the number of rates charged by class intervals for calves at Cleveland, Columbus, and Cincinnati, 1940

Class interval in cents per hundred	Cleveland	Columbus	Cincinnati-Ohio
5- 14.9	1	11	14
15- 24.9	13	103	36
25- 34.9	648	441	118
35- 44.9	1,333	296	469
45- 54.9	1,522	115	577
55- 64.9	822	57	418
65- 74.9	373	35	189
75- 84.9	139	2	103
85- 94.9	30	5	20
95-104.9	14	1	11
Over	7	5	5
Total	4,902	1,071	1,960

Approximately one-half of the calves going to the Cincinnati market from Ohio farms were trucked for $0.75 per head. Another one-fourth were trucked for $1.00. In Indiana, 35.5 per cent of the rates for calves to the Cincinnati market were $0.75 per head, and 49.7 per cent were $1.00 per head.

RATES CHARGED, BY MILE ZONES, TO TRUCK LIVESTOCK TO CLEVELAND, COLUMBUS, AND CINCINNATI

The costs of marketing livestock between the farmer and the processor consist mainly of transportation and selling charges. Different methods of marketing have been and are being practiced to reduce marketing costs. These methods have been directed more to the problems of selling than to the influence of transportation. Since motor transportation is very important in livestock marketing, to get a complete picture of the problems of marketing livestock, it is necessary to examine motor transportation rates in detail. In order to study this transportation factor, the logical approach is to analyze the rate structure.

All rates other than by hundredweight have been converted in this section to a hundredweight basis to give uniformity to the comparisons and to facilitate analysis. To present the rate structure in more detail, the following tables give the average rates charged to truck livestock, by mile zones.

The average rates, by mile zones, charged to truck livestock to the Ohio markets, Cleveland, Columbus, and Cincinnati, showed wide variations. Table 21 gives the rates, by species, for trucking livestock to Cleveland, by mile zones, in 1937, 1938, 1939, and 1940. An analysis of the rates given in this table shows that the same rate was charged for distances close to the market as for distances farther out. The rates for each species also varied from year to year.

The range of cattle rates averaged by mile zones was approximately $0.14 in 1937, $0.37 in 1938, $0.15 in 1939, and $0.15 in 1940. Rates for calves varied $0.55 in 1937, $0.21 in 1938, $0.27 in 1939, and $0.35 in 1940. Rates for hogs and sheep also showed some variations from year to year, as can be seen in table 21.

Trucking rates, given in table 22 for Columbus, showed the same kind of variations that existed at Cleveland. Large variations occurred between species and between rates for each species at various distances. Each species had a different rate level. A higher rate was charged for trucking calves than any other species of livestock.

TABLE 21.—The average rate charged, by mile zones, for trucking livestock from Ohio farms to Cleveland market, by species, 1937 to 1940

(Cents per hundred)

Mile zone	Cattle				Calves				Hogs				Sheep			
	1937	1938	1939	1940	1937	1938	1939	1940	1937	1938	1939	1940	1937	1938	1939	1940
0– 9	33.0	10.2	27.9	25.2	84.0	60.0	57.8	57.0	30.0	......	40.0	34.9	69.7	....	35.0	35.0
10– 19	40.0	40.0	31.3	32.8	78.0	58.8	54.5	54.5	8.0	......	36.6	18.0	43.3	....	....	....
20– 29	33.3	16.5	20.6	25.8	50.0	....	56.9	40.9	30.0	......	31.9	42.4	38.4	....	....	....
30– 39	31.1	30.7	30.1	29.7	57.5	49.3	56.0	54.0	35.0	36.8	32.5	28.9	40.5	32.0	42.8	35.5
40– 49	30.5	29.5	30.3	27.0	53.9	55.6	51.5	50.4	34.6	31.9	30.1	30.2	43.5	35.5	35.8	36.1
50– 59	30.0	30.1	28.4	28.1	51.7	50.9	52.7	49.6	34.1	31.7	32.8	31.1	35.8	39.8	36.3	34.6
60– 69	30.5	29.0	28.9	29.4	49.7	48.0	46.3	43.8	34.5	31.0	31.4	29.8	35.6	32.1	36.3	33.3
70– 79	29.8	30.8	30.2	31.3	46.5	48.4	47.1	42.5	32.7	32.9	33.1	33.0	32.3	36.4	41.6	37.8
80– 89	31.3	32.1	28.9	29.7	43.1	42.2	52.7	44.8	32.8	31.5	30.4	30.2	33.1	36.7	32.7	33.6
90– 99	31.1	31.6	29.0	30.0	43.7	41.9	61.4	41.2	33.7	32.7	30.4	31.8	34.2	36.3	36.3	31.8
100–109	27.8	28.3	25.7	24.8	46.0	44.3	48.7	48.6	28.7	30.3	26.9	28.2	37.8	34.7	30.0	32.9
110–119	27.7	25.6	24.7	22.4	49.8	45.5	39.8	49.3	28.5	27.6	26.8	27.6	40.0	28.5	33.9	29.6
120–129	27.7	27.3	27.5	24.2	43.2	41.3	45.5	48.5	29.4	28.0	27.8	26.0	....	26.3	35.2	33.5
130–139	32.5	29.6	30.3	29.8	57.4	....	60.7	48.4	30.9	30.8	29.7	30.9	....	38.6	25.0	39.2
140–149	33.1	31.0	31.8	25.9	54.0	46.6	58.5	55.4	30.0	40.0	32.7	28.7	....	46.2	42.1	....
150–159	36.0	47.8	50.0	....	29.3	38.5	....	....	31.0	37.0	....	....	....	50.0	....	....
160–169	37.7	38.0	45.0	....	43.6	44.9	44.9	....	35.0	25.2	....	....	....	47.0	45.0	....
170–179	41.6	....	35.0	....	45.0	....	....	....	40.0	....	....	....	....	....	23.7	60.0
180–189	....	....	35.0	25.0	....	....	34.2	76.9	29.0	....	11.4	27.0	....	....	....	....
190–199	....	....	....	36.5	....	....	....	....	....	....	....	....	....	....	....	....
200–209	30.0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Over 210	....	....	....	37.4	....	....	....	45.5	....	....	....	....	....	....	....	....

TABLE 22.—The average rate charged, by mile zones, for trucking livestock from Ohio farms to Columbus market, by species, 1937 to 1940

(Cents per hundred)

Mile zone	Cattle				Calves				Hogs				Sheep			
	1937	1938	1939	1940	1937	1938	1939	1940	1937	1938	1939	1940	1937	1938	1939	1940
0- 9	13.4	14.9	10.9	10.2	43.6	36.6	37.7	36.2	14.0	15.4	13.9	14.7	26.7	27.7	12.0	20.8
10- 19	13.2	14.4	12.9	13.9	42.1	37.5	37.9	32.8	14.1	13.1	12.0	13.7	21.2	27.1	21.2	21.5
20- 29	15.9	15.2	14.4	15.1	40.8	34.2	35.0	34.8	14.5	15.3	15.0	16.0	20.0	16.0	22.9	20.8
30- 39	13.5	15.6	15.6	17.8	40.1	35.9	22.5	36.6	13.6	15.9	16.3	13.4	14.2	21.0	19.2	17.5
40- 49	18.9	13.9	17.2	17.5	53.3	43.1	30.6	29.6	23.6	13.7	14.7	14.0	10.0	29.0	10.0	16.7
50- 59	14.2	21.3	.....	.....	.....	.....	.....	.....	23.1	.....	.....	8.0	9.1	.....	.....	.....
60- 69	25.0	.....	.....	.....	60.0	.....	.....	38.5	21.0	.....	.....	17.8	19.0	.....	.....	.....
70- 79	21.0	.....	31.8	20.0	.....	.....	34.5	45.4	15.0	12.5	19.4	.....	.....	.....	.....	.....
80- 89	.....	20.0	5.6	14.0	.....	.....	.....	.....	.....	.....	.....	8.0	.....	.....	.....	.....
90- 99	4.0	.....	46.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
100-109	.....	43.6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
110-119	15.0	15.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
140-149	.....	.....	.....	15.0	.....	.....	.....	.....	15.7	.....	.....	15.0	.....	.....	.....	.....

