Transportation costs and cattle feeding in Arizona

TRANSPORTATION COSTS AND CATTLE FEEDING IN ARIZONA

by

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TABLE OF CONTENTS

TABLE OF CONTENTS--Continued

LIST OF TABLES

LIST OF TABLES--Continued

LIST OF ILLUSTRATIONS

ABSTRACT

Any industrial operation is faced with the problem of minimizing transportation costs when determining plant location. Raw materials must be moved in and finished products transported to final markets. These costs must be weighed against the production advantages or disadvantages provided by nature in specific locations. Cattle feeders must make decisions of this nature. Feeder cattle are brought into Arizona from substantial distances while fat cattle and carcasses are exported a shorter but still significant distance. In order to be competitive, combined costs of production and transportation for Arizona feeders must be balanced against similar operations in alternative locations.

This study attempts to explain this movement and establish a cost figure. To accomplish this goal a brief description of the cattle industry in Arizona has been made. Also, economic and institutional forces as they relate to inter and intrastate transportation are discussed to provide some insights into the problems associated with the movement of livestock, carcasses and feeds.

Relatively high costs for transportation are incurred by Arizona feedlot operators as a result of the

distances from feeder calf suppliers and from consumer markets for beef. In order to be competitive at the consumer level some factor must offset these costs. This factor must be found in the feeding process whereby the conversion of feed into beef has a relatively high degree of efficiency.

CHAPTER I

INTRODUCTION

"I always did say that these cattle bore a kind of liking to a young kid at a carnival with a buck. Boy, boy, boy does he ever get a ride."[1]

Problem Situation

The process of production and delivery of a sirloin steak to the consumer involves numerous transformations in space, time and form. From birth, the calf will travel, perhaps thousands of miles, by various means and will be fed various feeds as milk, grass, hay, grain, molasses and special chemicals. It is likely to change owners and locations several times before it reaches maturity and is considered ready for market. It then will travel again to be slaughtered, chilled, cut, packaged, and either frozen for storage or delivered for fresh sale in numerous scattered stores. It is finally purchased and cooked by the consumer.

The transformations described above constitute the complete and complex production and marketing of beef. Marketing costs constitute approximately one-half the retail

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1. George Mancini, "Feeder Cattle: Sources, Movements, Types and Changes," Proceedings of the Research Workshop on Cattle Feeding, Denver, March 16-18, 1964.

price of beef, and an important aspect of this marketing process is transportation. This is an unavoidable cost which influences the location of processors, their profit margins and the amount of beef consumed.

The Arizona cattle industry experiences a substantial volume of cattle movement into the state, out of the state and within the state. Feeder and stocker cattle are imported as well as exported. Over one-half of the 700,000 fed cattle marketed out of Arizona feed lots are slaughtered in the state, and the remainder exported, mostly to California. Since the distances moved are often of substantial length (see Figures 1 and 2) the resultant transportation costs tend to be significant. This study focuses on analyses of the amount of these costs and their influence on Arizona's competitive position in the market.

Objectives and Methodology

The primary objectives of this study are first to describe the movement of cattle and feed to, from, and within Arizona and to explain the reason for such movement. Secondly, it will attempt to show the dollar expenditure per hundred weight in moving cattle, feed and carcasses to the ultimate consumer, using applicable modes of transportation with specific reference to the Arizona Cattle Feeding industry. Finally, these costs will be compared to those of major competing areas with the advantages and disadvantages pointed out.

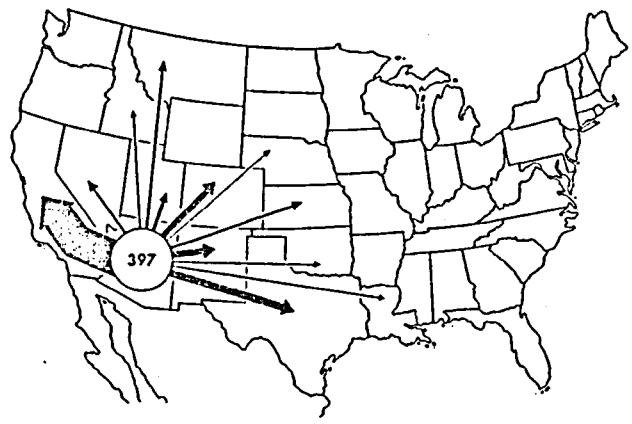

Fig. 1. Destination of non-fed cattle moving out of Arizona, 1969.

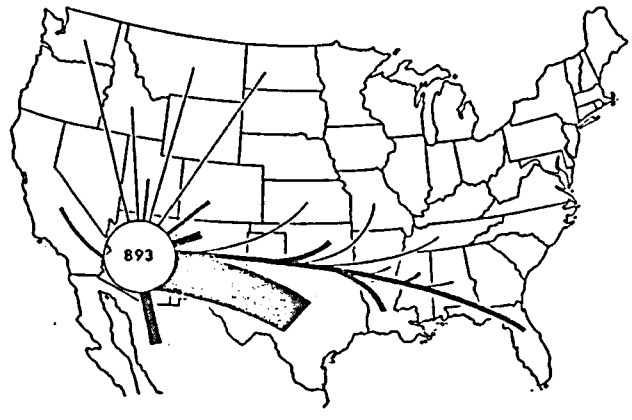

Fig. 2. Sources of non-fed cattle moving into Arizona, 1969.

Source: Arizona Crop and Livestock Reporting Service. Arizona Cattle Shipments Annual Summary, 1969. U.S. Department of Agriculture Statistical Reporting Service.

Chapter II of this study covers the first objective. In this chapter the cattle industry in Arizona is broken down into three phases, producing, fattening and slaughtering cattle. Each phase is discussed separately with regard to its historic background and transportation required. The chapter ends with a section about Arizona's major competitor for feed and feeder cattle.

Data on total cattle movements were obtained from reports of the Arizona and California Crop and Livestock Reporting Service Branch of the USDA Statistical Reporting Service. In order to determine the break-down of fed and non-fed cattle shipped out of Arizona, an estimate of the Arizona Fed Cattle slaughtered in the state had to be made. From studies made by The University of Arizona, Department of Agricultural Economics[2] a percentage of the breeding herd (cows two years and older plus bulls) cut for replacement was obtained. Assuming that the complete breeding herd cut went directly to Arizona slaughter houses, a percentage cut was taken from cows and bulls on farm January 1, in Arizona and deducted from total Arizona slaughter. The remainder, assumed to be fed cattle slaughtered in the state, was further deducted from total marketings of fat cattle to estimate out-shipments. Unfortunately, the lack of available data on the number of

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2. N. G. Wright, unpublished data, The University of Arizona, College of Agriculture, Department of Agricultural Economics, Tucson, Arizona, Dec. 10, 1965.

calves brought into Arizona to be warmed up and finished out of the state, and on the number of native calves finished in Arizona limit the accuracy of these estimates.