TABLE 23.—The average rate charged, by mile zones, for trucking livestock from Ohio farms to the Cincinnati market, by species, 1937-1940

(Cents per hundred)

Mile zone	Cattle				Calves				Hogs				Sheep			
	1937	1938	1939	1940	1937	1938	1939	1940	1937	1938	1939	1940	1937	1938	1939	1940
0– 9	20.0	16.1	18.4	22.4	62.7	54.3	71.6	33.5	11.6	14.6	25.5	19.1	......	17.1	23.5	19.1
10– 19	21.8	20.2	20.0	21.5	59.1	58.9	50.7	51.3	20.9	32.6	16.6	19.4	30.3	19.2	29.6	27.4
20– 29	19.8	24.1	18.4	18.5	54.1	47.9	51.4	52.8	20.4	19.9	22.2	18.4	32.8	38.7	35.3	30.3
30– 39	20.8	22.4	20.7	23.0	50.1	53.1	49.0	50.6	21.4	20.2	19.0	19.6	31.5	36.3	34.1	29.7
40– 49	20.9	20.7	19.9	19.8	52.3	49.0	51.6	49.6	20.7	19.0	18.0	19.2	31.8	29.2	29.8	29.6
50– 59	21.3	20.3	18.0	18.4	50.4	44.4	48.9	42.9	21.3	19.4	18.0	17.4	33.1	21.8	26.6	25.0
60– 69	21.9	21.5	22.5	18.1	44.8	52.0	48.5	43.5	19.8	20.1	20.5	17.1	28.8	25.9	32.1	27.5
70– 79	23.6	17.9	23.9	35.2	65.1	56.2	40.2	56.2	22.7	24.2	21.9	20.7	36.3	22.3	25.3	24.1
80– 89	26.4	24.9	24.5	22.6	47.8	42.5	40.7	35.4	21.5	22.7	22.8	22.7	26.9	29.8	21.2	37.6
90– 99	24.9	25.0	22.4	24.9	48.4	38.5	58.4	63.7	28.0	......	28.3	24.5	......	......	......	......
100–109	24.0	......	......	25.0	......	......	......	......	......	......	......	......	......	......	......	......
110–119																
120–129	28.4	......	......	......	......	......	......	......	24.3	......	......	......	......	......	......	......
140–145	......	......	......	......	......	......	......	......	......	......	......	14.9	......	......	......	......
180–189	......	7.1	......	......	......	......	......	......	......	......	......	......	......	......	......	......
190–199	......	......	......	20.1	......	......	......	......	......	......	......	......	......	......	......	......

TABLE 24.—The average rate charged for trucking livestock, by mile zones, from Indiana farms to the Cincinnati market, by species, 1938-1940

(Cents per hundred)

Mile zone	Cattle			Calves			Hogs			Sheep		
	1938	1939	1940	1938	1939	1940	1938	1939	1940	1938	1939	1940
0- 9.												
10- 19.	30.0	....	....	37.8	....	....	25.9	....	....	19.2	....	....
20- 29.	27.7	20.0	26.5	48.6	35.8	52.3	33.6	19.1	27.4	38.7	44.3	34.1
30- 39.	27.2	20.6	22.1	58.9	49.7	50.4	33.2	21.9	22.7	36.3	37.8	28.8
40- 49.	23.3	23.3	23.7	49.2	54.7	50.7	24.9	23.7	21.9	29.2	37.9	46.7
50- 59.	23.5	25.1	24.3	50.4	54.8	51.3	25.1	25.4	24.3	21.8	36.6	37.5
60- 69.	22.3	24.0	24.3	56.5	48.2	47.2	24.3	23.8	22.4	25.9	35.7	38.3
70- 79.	22.8	23.8	21.0	52.5	48.0	49.2	23.5	24.0	21.2	22.3	34.4	37.1
80- 89.	28.2	22.9	24.3	53.6	36.8	50.5	29.6	23.4	23.5	29.8	32.2	33.5
90- 99.	30.0	28.8	23.2	58.7	53.3	50.4	31.8	28.9	23.6	....	....	30.0
100-109.	15.2	15.7	21.3	53.0	37.1	53.8	16.1	14.1	18.1	....	12.7	32.7
110-119.	....	30.9	18.0	59.6	42.8	53.9	26.9	23.4	17.7	....	41.0	14.5
120-129.	....	....	25.0	....	....	....	....	....	....	....	....	....
130-139.	30.0	....	30.0	....	....	56.6	....	....	12.7	....	....	....
140-149.	....	....	30.0	....	....	....	20.0	....	....	....	....	....
150-159.	....	....	30.0	....	....	....	....	30.0	....	....	....	....
160-169.	....	25.0	....	....	....	....	29.3	25.0	28.3	....	....	....
170-179.	30.0	....	....	60.0	....	....	30.0	....	....	....	....	....
180-189.	34.9	26.8	27.4	....	28.3	72.7	....	25.0	30.0	....	....	....
190-199.	25.0	25.4	25.0	....	....	68.3	....	....	25.0	....	32.0	30.2
200-209.	....	....	26.8	....	57.7	45.0	....	....	30.0	....	....	36.8

In the Cincinnati area, based on data obtained only from Ohio, similar variation between rates existed for each species, as it did in the Cleveland and Columbus areas. Rates did not increase with distance.

The majority of the originating areas (tables omitted) from which livestock was transported were between 10 and 70 miles from the terminal market.

Table 24 gives the average rates, by mile zones, charged to truck livestock to the Cincinnati market from points in Indiana. These rates also show variations between species for the years studied, 1938, 1939, and 1940. Rates did not increase with distance. For example, at 10-19 miles, the rate for trucking cattle was $0.30 in 1938; and at 190-199 miles, the rate was $0.25 for the same year.

Rates charged in the three markets for the different species of livestock varied. At the Cleveland market, table 21 indicates that the most common average rate for trucking cattle fell within the range of $0.25 to $0.35. Variations occurred, of course, and, consequently, some rates fell outside this range. In the Columbus trucking area, the most common rate for trucking cattle was approximately $0.15. In the Cincinnati area, it was about $0.20 for cattle coming from Ohio farms. Cattle coming to the Cincinnati market from farms in Indiana were trucked in at slightly higher rates. In general, it can be said that Cleveland had the highest trucking rate for cattle, followed by Cincinnati for cattle coming from Indiana, then by Cincinnati for cattle from farms in Ohio, and, lastly, Columbus, with the lowest rate of the three markets.

Rates for trucking calves at the three markets showed less variation than the rates for trucking cattle at the same markets. Although wide variations existed at each market, a large majority of the rates at each of the three markets, Cleveland, Columbus, and Cincinnati, fell within the range of $0.40 to $0.60 per hundredweight. It should be remembered that rates for trucking calves are often based on a per-head charge of either $0.50 or $0.75. When this amount is converted to a per-hundredweight charge, the resulting rates will generally fall within the previously mentioned range.

Wide variations in hog rates among the three markets existed. In the Cleveland trucking area, from $0.30 to $0.40 per hundredweight was the most common trucking rate. In the Cincinnati area, the largest number of hogs going to the Cincinnati market from farms in Indiana was trucked for $0.20 to $0.30, as shown in table 24. Hogs going from farms in Ohio to the Columbus and Cincinnati markets were trucked at a smaller cost per hundred than those being trucked to Cleveland or those being trucked from Indiana to Cincinnati. Most hogs in Ohio that were trucked to Cincinnati were hauled for about $0.20; those going to Columbus, for about $0.15.

Sheep rates were not uniform among the three markets but showed large variations. Tables 21 to 24 show that the highest rate for trucking sheep was charged at Cleveland, the lowest, at Columbus. The rates for trucking sheep to Cincinnati were lower than rates at Cleveland but higher than rates at Columbus.

In general, it can be said that the highest rates for trucking all species of livestock were charged at Cleveland; the next highest, at Cincinnati; and the lowest rates, at Columbus. In no case did distance seem to affect the rate charged for trucking livestock.

To facilitate comparison of rates between markets, table 25 is given. It is important to notice the level of the rate structure for trucking cattle and hogs at each of the markets. By comparing the average rate charged for the

same distance at the different markets, it can be seen that the rate varies between markets. For example, for distances 30-39 miles, the average trucking rate for cattle at Cleveland was $0.301; at Columbus, $0.156; at Cincinnati, for Ohio, $0.207; and at Cincinnati, for Indiana, $0.206 in 1939. The rates for hogs also varied between markets. For distances 30-39 miles from the market, the average trucking rate at Cleveland was $0.325; at Columbus, $0.15; at Cincinnati, for Ohio, $0.19; and at Cincinnati, for Indiana, $0.219.

TABLE 25.—Average motor transportation rates for cattle and hogs from four areas to three Ohio markets, for selected distances, 1939 and 1940

(Cents per hundred)

	Cattle				Hogs			
Mile zone	Cleveland	Columbus	Cincinnati-Ohio	Cincinnati-Indiana	Cleveland	Columbus	Cincinnati-Ohio	Cincinnati-Indiana
1939:								
0- 9...........	27.9	10.9	18.4	....	40.0	13.9	25.5	....
10-19...........	31.3	12.9	20.0	....	36.6	12.0	16.6	....
20-29...........	20.6	14.4	18.4	20.0	31.9	15.0	22.2	19.1
30-39...........	30.1	15.6	20.7	20.6	32.5	16.3	19.0	21.9
40-49...........	30.3	17.2	19.9	23.3	30.1	14.7	18.0	23.7
50-59...........	28.4	....	18.0	25.1	32.8	....	18.0	25.4
60-69...........	28.9	....	22.5	24.0	31.4	....	20.5	23.8
1940:								
0- 9...........	25.2	10.2	22.4	....	34.9	14.7	19.1	....
10-19...........	32.8	13.9	21.5	....	18.0	13.7	19.4	....
20-29...........	25.8	15.1	18.5	26.5	42.4	16.0	18.4	27.4
30-39...........	29.7	17.8	23.0	22.1	28.9	13.4	19.6	22.7
40-49...........	27.0	17.5	19.8	23.7	30.2	14.0	19.2	21.9
50-59...........	28.6	....	18.4	24.3	31.1	8.0	17.4	24.3
60-69...........	29.4	....	18.1	24.3	29.8	17.8	17.1	22.4

Data for 1940 indicate the same sort of variation as existed in 1939; for example, at distances ranging from 40-49 miles, the average rate for trucking cattle to Cleveland was $0.27 per hundredweight. The rate at Columbus was only $0.175 per hundredweight; whereas rates at the Cincinnati market were $0.198 for the livestock coming from Ohio and $0.237 for that coming from Indiana.

Because of these differences in the rate structure at the different markets for similar distances, the important question arises: What factors influence the rates at the different markets? In a later section, an attempt will be made to analyze these factors.

RATES PER TON-MILE

In the previous section, rates were discussed on a hundredweight basis for given distances (mile zones). A different method of presenting these same rates is on a ton-mile basis, which is the amount charged to truck 1 ton of livestock 1 mile. As far as the trucking of livestock is concerned, this method of describing rates is seldom used in practice, but it is a useful method of comparison.

Table 26 gives the rates per ton-mile for transporting cattle by truck to the three markets under consideration in this study.

This type of analysis shows that as distance increased, the rates per ton-mile decreased. It also shows that the rates varied at each of the three markets and that there was considerable variation between the three markets in each of the years 1937, 1938, 1939, and 1940.

TABLE 26.—The ton-mile rate for trucking cattle to three Ohio markets,
Cleveland, Columbus, and Cincinnati, 1937, 1938, 1939, and 1940

(Cents per ton-mile)

Miles	Cleveland				Columbus				Cincinnati			
	1937	1938	1939	1940	1937	1938	1939	1940	1937	1938	1939	1940
15	53.0	53.2	41.7	43.7	17.6	18.2	17.2	18.5	29.0	26.0	26.6	28.6
25	26.6	13.2	16.4	20.6	12.7	12.0	11.5	12.1	15.8	19.2	17.5	14.8
35	17.7	17.0	17.2	16.9	7.7	8.8	8.8	10.2	11.8	12.6	11.8	13.1
45	13.5	13.0	13.4	12.0	8.4	6.2	5.4	7.8	9.2	9.2	8.6	8.8
55	10.9	11.4	10.3	10.4	5.0	7.6	......	......	7.7	7.4	6.5	6.7
65	9.3	8.8	8.8	9.0	7.7	......	......	......	6.7	6.6	6.9	5.6
75	7.9	8.2	8.1	8.3	5.6	......	8.4	5.3	6.3	4.8	6.3	9.3
85	7.3	7.4	6.8	6.9	......	4.6	1.3	......	6.2	5.6	5.7	5.3
95	6.5	6.6	6.1	6.3	......	......	9.7	......	5.2	5.2	4.7	5.2
105	5.3	5.4	4.5	4.7	......	8.2	......	......	4.5	......	......	......
115	4.8	4.4	4.4	3.9	2.6	2.6	......	......	......	......	......	......
125	4.4	4.4	4.4	3.8	......	......	......	......	4.5	1.1	......	......
135	4.8	4.2	4.4	4.4	......	......	......	......	......	......	......	......
145	4.5	4.2	4.3	3.6	......	......	......	......	......	......	......	......
155	4.6	6.2	6.4	......	......	......	......	......	......	......	......	......
165	4.5	4.6	5.4	......	......	......	......	......	......	......	......	......
175	4.7	......	4.0	......	......	......	......	......	......	......	......	......

The ton-mile rate for trucking cattle to the three markets shows that the great drop in the mile rate comes in distances under 25 miles. On distances over 25 miles, the decrease becomes less, and the rate becomes more stabilized. Cleveland has the highest ton-mile rate for trucking cattle, followed by Cincinnati. Columbus has the lowest rate.

The ton-mile rates for calves, hogs, and sheep (tables omitted) show that as distance increased, the ton-mile rate decreased very similarly to that for cattle, except in a few cases farthest from the market. The ton-mile rate at each market was fairly uniform throughout the 4-year period.

RELATIONSHIP BETWEEN THE RATE CHARGED AND THE
DISTANCE THAT THE LIVESTOCK WAS TRUCKED

In this and the two following sections is presented a detailed statistical analysis of rates. Livestock men who are not interested in statistical details may wish to omit these three.

The data presented in table 27, 28, 29, and 30 pertain to livestock trucking from various towns in Ohio to the Cleveland, Columbus, and Cincinnati markets for the years 1937, 1938, 1939, and 1940. In 1939 and 1940, a fourth part includes data on trucking rates from various towns in Indiana to Cincinnati. In an analysis of the data, a distinction should be noticed between Cincinnati from Ohio and Cincinnati from Indiana.

It is usually thought that the rate for trucking livestock to terminal markets increases as the trucking distance increases. An examination of table 27, however, indicates that there is a low degree of correlation between livestock trucking rates and distance. If there were a perfect correlation between rates and miles, the relationship would be 1. It is significant to notice in table 27 the relationships that existed in the various markets for each of the species of livestock in the years 1937, 1938, 1939, and 1940. Some of the relationships are plus quantities; other relationships are minus quantities. Plus quantities

indicate that as distance increased, the rate charged per 100 pounds increased; minus quantities indicate that as distance increased, the rate per 100 pounds decreased.

TABLE 27.—The coefficient of correlation between trucking rates of livestock and the hauling distance at Cleveland, Columbus, and Cincinnati, by species, 1937 to 1940

Species and market	Year			
	1937	1938	1939	1940
Cattle:				
Cleveland	+0.068	+0.081	+0.118	−0.0389
Columbus	+ .092	+ .321	+ .262	+ .1353
Cincinnati-Ohio	+ .28	+ .001	+ .268	− .089
-Indiana	....	....	+ .1132	+ .277
Calves:				
Cleveland	− .247	− .177	− .208	+ .445
Columbus	− .185	+ .084	− .086	+ .0375
Cincinnati-Ohio	− .25	− .289	− .097	− .4879
-Indiana	....	....	− .2063	+ .169
Hogs:				
Cleveland	− .140	− .128	− .232	− .169
Columbus	+ .247	+ .06	+ .439	− .134
Cincinnati-Ohio	+ .12	− .100	+ .228	+ .0012
-Indiana	....	....	+ .092	+ .0406
Sheep:				
Cleveland	− .170	− .059	.091	− .0912
Columbus	+ .188	− .084	− .159	− .1555
Cincinnati-Ohio	− .10	− .309	− .285	− .0075
-Indiana	....	....	− .077	− .233

The greatest relationship between rates and distance was at Columbus, where hog rates in 1939 had a correlation of +0.439. There was a tendency for all cattle rates in 1937, 1938, and 1939 to become slightly higher as distance increased, but in 1940, Cleveland and Cincinnati from Ohio rates decreased with distance. Hog rates increased with distance at Columbus in 1937, 1938, and 1939, and at Cincinnati in 1937, 1939, and 1940. Rates on hogs trucked from Indiana to Cincinnati in 1939 and 1940 also increased slightly as distance increased. Other trucking rates, except calf rates at Columbus in 1938 and 1940, showed decreases as distance increased. In 1940, calf rates at Cleveland, Columbus, and Cincinnati from Indiana increased with distance. All these increases and decreases were small, and the average rate was typical of the rate that was charged for any given distance, given in table 27.

Although the correlation values are small, are they significant or are they merely due to sampling? When the test of significance, based on the null hypothesis of zero correlation, was applied at the 1 per cent level, it was found that only two of the values for 1940 were significant. The value of +0.445 for calves at Cleveland and of −0.487 for calves at Cincinnati were both significant. The other values were not significant.[4]

It can be seen in table 28 that trucking rates were lower at Columbus than at either of the other two markets, Cleveland or Cincinnati, for each of the 4 years. Rates were highest at Cleveland, as compared with the other two markets, with the exception of calf rates at Cincinnati and the rates on sheep trucked from farms in Indiana to Cincinnati in 1939 and 1940.

[4]See Statistical Methods, by George W. Snedecor. The Collegiate Press, Inc., 1940. p. 133.

TABLE 28.—The average rate for trucking livestock and the average
distance that livestock was hauled, at Cleveland, Columbus, and
Cincinnati, 1937 to 1940

Species and market	Average rate (dollars per hundredweight)				Average distance (in miles)			
	1937	1938	1939	1940	1937	1938	1939	1940
Cattle:								
Cleveland	0.307	0.301	0.300	0.281	87.1	79.7	79.3	78.1
Columbus	.146	.164	.157	.157	30.3	30.4	35.2	29.9
Cincinnati–Ohio	.217	.215	.213	.202	44.7	47.4	45.6	46.1
–Indiana	....	....	.247	.235	....	....	71.0	83.6
Calves:								
Cleveland	.491	.478	.483	.476	82.0	78.3	75.7	76.4
Columbus	.365	.375	.326	.338	27.3	24.5	34.4	27.2
Cincinnati–Ohio	.524	.505	.503	.477	44.3	47.4	45.5	46.1
–Indiana	....	....	.487	.505	....	....	63.7	69.0
Hogs:								
Cleveland	.323	.318	.317	.296	85.2	81.0	76.6	78.6
Columbus	.152	.151	.148	.138	27.9	26.8	26.3	30.8
Cincinnati–Ohio	.211	.209	.203	.188	49.1	47.9	47.2	47.7
–Indiana	....	....	.243	.223	....	....	67.4	74.5
Sheep:								
Cleveland	.399	.317	.376	.339	92.4	85.5	75.1	81.1
Columbus	.181	.148	.214	.194	33.7	24.9	24.9	25.6
Cincinnati–Ohio	.318	.203	.301	.282	46.0	48.7	48.8	47.9
–Indiana	....	.243	.388	.364	....	....	67.0	71.7

Table 28 also gives the average distances that livestock in this study was
hauled to Cleveland, Columbus, and Cincinnati from 1937 to 1940. From 1937
to 1940, the average distance to Cleveland ranged from 75 to 92 miles; Colum-
bus, 24 to 35 miles; Cincinnati, from Ohio, 44 to 49 miles; and Cincinnati, from
Indiana, 63 to 83 miles. Livestock was being trucked a greater distance, on
the average, to Cleveland than to the other two markets.