Feed grain consumption in Arizona was determined from the conversion ratios of the different types of animals fed as supplied by University of Arizona personnel in the Animal Science Department. Appendix I shows the calculations performed.

Since this study is devoted to transportation and its costs, the general economic and institutional forces inherent in all transportation are discussed in Chapters III and IV as a prelude to the final chapter which shows the actual costs of transportation to Arizona cattlemen. Information contained in Chapters III and IV is primarily the author's interpretation of secondary data and other studies on transportation economics. The freight rate structure for commodities relative to this study as outlined in Chapter V was determined from published tariffs and primary data collected from cattle haulers, the Arizona Cattle Feeders Association, railroads and The University of Arizona personnel.

Limitations

Any study such as this is subject to the problems of dynamics, inherent in any industry in the long run. Technological improvements constantly alter existing situations. Solutions to a problem in one element of our society often

create problems in another area, the reaction to which may alter the original problem and its solution. In the short run, some degree of statistics must be assumed, but even this, at best, is a questionable assumption in our complex society with its many interrelationships.

Finally, it should be recognized that institutional forces wield heavy influence in the analysis of a transportation problem. In pure economic analysis, the price system is a proven standard by which cost and benefits can be measured. However, when the complex of institutional forces is taken into account, the measurability of variables is lost.[3]

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3. Arthur Henry Smith, Economic, Social and Legal Problems of the Arizona Cattle Feeding Industry as Related to Ag-Product Disposal, unpublished Master's Thesis, The University of Arizona, 1964, p. 14.

CHAPTER II

ARIZONA BEEF CATTLE INDUSTRY

The term Beef Cattle Industry, as used in this study includes producing cattle, fattening for slaughter and slaughter. All three functions occur in Arizona.

Cattle Ranching and the Breeding and Raising of Arizona Cattle

In the late eighteen hundreds, Arizona, in addition to its mild climate, enjoyed vast areas of lush grasslands that had no other economic use than grazing cattle. This brought about a tremendous growth of the cattle ranching industry. It is difficult to identify when the peak was reached but since 1920 when inventories of cattle were first compiled, the industry has shown a steady decline. In 1920 there were 866,000 cows and bulls on Arizona ranges. In 1965 there were only 406,000. Most of the decline in cattle numbers as well as much of the acreage grazed can be attributed to deterioration of ranges from over-grazing prior to 1920. But also significant are the economic and social changes that have taken place in the range areas of the country over the past decade. Higher uses than grazing have developed for much of the range lands. The rapid population growth in Pima, Pinal

and Maricopa Counties has transferred much land from grazing to residential use. This, combined with increasing returns in other agriculture and non-agriculture fields have raised opportunity costs to the point where grazing cattle in many areas cannot economically be continued. Speculation has also driven up land values; and, although much of this land remains in grazing, as population growth continues, it is very probable that residential and recreational uses will eliminate much grazing in the future.

There are some ranches that continue in operation in spite of high opportunity costs. If speculative profits are anticipated from future values, such operations may be economically rational. But in many cases no consideration is given to the future. The reason most often presented for this economically irrational behavior is the sociopsychological concept of ranching as a "way of life." This concept includes both the bonafide cowman who can still derive a small cash income from his cattle and the wealthy newcomer who can afford the luxury of being called a rancher without concern for both the cash and opportunity costs.

Finally, there are some ranches in Arizona, though perhaps in the minority, that can be considered economically rational concerns. Of the existing ranches, most are cow-calf operations, although there are some straight steer

ranches.[1] Except for culled cows and bulls which have outlived their usefulness, the cattle sold off Arizona ranches are almost exclusively stocker or feeder cattle; that is, cattle which will be carried on pasture another season or those which are to be immediately fattened.

Nearly all Arizona raised stockers and feeders are shipped out of state. Table 1 shows the total number of cattle shipped from Arizona from 1961 through 1968 and estimates of the numbers of fed and non-fed cattle exported. In 1968 the substantial decrease in fed cattle exported reflects the opening of a new packing plant in Tolleson.

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1. A cow-calf operation is a breeding and raising operation consisting of a brood-cow herd, bulls and calves. The calves are normally born in the early spring and are either sold the following fall or carried over to be sold as yearlings. A steer ranch is a seasonal operation pasturing only steers in the spring and summer months to be sold in the fall.

TABLE 1. Total Number Shipped and Estimates of Fed and Non-Fed Cattle Shipped Out of Arizona, 1961-1968

Year	Total Number of Cattle Shipped[a]	Fed Cattle Shipped[b]	Non-Fed Cattle Shipped
	(Thousands of Head)		
1961	665	394	269
1962	757	435	322
1963	757	467	290
1964	670	436	224
1965	773	476	297
1966	758	432	326
1967	794	486	308
1968	677	344	333

a. Arizona Crop and Livestock Reporting Service. Arizona Cattle Shipments Annual Summaries, 1961-1968. U.S. Department of Agriculture Statistical Reporting Service.

b. Arizona Crop and Livestock Reporting Service. Arizona Agricultural Statistics. Statistical Reporting Service, U.S. Department of Agriculture, Phoenix, 1965-1969.

Although California continues to receive the majority of Arizona non-fed cattle, both the absolute amount shipped to California as well as the percentage of all non-fed cattle exported have declined substantially since 1961 (Table 2). Most of the remaining non-fed cattle are exported to New Mexico and Texas.

TABLE 2. Number of Non-Fed Cattle Shipped from Arizona and Stockers and Feeders Received by California, 1961-1968

	Number of Non-Fed Cattle Shipped[a]	Stockers and Feeders Imported into Cal. from Az.[b]	% of Number of Non-Fed Cattle Shipped
	(head)	(head)	(%)
1961	269	259	96
1962	322	280	87
1963	290	236	81
1964	224	167	75
1965	294	204	69
1966	326	222	68
1967	308	219	71
1968	333	189	57

a. Arizona Crop and Livestock Reporting Service. Arizona Cattle Shipments Annual Summaries, 1961-1968. U.S. Department of Agriculture Statistical Reporting Service.

b. California Crop and Livestock Reporting Service. California Annual Livestock Reports. California Department of Agriculture, Bureau of Agricultural Statistics, Sacramento, 1966-1969.

Arizona Cattle Feeding

Although the Arizona cattle ranching industry is at best in a relatively stationary state, cattle feeding has experienced such growth in the past decade that it is currently the most dominant phase of the overall cattle industry in Arizona. The number of cattle marketed out of Arizona feedlots has increased from 374,000 in 1956 to 703,000 in 1968.

Arizona cattle feeding traces its origin to the development of irrigated farming in the Salt River Valley late in the 19th century. At that time one and two-year old steers were placed on irrigated pasture until they became

grass fat. With the completion of the Salt River Project, irrigated farming grew rapidly. Feed grains became readily available, and the slower, less effective practice of pasture fattening gradually gave way to feed lot finishing with a complete ration of dry roughage and concentrate feeds.[2]

After World War II cattle feeding in Arizona began to expand more and more rapidly relative to the rest of the country (Figure 3). Much of this expansion can be attributed to the post World War II population boom in California and much to a shift in consumer demand from grass fattened to grain fattened beef; but perhaps the most significant factor is the climatic condition found in Arizona and California which is particularly amenable to cattle feeding. Wright found that cattle in feedlots in these two western states having mild winters consume less feed per pound of gain than the United States average.[3] Arizona's arid climate also tends to lower non-feed costs. Expensive paved feedlots are not essential, and inexpensive pit silos for grain storage can be used instead of the more costly upright silos.[4]

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2. Hilliard Jackson, A Glance at the Arizona Beef Cattle Industry, unpublished manuscript, The University of Arizona, College of Agriculture, Department of Agricultural Economics, 1966.

3. N. G. Wright, unpublished data, The University of Arizona, College of Agriculture, Department of Agricultural Economics, December 10, 1965.

4. Walter W. Pawson, "Emerging Patterns of Feedlot Management in the Southwest and Interregional Competition in the Location of Cattle Feeding," Proceedings of the Research Workshop on Cattle Feeding. Denver, March 16-18, 1964.

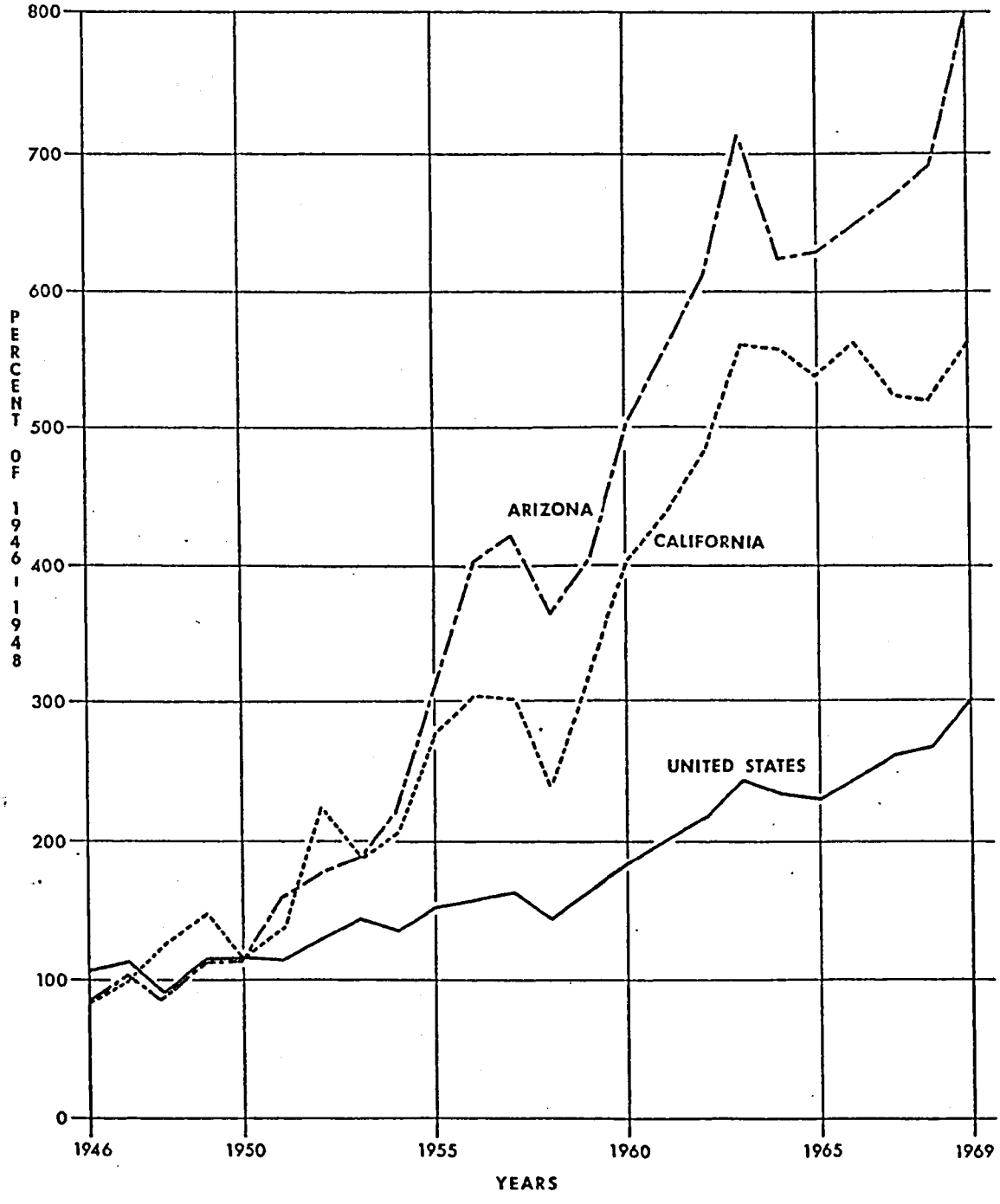

Fig. 3. Trends in the number of cattle and calves on feed in Arizona, California, and the United States as of January 1, 1946-1969.

Source: U.S. Department of Agriculture, Statistical Reporting Service, Number of Cattle and Calves on Feed as of January 1, Washington, 1946-1949.