Table 29 gives the standard deviations and the standard error of estimate
of the rates. The standard deviation, when added to and subtracted from, the
average rate, includes about two-thirds of the rates. The smaller the value
for the standard deviation, the more concentrated are the rates around the
average rate (arithmetic mean).

In table 29, calf and sheep rates have a larger standard deviation than
cattle or hog rates. This fact indicates that cattle and hog rates are more
concentrated around the average rate than either calf or sheep trucking rates.
Calf and sheep rates have a wider range than cattle or hog rates. In 1937,
with the exception of the standard deviation rate for hogs, the rates at Cleve-
land showed the most dispersion from the average. In 1938, the deviation was
greatest at Columbus for cattle and at Cleveland for calves. For hogs and
sheep in 1938, the deviations were greatest at Cincinnati. In 1939, the stand-
ard deviation for cattle, calves, and hogs was greatest at Cincinnati, from
Indiana. For sheep, it was greatest at Cincinnati, from Ohio. Data for Cin-
cinnati, from Indiana, were not available in 1937 and 1938. In 1940, cattle and
hog rates had a wider dispersion at Cleveland and Columbus; calf and sheep
rates, at Cincinnati, from Indiana. These standard deviations covering a
4-year period give evidence of the lack of any uniform system of rates
between markets.

TABLE 29.—The standard deviation and the standard error of estimate
of trucking rates at the Cleveland, Columbus, and Cincinnati
markets, by species, 1937 to 1940

(Dollars per hundred)

Species and market	Standard deviation				Standard error			
	1937	1938	1939	1940	1937	1938	1939	1940
Cattle:								
Cleveland	0.061	0.0655	0.0707	0.0701	0.06	0.065	0.0702	0.07
Columbus	.049	.0755	.0897	.0723	.048	.0715	.0865	.0716
Cincinnati-Ohio	.047	.0456	.0671	.0649	.046	.0455	.0645	.0646
-Indiana .	....	....	.0945	.0538	....	....	.0938	.0518
Calves:								
Cleveland	.1249	.1238	.1149	.101	.12	.122	.1124	.0904
Columbus	.107	.098	.1114	.0959	.105	.097	.1109	.095
Cincinnati-Ohio . .	.088	.1099	.0978	.1034	.052	.0984	.0973	.0902
-Indiana .	....	....	.1255	.1202	......	....	.1228	.1185
Hogs:								
Cleveland	.0647	.0561	.0687	.0538	.064	.055	.0668	.0531
Columbus	.068	.054	.0491	.0571	.043	.054	.0441	.0566
Cincinnati-Ohio	.056	.0756	.0511	.0436	.055	.0755	.0498	.0435
-Indiana .	....	....	.0692	.0472	....	....	.0689	.047
Sheep:								
Cleveland	.136	.0916	.0936	.085	.134	.091	.0932	.0846
Columbus	.082	.060	.0946	.0757	.081	.060	.0934	.0747
Cincinnati-Ohio . ..	.063	.1208	.0959	.0832	.063	.1148	.0914	.0832
-Indiana .	....	....	.0945	.116	....	....	.0942	.1128

The standard error of estimate of the different rates given in table 29 is
very little different from the values of the standard deviations, indicating that
very little was gained by fitting the line of regression.   It is important to
understand what the standard error of estimate measures.   In table 30, are
given the various lines of regression.   A line fitted ± (plus or minus) one
standard error from this trend line would include about two-thirds of the rates.
For example, the equation for cattle rates at Cleveland in 1937 was $0.297+
$0.00012, and the standard error of estimate was $0.06, as shown in table 29.
Two lines beginning at $0.237 ($0.297 minus $0.06) and at $0.357 ($0.297 +
$0.06), respectively, and continuing $0.06 above and below the trend line would
include two-thirds of the rates.

The equations in table 30 are the lines of regression.   These equations
indicate the slope of the lines and the rate of slope, which, theoretically, should
give the computed rates for any given distance.   The largest value in the fol-
lowing equations is a theoretical number whose calculation is necessary in
determining the slope of the line.   For example, the first equation listed in
table 30 is cattle rate at Cleveland in 1937, which was $0.297+$0.00012X_2.
The plus sign indicates that the rates increased as distance increased.   The
number $0.00012 indicates that for each mile increase in distance, the trucking
rate increased $0.00012, which was a very slight increase.   Multiplying
$0.00012 by X_2, or the distance the livestock was trucked, and adding the result
to $0.297 would give the trucking rate.

For example, if one were to calculate the cattle rate at 100 miles, this
would be obtained by taking $0.297 plus ($0.00012 × 100 miles), which equals
$0.297 plus $0.012, or $0.309.   This should be the theoretical rate for 100 miles.

The significant point to notice in the equations is the small increase (or
decrease) of rates with distance.   Consequently, the line of regression is
almost a straight line; that is, a straight line projected from the average rate

TABLE 30.—Lines of regression* at the Cleveland, Columbus, and Cincinnati
markets, by species, 1937, 1938, 1939, and 1940

(Dollars per hundred)

Species	1937	1938	1939	1940
Cattle:				
Cleveland	0.297 + 0.00012	0.2875 + 0.000165	0.2799 + 0.000255	0.2852 − 0.000059
Columbus	.1375 + .000269	.1298 + .001138	.0936 + .00224	.1429 + .0048
Cincinnati-Ohio.....	.189 + .0006	.2148 + .0000028	.1724 + .000985	.2052 − .000074
–Indiana .	....	....	.2244 + .00032	.2084 + .00032
Calves:				
Cleveland	.5667 − .0009	.5366 − .00074	.5386 − .000731	.3841 + .0012
Columbus	.4075 − .00156	.3575 + .000715	.3553 − .000838	.3311 + .00026
Cincinnati-Ohio. ...	.57 − .0012	.5815 − .001607	−.5232 − .000445	.6948 − .00472
–Indiana .	....	....	.5637 − .0012	.4696 + .00051
Hogs:				
Cleveland	.345 − .00026	.3307 − .000234	.3557 − .000534	.3176 − .0272
Columbus	.118 + .0012	.1444 + .000249	.1092 + .001457	.1492 − .0362
Cincinnati-Ohio.....	.196 + .0003	.2282 − .0004	.1767 + .000556	.1882 + .0000028
–Indiana .	....	....	.2365 + .000242	.2187 + .000063
Sheep:				
Cleveland	.465 − .0007	.3742 − .000195	.3957 − .00257	.3506 − .0138
Columbus	.2010 + .0006	.2505 − .00116	.2491 − .001413	.2250 − .00119
Cincinnati-Ohio.....	.30 − .003	.3792 − .00184	.3707 − .001433	.2842 − .000034
–Indiana .	....	....	.4128 − .000366	.4190 − .00075

*Values for the equation $Y_c = a + b\,X$ can be calculated from data in this table.

on the rate scale would nearly represent the rates for different distances.
These lines of regression indicate that a rate for 100 miles is almost the same
as one for 10 or 20 miles.

An analysis of the "a," or "theoretical," values indicates the relative level
of trucking rates at the various markets and among species at the same
markets.

RAILROAD RATES AND MOTOR RATES IN OHIO

In comparing the rates charged by the railroads with motor truck rates,
a different picture is obtained. A significant contrast between rates charged
by the two types of transportation is the degree of relationship that exists
between rates and distances. Little relation existed in motor trucking rates,
but there was a close relationship in railroad rates, table 31.

The relationship (coefficient of correlation) for railroads is +0.967, which
is highly significant. The line of regression for railroads is $0.1265 +
$0.000637X, or $0.1265 plus the sum of a given distance multiplied by $0.000637.
Two lines fitted parallel to this line, the standard error of estimate, which
include two-thirds of the cases, are ± $0.0075 from the regression line. This
latter measure is the standard error of estimate.

The average rate for transporting livestock from the group of towns listed
in table 31 by railroad is $0.1871, and the standard deviation is $0.037. The
standard error of estimate shows that there is a great concentration of rates
for various distances along the line of regression. Table 31 shows that the
rates actually range from 13 to 24 cents per hundred for ,a double deck of
calves, goats, hogs, lambs and sheep, and for a single deck of cattle.

So that the reader will be able to make a comparison between railroad and
motor rates, the following data are presented. Transportation rates, both rail-
road and motor, for cattle and hogs, single deck, from 16 towns in the Cleve-
land area, table 32, have been correlated with the transportation distance.
Comparable data were available for only 16 towns.

TABLE 31.—Rates charged to transport livestock to the
Cleveland market by railroad

(Dollars per hundred)

From—	Approximate mileage	Cattle, single deck; calves, goats, hogs, lambs, sheep, double deck
Hudson	25	0.13
Cuyahoga Falls	33	.14
Wellington	36	.14
Ravenna	37	.14
Barberton	45	.15
New London	47	.15
Greenwich	54	.16
Marshallville	57	.16
Alliance	58	.16
Shelby	67	.17
Wooster	73	.17
Galion	79	.18
Holmesville	80	.18
Shreve	82	.18
St. James	85	.19
Millersburg	86	.19
Glenmont	98	.20
Marion	101	.20
Danville	110	.21
Delaware	113	.21
Mt. Victory	121	.21
Newcomerstown	122	.21
Coshocton	136	.21
Columbus*	137*	.22
Columbus†	169†	.22
Bellefontaine	140	.22
Cambridge	148	.22
Galena	150	.22
Upper Sandusky	156	.21
Dunkirk	174	.22
Caldwell	177	.23
Lima	199	.23
Van Wert	226	.24

*New York Central R. R.
†Pennsylvania R. R.

One of the most important things to notice in table 33 is the average rate for transporting cattle and hogs by rail. For cattle, the average rate by rail from these 16 towns was $0.175 per hundredweight, by motor, $0.309. These averages, and those for hogs, show the differences in the rate level of the two methods of transportation although the average transportation distance was approximately the same.

The next important measure to notice is the coefficient of correlation. These data show a high degree of relationship between railroad rates and distance, practically no relationship in motor rates.

The standard deviation clearly points out that railroad rates are more concentrated around the average rates than are motor rates. For railroads, a rate that is either plus or minus the average rate, $0.02, will include about two-thirds of the rates charged; but for motor rates, the value is increased to $0.04 to include about two-thirds of the rates. Similar conclusions are verified when the range in rates is observed. Motor rates have a greater dispersion than railroad rates.

TABLE 32.—The railroad and average motor rate charged to transport
cattle and hogs from 16 Ohio towns to Cleveland, 1939

(Dollars per hundred)

Name of town	Cattle		Hogs	
	R. R.	Motor	R. R.	Motor
Wellington	0.14	0.298	0.16	0.322
Ravenna	.14	.302	.16	.349
New London	.15	.274	.17	.344
Greenwich	.16	.350	.18	.327
Marshallville	.16	.202	.18	.250
Alliance	.16	.250	.18	.250
Shelby	.17	.350	.19	.290
Wooster	.17	.272	.19	.226
Galion	.18	.300*	.21	.329
Holmesville	.18	.370	.20	.308
Shreve	.18	.355	.20	.352
Millersburg	.19	.347	.22	.325
Glenmont	.20	.380	.23	.385
Marion	.20	.263	.23	.276
Danville	.21	.321	.24	.333
Delaware	.21	.316	.24	.312
Difference between high and low	.07	.18	.08	.159

*No rates for 1939, but estimated on basis for 1938, which was 30.0 for cattle and 32.1
for hogs.

TABLE 33.—Comparison of railroad and motor rates for cattle
and hogs to Cleveland from 16 towns, 1939

	Cattle		Hogs	
	R. R.	Motor	R. R.	Motor
Average rate (dollars per hundredweight)	0.175	0.3098	0.1987	0.3111
Average distance	73.625	72.937	73.625	72.937
Coefficient of correlation	+.995	+.078	+.986	—.00754
Standard error of estimate	.002	.0471	.00429	.0413
Standard deviation	.022	.0472	.0261	.04139
Yc = a+bX	.1064+	.2971+	.1182+	.31269—
	.00093	.000167	.00109	.0000215

When a line of regression is fitted to the rates, the standard error of estimate is very small for railroad rates, but the standard error of estimate for motor rates is about as great as the standard deviation.

RELATIONSHIP BETWEEN TRUCKING RATES AND NUMBER OF HOGS PER SQUARE MILE

It has been pointed out that there was little relationship between trucking rates and distance but that there was a high degree of relationship between railroad rates and distance. Although such relationships (coefficients of correlation) do not explain cause and effect, it seems desirable to look for other factors that may have a relationship with rates. One of these is the number of hogs per square mile per county (density). The density per square mile was available only on a county basis; hence average county rates were used.

The number of hogs per square mile per county in Ohio was arrived at by dividing the number of hogs on farms January 1, 1939, as reported by the Agricultural Marketing Service, by the square miles in the county. Compa-

rable data for Indiana were secured by using the average number of hogs on farms March 1 for the years 1936, 1937, and 1938, as reported by the county assessors, and then adjusting to give the number of head per county on a January basis.

Three sets of data are presented. The first involves 30 counties from which livestock was trucked to the Cleveland market; the second, 11 counties in Ohio around the Cincinnati market; the third, 16 counties in Indiana from which livestock was trucked to the Cincinnati market. The data from the various counties are presented in table 34.

TABLE 34.—The average trucking rate and average density* of hogs,
for 57 selected counties in Ohio and Indiana, 1939

Cleveland (30 counties)			Indiana (16 counties)			Ohio (11 counties)		
County	Average rate	Average density	County	Average rate	Average density	County	Average rate	Average density
Lake	$0.402	6.6	Switzerland ..	$0.306	11.4	Adams	$0.25	28.4
Ashtabula	.335	9.5	Jefferson	.28	23.3	Clermont..	.235	41.5
Union	.32	11.0	Martin	.30	26.2	Brown	.224	56.7
Trumbull	.403	11.1	Jennings	.251	29.6	Butler	.172	108.8
Geauga........	.344	12.7	Jackson	.253	30.4	Highland..	.206	120.2
Portage	.349	15.5	Dearborn.....	.245	30.6	Warren....	.179	125.2
Lorain........	.317	17.7	Ripley........	.271	32.1	Darke	.25	142.6
Mahoning....	.284	19.4	Daviess......	.250	64.7	Greene......	.162	198.3
Columbiana...	.25	19.8	Ohio :........	.339	66.0	Preble.....	.171	211.8
Medina	.207	28.3	Franklin	.214	104.6	Clinton.....	.155	230.6
Summit	.321	29.2	Wells.........	.300	147.6	Fayette	.219	237.0
Ottawa........	.28	29.3	Decatur	.198	157.1			
Stark..........	.27	33.0	Union	.161	158.7			
Coshocton	.315	34.6	Wayne	.182	189.6			
Huron	.292	39.7	Fayette	.160	222.7			
Erie	.313	42.6	Rush	.146	286.8			
Ashland.......	.328	44.2						
Holmes	.34	48.3						
Richland	.311	58.6						
Wayne	.273	58.7						
Delaware.....	.331	63.4						
Sandusky	.28	66.3						
Knox	.33	66.3						
Morrow........	.342	76.2						
Wood..........	.225	78.9						
Seneca........	.286	92.9						
Hancock.......	.27	123.7						
Crawford.....	.28	124.2						
Wyandot......	.309	137.4						
Marion	.284	145.2						
Average... ...	.306	51.48		.241	98.84		.202	136.46

*Number per square mile.

An analysis of these data showed that the degree of relationship in the Cleveland area (coefficient of correlation) between the average county rate and the density per square mile was low, —0.328. Similar data for the 11 Ohio counties around Cincinnati, also presented in table 34, gave a relationship of —0.61, slightly higher than that in the Cleveland area. The relationship that existed for the 16 counties in Indiana was high in comparison with the other two sets of data, being —0.78.

The question should be asked, are these correlations significant, or are they due to sampling? When a test of significance is applied to these three correlation values, it is found that only the value —0.78, for the 16 Indiana

counties, is significant. The other two values could be due to sampling variation. This test of significance is based on the null hypothesis of zero correlation. The 0.1 per cent level was used for testing the significance of these values. Based on 9 degrees of freedom, the correlation value for the 11 counties in the Cincinnati area would have to be 0.735 or more to be significant at the 1 per cent level. In the Cleveland area, with 28 degrees of freedom, a value of 0.463 or more would be significant.

In each analysis, the data showed that as the number of hogs per square mile (density) increased, the trucking rate decreased.

TABLE 35.—Statistical measures of average trucking rates and average density per square mile of hogs in 57 selected counties in Ohio and Indiana, 1939

Area	Average rate	Average density	Coefficient of correlation	Standard deviation	Standard error of estimate	Line of regression $Yc = a+bX$
Cleveland (30 counties)	$0.30	51	—0.328	$0.043	$0.04	$0.3248—0.000358
Cincinnati (11 counties)	.20	136	— .61	.034	.027	.2417— .000289
Indiana (16 counties)	.24	98	— .78	.057	.036	.2942— .000538

It is important to make a comparison between the three markets of the average trucking rate and the average density. It gives further proof that the trucking rates decreased as the density increased. At Cleveland, the average rate was $0.30, and the average density, 51. In the Indiana counties, the average rate was $0.24, and the density was 98. From the Ohio counties around Cincinnati, the average rate was $0.20, and the average density was 136 hogs per square mile. The averages also point out the approximate level of the rate structure in each of the areas.

COST OF MARKETING LIVESTOCK FROM THE FARMER TO THE PROCESSOR

In the preceding sections, no attention has been given to marketing costs to the processor other than those of transportation. In addition to transportation, there are other marketing costs, such as yardage, commission, and insurance, feed and other minor expenses which should be considered in the marketing of livestock. Very little livestock transported by truck is fed at these Ohio yards. Therefore, feed costs at the yards are of little importance at these markets in a discussion of motor transportation. Death and crippled losses are omitted. Data on shrinkage were not available.