More than 80% of the lots and 95% of the head capacity is located in the southern part of the state. Phoenix in Maricopa County until 1966 was the location center of Arizona cattle feeding. However, heavy civic pressure objecting to feedlot odor accentuated by severe flood damage in December of 1965, has forced feeding operations to move to less populated areas. Many have moved to Cow Town, Arizona, near the city of Maricopa in Pinal County.

Table 4 shows Arizona cattle feeding to be a large scale operation and it is becoming increasingly so. Since 1961, the number of feedlots has declined 54%, while marketings have increased 37%. It is noteworthy that the largest decline in feedlot numbers was registered among those with head capacities under 4,000--implying substantial economies of size in this industry.

The actual product of a commercial lot is not, as may be thought, the fat animal. It is the pounds of weight gained during the feeding process. The raw materials are the feeder cattle and feed. The principal economic factors then, are (1) per pound price of the feeder animal, (2) per pound cost of the gain in weight and (3) the per pound price of the fat animal.

Location of the source of feeder cattle obviously plays an important role in the per pound price paid for the

TABLE 3. Number of Cattle Feedlots by Size Group, and Number of Fed-Cattle Marketed by Each Size Group in Arizona, 1961-1968

Year	Feed Lot Capacity											
	Under 1,000 Head		1,000 Head and Over								Total	
			1,000-3,999		4,000-7,999		8,000-15,999		16,000 & Over			
	Lots	Cattle Mkt.	Lots	Cattle Mkt.	Lots	Cattle Mkt.	Lots	Cattle Mkt.	Lots	Cattle Mkt.	Lots	Cattle Mkt.
	No.	1,000 Head	No.	1,000 Head	No.	1,000 Head	No.	1,000 Head	No.	1,000 Head	No.	1,000 Head
1962	95	36	55	67	21	109	11	145	7	211	189	568
1963	38	27	47	62	20	113	13	152	7	254	125	608
1964	27	24	39	59	22	118	15	192	6	207	109	600
1965	27	10	35	59	20	130	14	199	6	252	102	650
1966	17	9	30	57	21	111	12	142	7	295	87	614
1967	11	7	27	38	21	154	10	167	7	299	76	665
1968	9	4	28	43	21	120	10	166	9	370	77	703

Number of feedlots with 1,000 head or more capacity is number of lots operating any time during year. Number under 1,000 head capacity and total number of all feedlots is number at end year.

Number of lots does not include "warm-up" operations.

Source: U.S. Department of Agriculture, Statistical Reporting Service, Number of Cattle Feedlots by Size Groups and Number of Cattle Marketed. Washington, 1968-1969.

TABLE 4. Types and Grades of Cattle Fed in Arizona, 1961

Item	"White Face" Cattle	Mixed Bred Cattle	Total or Average
	%	%	%
% of Cattle Marketed	36	64	100
Slaughter Cattle Grades			
Choice	86	62	74
Good	13	33	23
Standard	1	5	3
Total	100	100	100
Feeder Cattle Grades			
Choice	75	--	38
Good	20	22	21
Medium	5	70	37
Common or Inferior	--	8	6
Total	100	100	100

Source: Walter W. Pawson, "Emerging Patterns of Feedlot Management in the Southwest and Interregional Competition in the Location of Cattle Feeding," Proceedings of the Research Workshop on Cattle Feeding. Denver, March 16-18, 1964.

animals. Arizona cattle growers produce more than 300,000 head of stocker and feeder cattle in a given year. Arizona feedlot operators, however, import the majority of their cattle--mostly from Texas, New Mexico and Old Mexico, but often from as far away as Florida. Figure 4 shows the sources of feeder and stocker calves for Arizona feedlots in 1969. There are a number of interrelated reasons for this seemingly uneconomic behavior. One is that mixed bred

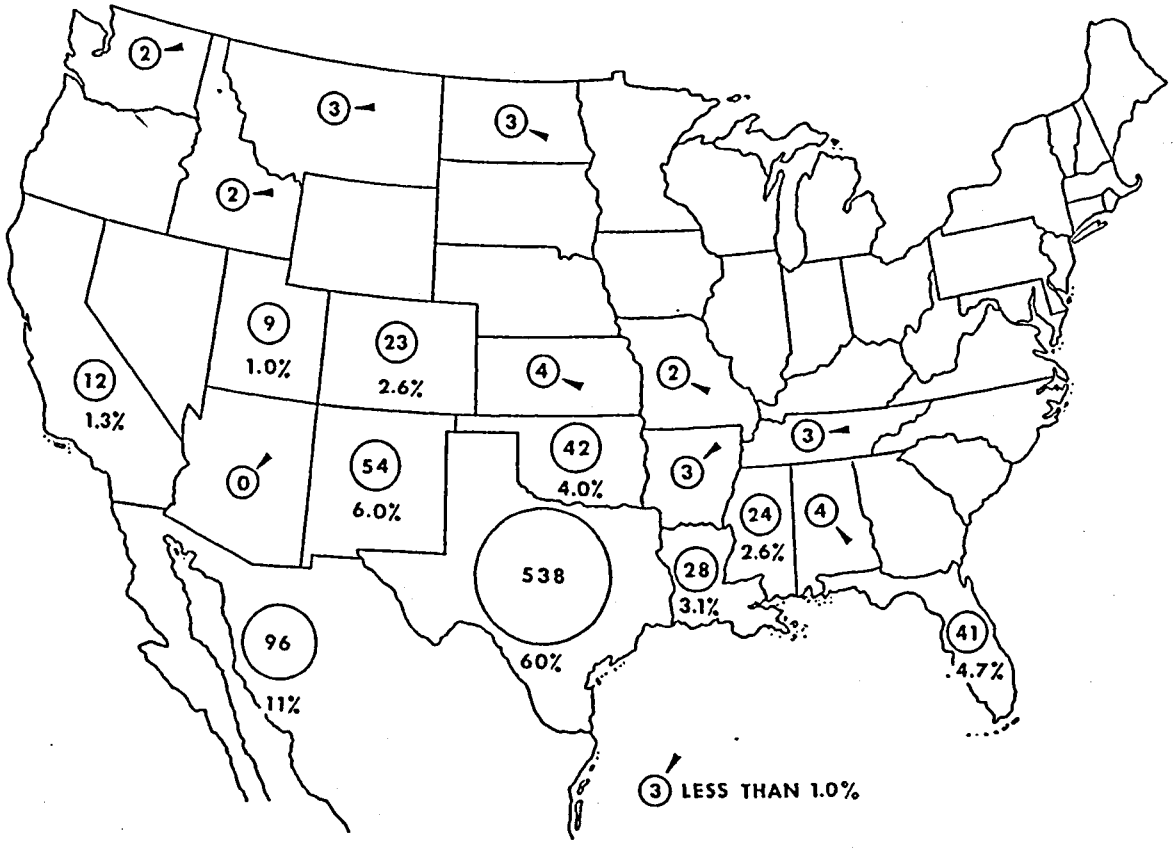

Fig. 4. Sources of stocker and feeder calves and percentages by state of origin in 1969.

Source: Arizona Crop and Livestock Reporting Service. Arizona Cattle Shipments Annual Summaries, 1969. U.S. Department of Agriculture Statistical Reporting Service.

cattle either with some brahma blood or European breeds mixed with milk stock[5] showing poorer conformation in comparison with pure bred animals, perform better than native pure breds in Arizona feedlots. The Okies and crossbreds have more natural growth or "growthyness" than the European pure breds, and at the same time hybrid vigor of the mixed breeds lends to more efficient conversion of feed into meat.

Another important factor leading to the large importation into Arizona of crossbred and Okie cattle is the ability of these types to upgrade in the feeding process. Table 4 compares the grades of crossbred and Okie cattle with "white face" cattle going into the feedlots as feeders and coming out ready for slaughter. The import of this grade differential on feeder cattle costs is illustrated in Table 5 and obviously can be substantial.

The question now arises as to why California imports pure bred Arizona native cattle if they can obtain mixed bred feeders from the same source as Arizona and feed them as efficiently. From California buyers, the writer understands that most of the non-fed cattle exported from Arizona to California go to grazing areas both irrigated and non-irrigated--some heifers to become replacements for California producers and the remainder to be grazed to heavier weights with a short finishing period in commercial feedlots. Several

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5. These types of animals are commonly referred to as Okies.

TABLE 5. Difference in Feeder Cattle Costs to Arizona Cattle Feeders for Arizona Produced Choice Grade Steer Calves and Fort Worth Medium Grade Steer Calves, 1961-June 30, 1966

Year	Annual Average Prices for 300-500 lb. Choice Grade Steer Calves--Phoenix[a]	Cost of Fort Worth Standard Gr. Steer Calves[b] Laid Down in Phoenix Feedlots.[c]	Difference
	$ per cwt.	$ per cwt.	$ per cwt.
1961	25.44	22.47	2.97
1962	26.95	24.19	2.76
1963	26.01	23.17	2.84
1964	21.52	18.26	3.26
1965	22.29	20.08	2.21
1/1/66-6/30/66	27.59	23.67	3.92
Average 1961-1965	24.44	21.63	2.81

a. 1964--21 weeks no sales listed in this weight.

b. 1961 and 1962 all weights, 1963-1965, 250-500 pound calves.

c. Constant transportation cost of 1.34 per cwt. Fort Worth to Phoenix, 1963.

Source: U.S. Department of Agriculture, Agricultural Marketing Service, Livestock Division, Form LS-214, 1961-1966.

assumptions may be made from this phenomenon. One, pure bred Arizona cattle will gain more efficiently on suitable grazing areas than in commercial feedlots. Two, non-irrigated pasture with adequate grazing capacity is not available in Arizona. Three, the cost of water in Arizona is too high to use irrigated areas for pasture.

Table 6 shows that, until 1967, Arizona fed more feed grain than it produced. California continues to be a grain deficit state, and this deficit has in part been met by importing feed grains from Texas. There are two quite logical reasons for this. The first is the price of sorghums as reflected by freight rates. Other factors being equal, if Arizona were to import its grain from Texas and California to import from Arizona, sorghum prices in California would be equal to or greater than those in Texas plus the freight to Arizona plus the freight from Arizona to Texas. Through freight would certainly have a cost advantage over shipping in two stages, and this plus back haul situations would reflect in sorghum prices. In addition the proximity of Arizona growers to Arizona feedlots indicates direct links and special arrangements with one another, and subsequently the dominance of such arrangements over sales in California.

In the product market, Arizona feedlot operators historically have looked out-of-state. Until 1968, over 50% of Arizona fed cattle were exported to California, and less than 30% were slaughtered in Arizona. Table 7 gives estimates of

TABLE 6. Arizona Feed Grain Production, Consumption and Surplus or Deficit, 1961-1968

	1961	1962	1963	1964	1965	1966	1967	1968
Feed Grain Production[a]	(1,000's of tons)							
Sorghum	229	178	210	260	349	420	558	511
Barley	269	173	201	238	253	177	288	308
Wheat	33	30	36	47	35	28	74	81
Corn	11	11	13	16	16	18	22	15
Oats	6	6	3	4	3	2	0	0
Total Production	548	398	463	565	656	645	942	915
Feed Grain Consumption								
Hogs[b]	11	11	13	13	14	17	25	29
Sheep[b]	1	1	1	1	2	2	2	1
Chickens[b]	29	32	36	39	36	39	42	41
Turkeys[b]	2	3	3	3	2	2	2	2
Horses and Mules[c]	10	10	10	10	10	10	10	10
Range Cattle[d]	1	1	1	1	1	1	1	1
Dairy Cattle[b]	72	72	76	86	86	86	84	84
Fed Cattle[e]	514	568	608	600	650	614	665	703
Total Consumption	640	698	748	753	801	771	831	871
Surplus (Deficit)	(92)	(300)	(285)	(188)	(145)	(126)	111	44

a. Source: Arizona Crop and Livestock Reporting Service. Arizona Agricultural Statistics. Statistical Reporting Service, U.S. Department of Agriculture, Phoenix, 1961-1968.

b. See Appendix, Tables Ia through Ic.

c. No data was available on the number of horses in Arizona and at best an arbitrary figure had to be used.

d. Since range cattle are fed very little feed grain concentrates, a nominal 1M tons was chosen.

e. Dr. Thomas Stubblefield, Department of Agricultural Economics, University of Arizona in conjunction with personnel in the Department of Animal Science, estimated

TABLE 6--Continued

that one ton of feed grain concentrates per head of fat cattle marketed from Arizona feedlots would be a reasonable indication of the tonnage consumed by cattle on feed in Arizona.