In table 36, are given the costs of marketing livestock on a per-hundredweight basis at three Ohio markets, Cleveland, Columbus, and Cincinnati, for the year 1940. The costs of marketing were taken from a sample of account sales at each of the three markets. The size of the sample is given in the table. A sample was studied for each species at each of the three markets. The average weight, which is given in the table, was obtained by dividing the total weight by the number of head. With the exception of hogs, the average weight was lighter at Cincinnati than at the Cleveland or Columbus markets. In determining the cost of marketing, the trucking charge has not been included, because it has already been considered.

TABLE 36.—The cost of marketing livestock at three Ohio terminal markets, Cleveland, Columbus, and Cincinnati, by species, 1940

	Cattle			Calves			Hogs			Sheep		
	Cleveland	Columbus	Cincinnati	Cleveland	Columbus	Cincinnati	Cleveland	Columbus	Cincinnati	Cleveland	Columbus	Cincinnati
Commission	0.0962	0.1238	0.0994	0.2166	0.2253	0.2841	0.1194	0.0882	0.1394	0.1809	0.1672	0.2587
Yardage	.0516	.0332	.0457	.2535	.0321	.1498	.0879	.0435	.0710	.1403	.0594	.1307
Fire insurance........	.0006	....	.0006	.0028	....	.0048	.0012	....	.0012	.0023	....	.0036
Transportation insurance...............	.0005	.0004	.0048	.0004	....	.0246	....	....	.0068	....	....	.0157
N. L. M. B.*..........	.0020	.0011	.0012	.0063	.0012	.0012	.0032	.0012	.0015	.0049	.0017	.0027
Feed.................	....	....	....	....	....	....	....	....	....	....	....	....
Total................	.1509	.1586	.1517	.4796	.2586	.4645	.2117	.1329	.2199	.3289	.2283	.4114
Number of head......	385	434	539	225	255	219	1,174	1,807	2,702	3,370	3,197	1,369
Weight..............	369,355	338,310	455,982	36,200	39,680	36,535	246,825	397,230	550,195	269,490	244,790	105,100
Average weight......	959.4	779.5	845.9	160.8	155.6	166.8	210.2	219.8	203.6	79.9	76.5	76.8

*National Livestock and Meat Board.

It is the common practice for the various agencies marketing livestock, such as commission firms and stockyards, to levy their charges on a per-head or per-lot basis. In this study, all these charges have been converted to a per-hundredweight basis for a comparison between markets. These charges include the deductions that are made at the three markets, except those for feeding.

The average cost to market 100 pounds of livestock through each of the markets, presented in the order of Cleveland, Columbus, and Cincinnati, in 1940, was as follows: cattle, $0.1509, $0.1586, $0.1517; calves, $0.4796, $0.2586, $0.4645; hogs, $0.2117, $0.1329, $0.2199; and sheep, $0.3289, $0.2283, $0.4114. With the exception of calves, the cost of marketing per hundred is a little higher at Cincinnati than at the other two markets. Columbus had the lowest cost of marketing per hundredweight.

The cost of yardage and commissions made up a large part of the total cost of marketing. The commission for selling cattle at the markets was $0.10 to $0.12 per hundredweight; calves, from $0.22 to $0.29; hogs, $0.08 to $0.14; and sheep, $0.16 to $0.26. Yardage charges were lower, from $0.03 to $0.05 for cattle; $0.03 to $0.25 for calves; $0.04 to $0.09 for hogs; and $0.06 to $0.14 for sheep. Other charges, such as fire insurance, National Livestock and Meat Board, and feed, made up a very small part of the total marketing cost.

It should be remembered that these charges were average charges, that no account was taken of the amount of livestock sold at a particular time; also that most charges are determined on a "head" basis. Therefore, heavier animals will be marketed at a slightly lower cost per 100 pounds than lighter animals.

MARKETING COSTS AS AFFECTED BY THE NUMBER OF LIVESTOCK SOLD

In studying the costs of marketing, the question should be asked, "What influence does the size of lot sold have on the cost of marketing?" The saving made by sending larger lots of cattle to be sold can be seen in tables 37, 38, 39, 40, 41, and 42. In an attempt to determine the influence of the size of lot marketed at a given time, two sets of marketing costs are given for 1939. One set of costs is based on marketing in larger lots, the other, in smaller lots. The large lots include those of 8 head or more of cattle, 10 head or more of hogs, marketed at one time. Small lots include those under 8 and 10 head, respectively. A comparison of marketing costs for calves and sheep is not included in this analysis, but it would be expected to show similar results.

Savings were made in marketing the larger lots of cattle. The saving at Cleveland was $0.029 per hundredweight. At Columbus, the saving was very small, being $0.009 per hundredweight. At Cincinnati, it was approximately $0.02 per hundredweight. These savings seem small, but when they are applied to the total amount of livestock marketed, they become a sizable amount of money. In planning a more efficient marketing system, any opportunities should be used to reduce marketing costs.

The two main marketing costs of cattle, exclusive of transportation, are commission and yardage. At Cleveland and Cincinnati, approximately two-thirds of the costs are commission for selling; one-third, yardage. At Columbus, the costs are about three-fourths for commission and one-fifth for yardage. Fire insurance and the National Livestock and Meat Board charges are minor.

TABLE 37.—The total cost, cost per hundred, and per cent of total cost of marketing large and small lots of cattle at Cleveland in 1939

Expenses	Total cost, in dollars		Cost per hundred, dollars		Per cent of total cost	
	Large* lots	Small† lots	Large lots	Small lots	Large lots	Small lots
Commission	100.00	41.00	0.0880	0.1065	64.80	64.58
Yardage	51.20	21.40	.0451	.0556	33.21	33.72
Fire insurance	.71	.28	.0006	.0007	.44	.42
N.L.M.B.	2.34	.81	.0021	.0021	1.55	1.28
Total	154.25	63.49	.1358	.1649	100.00	100.00
Size of sample	121	41	....	....	....	....
Weight	113,582	38,486	....	....	....	....
Average	938.7	938.7	....	....	....	....

*Large lots, eight head and over.
†Small lots, under eight head.

TABLE 38.—The total cost, cost per hundred, and per cent of total cost of marketing large and small lots of hogs at Cleveland in 1939

Expenses	Total cost, in dollars		Cost per hundred, dollars		Per cent of total cost	
	Large* lots	Small† lots	Large lots	Small lots	Large lots	Small lots
Commission	108.50	21.77	0.1193	0.1281	57.47	52.65
Yardage	76.30	18.80	.0839	.1106	40.41	45.46
Fire insurance	1.12	.22	.0012	.0013	.58	.53
N.L.M.B.	2.93	.57	.0032	.0033	1.54	1.36
Total	188.85	41.36	.2076	.2433	100.00	100.00
Size of sample	442	84	....	....	....	....
Weight	90,963	17,287	....	....	....	....
Average weight	205.8	205.8	....	....	....	....

*Large lots, 10 head and over.
†Small lots, under 10 head.

TABLE 39.—The total cost, cost per hundred, and per cent of total cost of marketing large and small lots of cattle at Columbus in 1939

Expenses	Total cost, in dollars		Cost per hundred, dollars		Per cent of total cost	
	Large* lots	Small† lots	Large lots	Small lots	Large lots	Small lots
Commission	81.90	90.00	0.0993	0.1080	77.94	79.35
Yardage	22.25	22.55	.0270	.0270	21.19	19.84
N. L. M. B.	.89	.90	.0011	.0011	.87	.81
Total	105.04	113.45	.1274	.1361	100.00	100.00
Size of sample	89	90	....	....	....	....
Weight	82,441	83,367	....	....	....	....
Average	926.3	926.3	....	....	....	....

*Large lots, eight head and over.
†Small lots, under eight head.

TABLE 40.—The total cost, cost per hundred, and per cent of total cost of marketing large and small lots of hogs at Columbus in 1939

Expenses	Total cost, in dollars		Cost per hundred, dollars		Per cent of total cost	
	Large* lots	Small† lots	Large lots	Small lots	Large lots	Small lots
Commission	58.40	17.00	0.0935	0.0935	66.03	65.98
Yardage	29.20	8.50	.0468	.0468	33.05	33.03
N. L. M. B.	.82	.25	.0013	.0014	.92	.99
Total	88.42	25.75	.1416	.1417	100.00	100.00
Size of sample	292	85				
Weight	62,429	18,173				
Average	213.8	213.8				

*Large lots, 10 head and over.
†Small lots, under 10 head.

TABLE 41.—The total cost, cost per hundred, and per cent of total cost of marketing large and small lots of cattle at Cincinnati in 1939

Expenses	Total cost, in dollars		Cost per hundred, dollars		Per cent of total cost	
	Large* lots	Small† lots	Large lots	Small lots	Large lots	Small lots
Commission	283.30	92.00	0.0858	0.1061	64.22	68.81
Yardage	152.40	40.00	.0462	.0462	34.58	29.96
Fire insurance	1.81	.64	.0005	.0007	.37	.45
N.L.M.B.	3.75	.99	.0011	.0012	.83	.78
Total	441.26	133.63	.1336	.1542	100.00	100.00
Size of sample	381	100				
Weight	330,251	86,680				
Average	866.8	866.8				

*Large lots, eight head and over.
†Small lots, under eight head.