TABLE 7. Number and Destination of Fat Cattle Marketed Out of Arizona Feedlots, 1961-1968

Year	Fat Cattle Mktd from Ariz Fdlts	Destination					
		Arizona		California		Other States	
	1000 Head	1000 Head	%	1000 Head	%	1000 Head	%
1961	514	120	23	261	51	133	26
1962	568	133	23	336	59	99	17
1963	608	141	23	383	63	84	14
1964	600	161	27	386	64	53	9
1965	650	171	26	369	57	110	17
1966	614	182	30	325	53	107	17
1967	665	179	27	378	57	108	16
1968	703	359	51	300	43	44	6

Source: Arizona Crop and Livestock Reporting Service. Arizona Agricultural Statistics. Ibid., 1965-1968. California Crop and Livestock Reporting Service. California Annual Livestock Reports. Ibid., 1965-1968.

the destinations of Arizona fed cattle. In 1968, with the opening of a new packing plant in Tolleson, Arizona, the number of Arizona fed cattle slaughtered in Arizona increased substantially. In fact, 1968 was the first year on record that more Arizona fed cattle were slaughtered in the state than were shipped out.

Meat Packing in Arizona

In spite of its extensive cattle feeding industry, Arizona was, until 1968, a deficit state for dressed beef. In 1967 there were 245,400 head of cattle slaughtered with a live weight of 235,074 million pounds. Assuming an average yield of 65 percent, dressed beef available for consumption would be 152,798 million pounds. If Arizona's per capita beef consumption equaled that of the United States as a whole the deficit would approximate 20 to 25 million pounds. In 1968 there were 418,600 head of cattle slaughtered in Arizona with a live weight of 417,122 million pounds to produce 271,129 million pounds of dressed beef at a 65 percent yield. Thus, Arizona has achieved a dressed beef surplus. The major part of this surplus moves to California markets for consumption.

From July 1, 1965 through June 30, 1966 there were 16 meat packing plants in Arizona slaughtering 238,000 head of cattle.[6] Only two of these plants were federally inspected and as such could ship in interstate commerce. The remaining 14 served only local surrounding areas, and are likely to find it difficult to compete with the technological efficiency and economies of size of the new plant.

Arizona feedlot operators, on the other hand, should benefit from the increased slaughter capacity within the

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6. Arizona Livestock Sanitary Board Records, Phoenix, Arizona, 1965 and 1966.

state. Table 3 (page 15) shows an increase in both the number of feedlots with 16,000 or more capacity and number of cattle marketed out of these lots. If the anticipated demand for their product allows Arizona cattle feeders to develop and make full use of economies of size, their profit margins should improve, but only to the extent that increasing numbers of feeder cattle and tons of feed grains are readily available at competitive prices.

Competing Areas

Texas is unquestionably Arizona's strongest competitor in the resource market of the cattle feeding industry. Feedlot capacities in Texas grew 112 percent between 1960 and 1966. Figure 5 divides Texas into six feeding areas and shows each one's capacity growth from 1960 to 1966, and its feed grain total digestible nutrients (DN) surplus or deficit in 1959. Grain sorghum provided 83 percent of feed grain TDN produced in Texas, and was the grain predominantly used in feeding cattle. It appears that the growth of the cattle feeding industry in Texas is leading it to become a feed grain deficit state. But personnel of the Department of Agricultural Economics at Texas A&M University hesitate to predict when this situation will occur since sorghum production has increased substantially over the amounts shown in Figure 5. Also, there are indications that shifts from

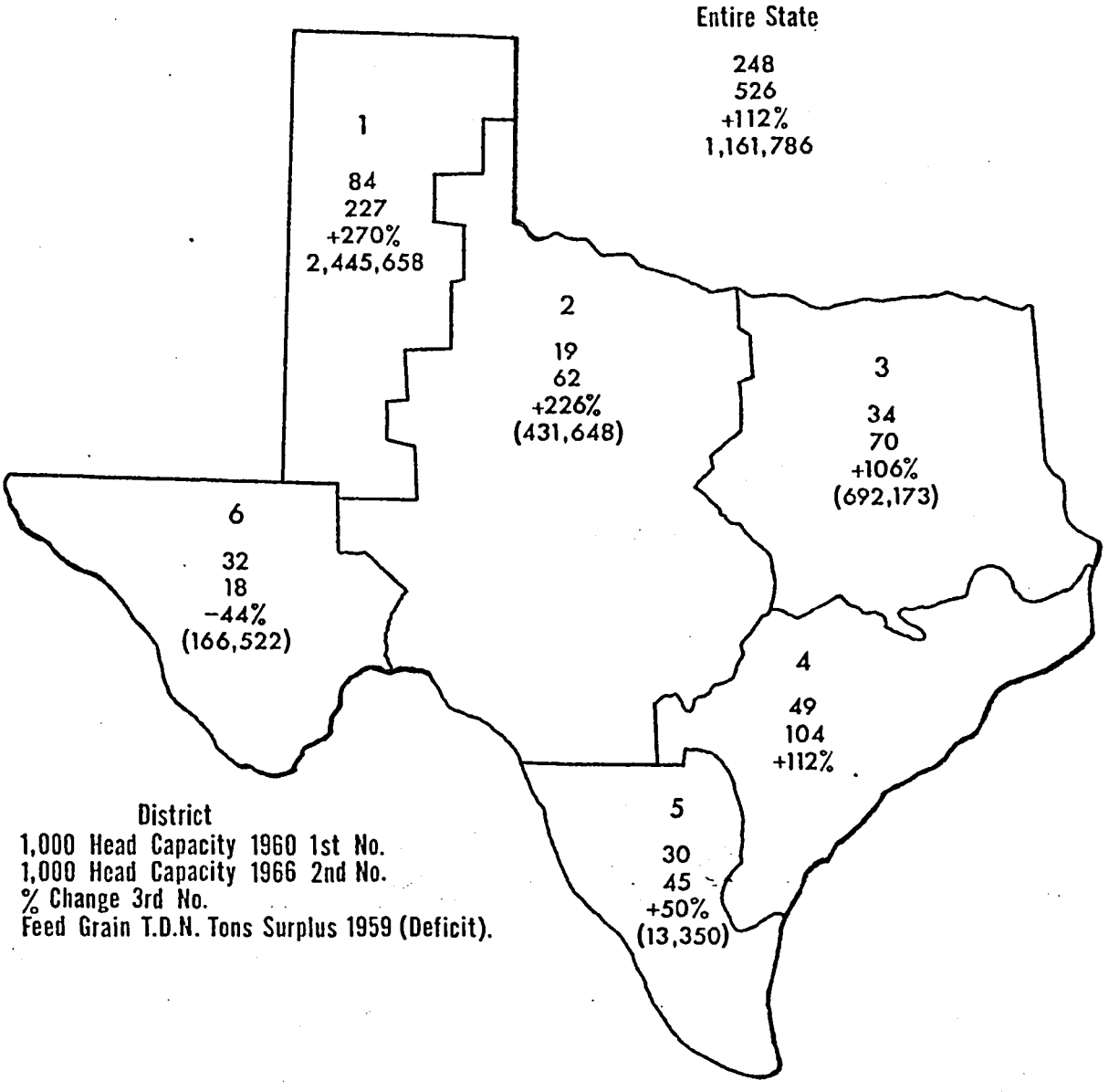

Fig. 5. Major cattle feeding areas in Texas, their change in head capacity from 1960 to 1966 and the feed grain surplus or deficit at the beginning of the period.

Source: Thomas D. Aaron, Jr. and Clarence A. Moore, Demand for Feed Grains by Livestock in Texas, Bulletin MP 626, The Agricultural and Mechanical College of Texas, Texas Agricultural Experimental Station, College Station, Texas, January, 1963.

hog production to cattle feeding may have released some corn producing acreage to sorghum production.

In addition to increased demand by Texans for Texas grown grain sorghums, the growth of cattle feeding would indicate increased demand for feeder cattle from both Texas and the Southeastern states. It is apparent then that Arizona cattle feeders are facing heavier competition for their cattle and feed resources from Texans who are closer to the source. Since the implications of this involve freight rate structures, they will be discussed in Chapter V.

There is some evidence that Texas fed live cattle compete directly with Arizona fed live cattle in the southern California market. Hopkins and Kramer claimed in 1965 that such shipments of slaughter cattle from Texas had dropped off sharply in the previous decade.[7] This may be true, but the following quotation from the May, 1966 issue of the Western Livestock Journal indicates that Texas was considering the West Coast market. "The normal movement of High Plains fat cattle is southern; particularly into South Texas, one of two areas with the fastest population growth in the United States. The other is California, and according to Thomas, these high population areas provide High Plains feeders with a great opportunity."[8]

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7. John A. Hopkins and Robert C. Kramer, Cattle Feeding in California, Bank of America, N. T. & S. A., San Francisco, January 1965, p. 44.

There is also competition for Arizona feeders from Texas fed beef carcasses. Some live Texas fat cattle have been shipped for slaughter to Denver, Kansas City and Omaha. Freight rate decisions have favored west bound rail movement of carcass beef from these centers. Hopkins and Kramer have pointed out that some carcass beef is shipped directly to California from Texas, but substantial growth of this directional flow was not expected until cattle feeding expanded in Texas and surrounding areas to a point where it could more than supply the expanding metropolitan markets of Texas and the Southeast.[9] Nevertheless, Hopkins and Kramer felt Texas would be an important dressed beef supply area for California. Subsequent developments in Texas show the number of cattle marketed out of Texas feedlots has increased from 1,040,000 head in 1965 to 2,706,000 in 1969. This must be considered a threat to the competitive position of Arizona feeders.

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8. Jerry Seriese, "Cattle Feeding Explosion in the High Plains," Western Livestock Journal, May, 1966.

9. Hopkins and Kramer, op. cit., p. 45.

CHAPTER III

THE ECONOMICS OF TRANSPORTATION

Output Supply and Costs

The first and perhaps most difficult obstacle facing a transportation economist is determining a unit of measurement for output. The product of transportation is extremely heterogeneous making any universal definition highly theoretical. Generally, the unit assigned is the ton-mile or ton carried one mile. This, however, is by no means a homogeneous unit as it gives no indication of the value of the commodity being transferred, the amount or quality of the service, time consumed, nor does it indicate whether the carrier is moving many tons a few miles or a few tons many miles.[1] Since the ton-mile clearly cannot be construed as a measurement of general output or operating efficiency, it must be defined with specific regard to the service performed.[2]

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1. Hugh S. Norton, Modern Transportation Economics, Charles E. Merrill Books, Inc., Columbus, Ohio, 1963, p. 107.

2. Ibid., p. 108.

Supply and General Cost Theory for Transportation

Production of the transportation service, like production of any other good or service assumes a production function and the law of variable proportions. In other words, some variable factor or factors is applied to a fixed factor or factors to produce an output which will increase to some point then increase at a decreasing rate.

Since this study is concerned only with truck and rail transportation, discussion will be limited to these two modes. What distinguishes production of rail transportation from motor transportation as well as from many other forms of production is the high proportion of total factor inputs that are fixed over all lengths of run, short of the infinite. The effect of these on the average cost curves of individual truck and rail transportation firms is illustrated in Figure 6. In sections A and B of Figure 6, both firms operate with pure profit at Q_1P_1. Assume now a downward shift in the demand curve which would shift the average revenue and marginal revenue curves to AR_2 and MR_2 in both sections. The quantity of output would shift back to Q_2 in both sections since losses would be minimized at a point where marginal cost equals marginal revenue. However, the firm with relatively low variable costs, though not meeting total costs, is able to meet variable costs, while the firm with