TABLE 42.—The total cost, cost per hundred, and per cent of total cost of marketing large and small lots of hogs at Cincinnati in 1939

Expenses	Total cost, in dollars		Cost per hundred, dollars		Per cent of total cost	
	Large* lots	Small† lots	Large lots	Small lots	Large lots	Small lots
Commission	113.15	60.25	0.1466	0.1774	65.39	69.32
Yardage	57.60	25.35	.0746	.0746	33.27	29.15
Fire insurance	.96	.65	.0012	.0019	.54	.74
N.L.M.B.	1.40	.69	.0018	.0020	.80	.79
Total	173.11	86.94	.2242	.2559	100.00	100.00
Size of sample	384	169				
Weight	77,184	33,969				
Average	201	201				

*Large lots, 10 head and over.
†Small lots, under 10 head.

By marketing hogs in larger lots, a saving can also be made, except at Columbus. The saving made at Cleveland when 10 or more hogs were marketed at one time was $0.036 per hundredweight. At Columbus, no saving was made. At Cincinnati, the saving was approximately $0.03. Slightly over one-half of the total cost at Cleveland was for commission, and the remaining part was for yardage. The costs at Columbus and Cincinnati were about two-thirds for commission and one-third for yardage.

The conclusion to be drawn from this analysis of marketing costs is that a possibility for a very slight saving does exist, and that in a great many instances, this saving can be put into use as a tool for further efficiency in marketing.

HOW OHIO FARMERS MARKET THEIR LIVESTOCK

The method and system farmers use in marketing their livestock influence not only transportation costs, but also marketing costs. If farmers call truckers to their farm to pick up 1 steer, or 5 hogs, or 8 lambs, as compared with 10 steers, or 50 hogs, or 75 lambs, or even larger lots, both transportation and marketing costs will be influenced.

To show how farmers did market their livestock, the writers selected a sample of account sales for 1940. A 1 per cent sample was selected first; then account sales were added until adding additional account sales did not change but slightly the totals or averages. This sample was slightly smaller than the sample actually used, which was 4 per cent of the account sales for the months of January, April, July, and October.

Ohio farmers sell a majority of their livestock in straight and in small lots, as shown in table 43.

In the Cleveland area, 72.8 per cent of the cattle, 87.2 per cent of the calves, 82.3 per cent of the hogs, and 70.7 per cent of the sheep were sent from the farm in straight lots, that is, all cattle, all calves, etc. In the Columbus area, these percentages of straight consignments were 61.3, 69, 79, and 58.7 for cattle, calves, hogs, and sheep, respectively. For the Cincinnati area, the percentages were 73.6, 77.5, 87.6, and 81.6 for the same species, respectively. The percentage of straight consignments was largest at Cleveland and smallest at Columbus. A large percentage of the cattle and calves at each of the markets was marketed in lots of only one head. A true picture of how cattle and calves are marketed in Ohio can be obtained by remembering that a majority of consignments were of only one head of cattle or calves.

A majority of the hogs in the Cleveland and Columbus areas were marketed in straight lots of 10 head or less. The size of hog consignments in the Cincinnati area was larger than in the Cleveland or Columbus areas. In the Cincinnati area, nearly one-fourth of all consignments were from 11 to 21 head, and another 21 per cent were 21 head or over, indicating somewhat larger consignments in southwestern Ohio.

In the Cleveland area, a majority of sheep consignments were 6 head or over, and 24 per cent were over 11 head. In the Columbus area, two-fifths of the sheep were marketed in mixed lots. In the Cincinnati area, a majority of the sheep were marketed in lots of 3 to 21 head.

The mixed consignments moved in all sorts of combinations, but the combinations of cattle and calves and calves and hogs predominated in each of the market areas.

TABLE 43.—The percentage of straight consignments and percentage of mixed consignments, by size of consignments, by species, at Cleveland, Columbus, and Cincinnati, 1940*

Number of head	Cattle			Calves			Hogs			Sheep		
	Cleveland	Columbus	Cincinnati	Cleveland	Columbus	Cincinnati	Cleveland	Columbus	Cincinnati	Cleveland	Columbus	Cincinnati
1	48.2	37.6	50.0	65.1	46.3	63.1	13.3	12.6	9.0	2.4	12.0	3.9
2	9.2	9.8	7.6	15.4	14.9	12.6	6.5	9.2	3.9	6.1	4.0	3.9
3- 5	6.6	6.4	10.2	5.4	6.0	1.4	18.2	13.0	12.3	6.1	12.0	15.8
6-10	3.1	5.2	4.2	1.0	1.8	.4	25.0	19.5	18.1	17.1	6.7	28.9
11-21	4.8	1.7	....	.3	....	....	15.1	14.8	23.2	12.2	10.7	19.8
21-over	.9	.6	1.7	....	....	....	4.2	9.9	21.1	26.8	13.3	9.3
Mixed consignments	27.2	38.7	26.4	12.8	31.0	22.5	17.7	21.0	12.4	29.3	41.3	18.4
Total number	228	173	118	390	281	222	384	324	332	82	75	76

*The data were obtained by taking a selected sample from the account sales at Cleveland, Columbus, and Cincinnati. The sample was built up; that is, first, a 1 per cent sample was taken; then this was added to until the percentage distribution was not changed materially.

TABLE 44.—The percentage of the consignments within a given weight group that were marketed at Cleveland, Columbus, and Cincinnati, 1940

Weight marketed	Cattle			Calves			Hogs			Sheep			Mixed*		
	Cleveland	Columbus	Cincinnati	Cleveland	Columbus	Cincinnati	Cleveland	Columbus	Cincinnati	Cleveland	Columbus	Cincinnati	Cleveland	Columbus	Cincinnati
0- 250...	0.6	0.9	....	75.1	71.1	82.9	7.5	6.3	3.7	14.5	28.9	15.6	1.6	0.8	2.9
251- 500...	....	1.8	3.4	19.3	22.2	17.1	11.3	14.7	7.7	12.7	22.2	22.5	1.6	6.0	5.8
501- 750...	14.3	11.7	20.7	3.2	2.1	....	12.5	10.2	7.7	14.5	4.4	24.1	10.7	6.0	5.8
751- 1,000...	29.2	29.7	31.0	1.2	3.1	....	8.4	9.8	7.0	12.7	11.2	17.2	10.7	11.1	17.4
1,001- 1,500...	23.0	15.3	17.2	.6	1.5	....	17.2	13.3	13.4	10.9	11.2	10.3	21.4	20.5	21.7
1,501- 2,000...	6.8	15.3	3.4	.6	....	....	14.7	11.3	7.7	5.5	6.6	....	14.8	14.6	8.7
2,001- 3,000...	7.5	5.4	11.5	....	....	....	14.4	12.5	14.1	9.1	13.3	6.9	18.0	14.6	7.2
3,001- 4,000...	5.6	6.3	5.7	....	....	....	5.9	3.9	6.7	7.3	....	1.7	6.6	8.5	11.6
4,001- 5,000...	1.9	4.5	2.3	....	....	....	4.7	7.8	10.1	3.6	2.2	1.7	4.0	5.1	2.9
5,001-10,000...	6.2	7.2	3.4	....	....	....	3.4	7.8	19.1	5.5	....	....	7.4	12.0	16.0
10,001-20,000...	3.7	1.9		....	....	....	....	2.0	2.8	....	....	....	3.2	.8	....
20,001-over	1.2	....	1.4	....	....	....	....	.4	....	3.7	....	....	....	....	....
Total per cent.	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Mean	2,489	2,170	2,198	214	231	168	1,711	2,334	3,324	2,252	847	846	2,440	2,588	2,551

*Mixed are combinations of cattle and calves or cattle, calves, hogs, etc.

Ohio farmers should take notice of the small number of livestock that they are sending to market at a particular time. Where it is possible to send them, larger consignments would reduce slightly the total cost of transportation and marketing. On the other hand, marketing animals when finished, or ready for market, may be of more importance.

In table 44 is presented the same information as in table 43, except that the data have been converted to a weight basis instead of a head basis. The data in table 44 are for straight consignments only; no account is taken of mixed consignments.

A large majority of cattle, hog, and sheep consignments were 1,500 pounds or less. Almost all the calf consignments were less than 500 pounds, and a big majority of these were less than 250. The average cattle consignment was less than 2,500 pounds, which is a rather small consignment and means that salesmen at the markets must handle a large number of small consignments. The average hog consignment varied from over 1,700 pounds at Cleveland to slightly above 3,300 pounds at Cincinnati. The mixed consignments were about the same size at all three markets. The average at the three markets was about 2,500 pounds.

To show the importance of straight and mixed consignments, table 45 is presented. Slightly more than 12 per cent of the total weight at Cincinnati was marketed in mixed consignments, and 69 per cent of total weight was straight hog consignments. The mixed consignments, on a weight basis, were highest at Columbus, 24.7 per cent. At Cleveland, they were 20.6 per cent, on the same basis.

TABLE 45.—The total and percentage distribution of the weight of livestock marketed by Ohio farmers in mixed consignments and in straight consignments, by species, taken from a selected sample at three Ohio markets, Cleveland, Columbus, and Cincinnati, 1940

Kind of consignment	Weight in pounds			Percentage		
	Cleveland	Columbus	Cincinnati	Cleveland	Columbus	Cincinnati
Cattle.................	400,705	240,875	191,190	27.8	19.7	13.3
Calves.................	73,250	44,875	28,500	5.1	3.7	2.0
Hogs	547,625	597,625	990,500	38.0	48.8	69.0
Sheep.................	123,895	38,100	49,000	8.6	3.1	3.4
Mixed*	297,500	302,750	176,000	20.5	24.7	12.3
Total.................	1,442,975	1,224,225	1,435,190	100.00	100.00	100.00

*Includes all mixed lots; no breakdown of different combinations.

CONCLUSIONS

Motor trucks have, except for a very small volume, replaced railroads for transporting livestock short distances to market. This shift from rail to motor has taken place during the past two decades and was especially marked during the period from 1925 to 1935.

During the past decade, rates for transporting livestock have declined perceptibly in Ohio. In 1929, they were, on the average, about 70 per cent higher than during the years 1937 to 1940. The rates for 1940 were slightly lower than those for recent years although it would seem that the rates have about reached bottom for the comparable areas in Ohio, assuming, of course, that no unusual improvements or conditions in motor transportation will be introduced to change costs. Of course, rates may change slightly from the 1940 level. There seems to be a possibility that they may for the distances from 50 to 100 miles, but it is not as likely that they will for the distances under 50 miles.

From analyzing the rates in this study from as many as 320 communities in Ohio, it does not seem possible to draw any conclusions that rates follow any definite pattern. As a matter of fact, one would be inclined to believe that rates up to the present have been influenced as much by custom as by any other factor. The rates for trucking services seem to take on the characteristics of the community or market area, as is observed by comparing the rates for the three Ohio markets for the same distances or mile zones. Another study of these same markets after another 10 or 15 years may bring out other factors involved in rate making that have not seemed evident in recent years.

It is a safe conclusion that up to the close of 1940, motor rates for livestock transportation in Ohio were not dependent upon distance as an important factor. In fact, both observation and statistical measurements show no correlation. Since railroad rates in this territory follow definitely the distance principle and users of railroad transportation have been accustomed to it, it would seem that motor rates would have accepted the same principle. To show the relationship, cattle rates and hog rates, single deck, for both motor and railroads were correlated with distance for 16 towns to Cleveland (table 33). The relationship of distance to rates was high for railroads, but there was little relationship for motor trucking rates. It is not safe to say that there is no relationship between motor rates and greater distances than those in this study, but there has been little relationship between distance and rates around the Ohio markets where most of the livestock trucking is for distances under 150 miles.

Although motor rates do not increase with distance as railroad rates do, at the longer distances, for example, 100 to 175 miles, from the market, the two rate structures tend to approach each other. This situation enables the motor truck to maintain more effectively its competitive position for the longer hauls. Thus, at longer distances from the market, competition is more important in determining motor rates, since railroad rates are on a definite, regulated basis.

In the motor transportation of livestock, a factor which showed more relationship than distance was the density of livestock. For this analysis, the data were none too good, but hogs were selected to see what might be obtained. Although the relationship between the density of livestock within an area and motor rates is not great, it is more pronounced than that between rates and

distance. This relationship probably means that livestock truckers can trans-
port a greater volume, have more loads nearer to the capacity of the truck,
keep overhead lower, and, as a result, vary rates more in regions with high
density than would be expected upon casual consideration.

Although many of the rates are charged by truckers on a hundredweight
basis, there is no degree of uniformity in the system for all species or all com-
munities. The rates for calves more than any other species were charged on
a per-head basis of $0.50, $0.75, or $1.00. Cattle, also sheep and lambs, were
sometimes trucked on a head basis. In some areas, there was a tendency to
arrive at the rate basis upon an agreed amount for the lot, particularly where
a trucker was unable to move to market with a full truckload.

In discussing the motor rate structure for livestock transportation, one
should keep in mind that competition among truckers has had a decided influ-
ence on the rate structure within areas and between areas.[5] Truckers operate
over a considerable area, and individual stockmen within an area usually have
available a number of truckers. This fact must be kept in mind in appraising
a basis for a rate structure. The amount of competition that exists in motor
rates is almost indeterminate, but it is a safe assumption that competition does
exist, since free entry into the trucking business is possible. Consequently,
any trucking rates within a given area that are out of line for any length of
time will be corrected by the competitive situation.

Another point to be kept in mind is the number of years that have elapsed
since the shift from rail to motor transportation. The areas that shifted first
to the motor truck were near the market. The areas more distant have shifted
later, and, as a result, the areas near by are older in experience. Many
truckers have gone out of the business, and those who were able to get and
hold the business are continuing. Consequently, experience has given these
truckers a better basis for rate charges. On the other hand, at more distant
points, truckers have not had as much experience, have not worn out as many
trucks, and have had to compete actively in some instances with the railroads
to induce patrons to shift to motor transportation. Hence, the rates for more
distant points may be lower during the earlier period of shift from railroads
to truck. Then custom will play an important part for a period. As an
example, if a trucker attempts to offer motor transportation service for a com-
munity served by a railroad, his rates must be low enough, considering con-
venience and the like, to get the business shifted to the truck. Let us say that
the rate was 30 cents per hundredweight. After this rate has been estab-
lished, it becomes the customary rate for the community, and the trucker will
have difficulty raising it. If the trucker finds by experience that the 30-cent
level is too low, he may be forced to quit or to raise his rates, but the cus-
tomary rate is a big obstacle for him to overcome. In many of the areas in
Ohio more than 75 miles from the markets, this situation, in part, prevails.

Convenience no doubt has influenced livestock transportation. There is
little question but that farmers have been influenced to use motor transporta-
tion because it is more convenient. Because of convenience, the rate structure
may be affected. For example, a farmer may be willing to pay a slightly

[5]Ohio Agr Exp. Sta. Bull. 440, The truck and its relationship to livestock marketing in Ohio, 1927; and Ohio Agr. Exp. Sta. Bull. 531, Motor transportation of livestock in Ohio, 1933.

higher rate per hundred by truck to have his livestock loaded at the farm and taken directly to market, rather than transport it a few miles by truck and then transfer to rail.

There is another point to keep in mind in analyzing rates by distance. In trucking livestock, many of the costs are more or less fixed and remain the same for a year, or for a period basis. A trucker's investment (many operate on borrowed capital in purchasing the truck) remains the same for a considerable period of time, 3, 6, and 12 months. The annual license fee and like expenses are on a 12-month basis. He may be hiring his labor on a week, day, or some other period basis. Such costs are not dependent so much on distance as they are on volume. Hence, a number of items that enter into costs do not vary according to distance. To have volume and to have each truckload approach capacity are more important than distance. For example: Assume point A, 50 miles from market, and point B, 100 miles; also that it costs a trucker 5 cents per mile to operate his truck. From point A, his cost of operation for one trip would be $5 per trip (50 $\times$ 2 $\times$ $0.05), and from point B, $10 (100 $\times$ 2 $\times$ $0.05). If from point A, he should have 7,000 pounds at $0.30 (capacity 10,000 pounds), the trucker would gross $21 for the trip. On the other hand, if from point B, he hauled 9,000 pounds at $0.30 (capacity 10,000 pounds), he would gross $27. With his cost running $5 per trip more from B, the trucker would be ahead when he could haul a heavier load, even though he hauled it from a point 50 miles farther from market. Therefore, if he should happen to be in a territory of more livestock per square mile, where he could increase his capacity from 10,000 pounds to 15,000 per truckload, he would be able to overcome considerable handicap in distance. In this study, the writers were unable to study the size of load transported or how near the trucks were loaded to capacity. These are undoubtedly important factors in determining rates and the rate structure.

Transportation rates on many agricultural commodities are regulated between terminal points, but livestock trucking rates have not been subject to such regulation in Ohio. Therefore, an entirely different system of rates has prevailed, as contrasted with what would have prevailed under a system of regulation. In motor rates, competition and custom have been allowed to work. The effects are indefinite, but the farmer has probably benefited by this situation. With the lack of regulation, livestock farmers have had a flexible rate structure. Had a uniform system of regulation similar to that of the railroads been in effect, a very rigid structure would undoubtedly have been in force. Then farmers farthest from market might have lost their advantage in transportation as compared with the farmer close to market.

Several assumptions can be made and should be kept in mind. Rates may remain on the present level, decline some more, or rise to a higher level. Likewise, they may ignore, as at present, the distance factor to most markets.

Assuming that rates will remain on or about the present level and will ignore distance as a factor up to 125 to 150 miles, some considerations seem logical concerning livestock marketing.

First, such markets as Cleveland, Columbus, Cincinnati, and Dayton will be favored in holding their present truck volume. When the distance principle is ignored, these markets have an advantage over other markets.

Second, smaller markets peculiarly or advantageously located will be able to enlarge as far as motor transportation rates are concerned. If this is a significant enough advantage, larger markets may develop within the decentralized areas, those areas that are not normally within the trucking areas of the terminal markets but must use rail facilities to reach them. Also, sizable, well-located auctions may be slightly favored to develop in the future from the present situation of many local auctions, concentration yards, packer buying points, and local markets.

Third, if it is assumed that in the future, motor rates will recognize distance and be somewhat higher for the longer distances, terminal markets, such as Cincinnati and Cleveland, will be placed at a greater disadvantage than at present, and markets at country points will be placed in a somewhat favored position compared with the present situation. Such a development would mean the probable enlargement of the country markets. Whether rates will continue in the future along their present pattern, only time will tell, but they should be observed and studied, for they can be favorable or unfavorable to certain parts of the livestock marketing system.