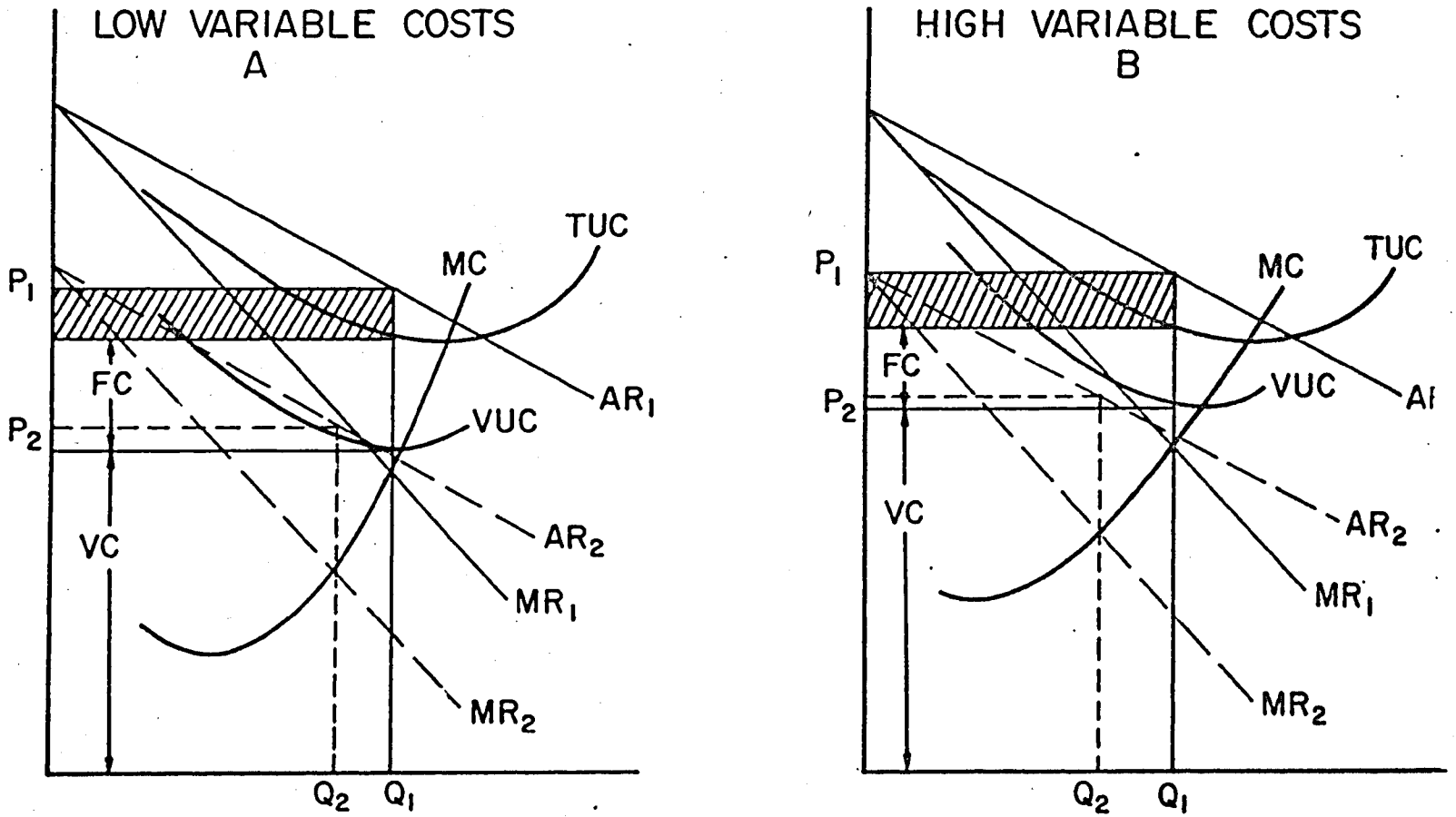

Fig. 6. Influence of declining revenue on firms with low and with high variable costs as a proportion of total costs.

relatively high variable costs cannot meet them and therefore would have to cease operations. In the short run, Firm A could remain in business so long as he covered his variable costs. Theoretically, the demand for the output of Firm B would remain in existence and be met by Firm A, and the average revenue curve of A would shift upward. Thus a firm or industry such as the railroads with costs that fluctuate less with output could theoretically weather periods of slack demand better than truckers with high variable costs.

Since fixed costs are "sunk" costs when they occur, plant scale for railroads must be carefully planned. Minor adjustments may be made, but a major change is usually very expensive. Stigler emphasizes this problem in his hypothetical example:

> Suppose a single line of railroad track can handle efficiently only 200 trains per day. Should the traffic increase beyond 200 trains per day, the railroad may do one of two things. First, it may put on more sidings, run longer and heavier trains (the diesel locomotive being capable of being used in various combinations of power helps this situation a great deal) and expand loading and unloading facilities. But this situation will become more and more expensive if traffic continues to increase until the company will be forced to resort to the second alternative. The latter alternative is to lay another track. But then, supposing traffic stands at 300 trains per day, the two tracks are used relatively lightly; so the costs per train are high. Increases of traffic up to 400 trains per day will be accompanied by falling average costs.[3]

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3. George J. Stigler, The Theory of Price, The Macmillan Co., New York, N. Y., 1949, p. 133.

Unlike railroads, the trucking industry does not require the huge capital investment in roadbed construction since it moves on public highways paying fees according to use. Thus, without a large scale of plant and operating equipment which is more divisible, trucking firm costs are much less removed from the level of output than are railroad costs.

There are some costs which are common to both truckers and railroads. Terminal costs which are independent of the length of run are an example. These are costs connected with loading, packing and unloading. If the length of run is short, terminal costs may be substantial relative to the cost of line movement. But here again, fixed terminal costs for truckers tend to be lower than for railroads since the flexibility of trucks allows loading at point of origin and unloading at final destination. Railroads generally require trucks or other facilities to assist their operation. In both modes, however, the size and shape of the carrier as well as the efficiency of the loading equipment also influence terminal costs; thus, technology is an important factor in this economic relationship.

Another factor significant to cost structure of all carriers is the combination of weight and space capacity. The ideal situation would be a load which would fill both capacities of the carrier. Unfortunately, such a situation

is a rarity, but approximation does tend to reduce costs on a ton-mile basis.

A third important cost common to both motor and rail carriers is that incurred by the return trip. This is a fixed cost once the decision to make the haul has been made and is usually covered by the initial charge for the front haul. Since the additional cost of returning loaded is negligible, it is extremely desirable to obtain a back haul, even if only the added cost is covered. The potential effect of back-haul rates on shipper costs is obviously important and will be discussed as it relates to the problem at hand in later chapters.

Demand for Transportation Service

The demand for transportation is a derived demand based on the demand of the products being shipped. Thus, it follows that the demand is actually for place utility, not for the movement of goods as such.[4]

Figure 7 illustrates a model of spacial transfer between two markets.

If there are no transportation costs, T = 0, then prices of the commodity, P_{1A} in market A and P_{1B} in market B would be equal. In market B, quantity Q_{B5} of the commodity is supplied and Q_{B3} is demanded creating surplus A which equals the deficit A in market A.

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4. Norton, op. cit., p. 124.

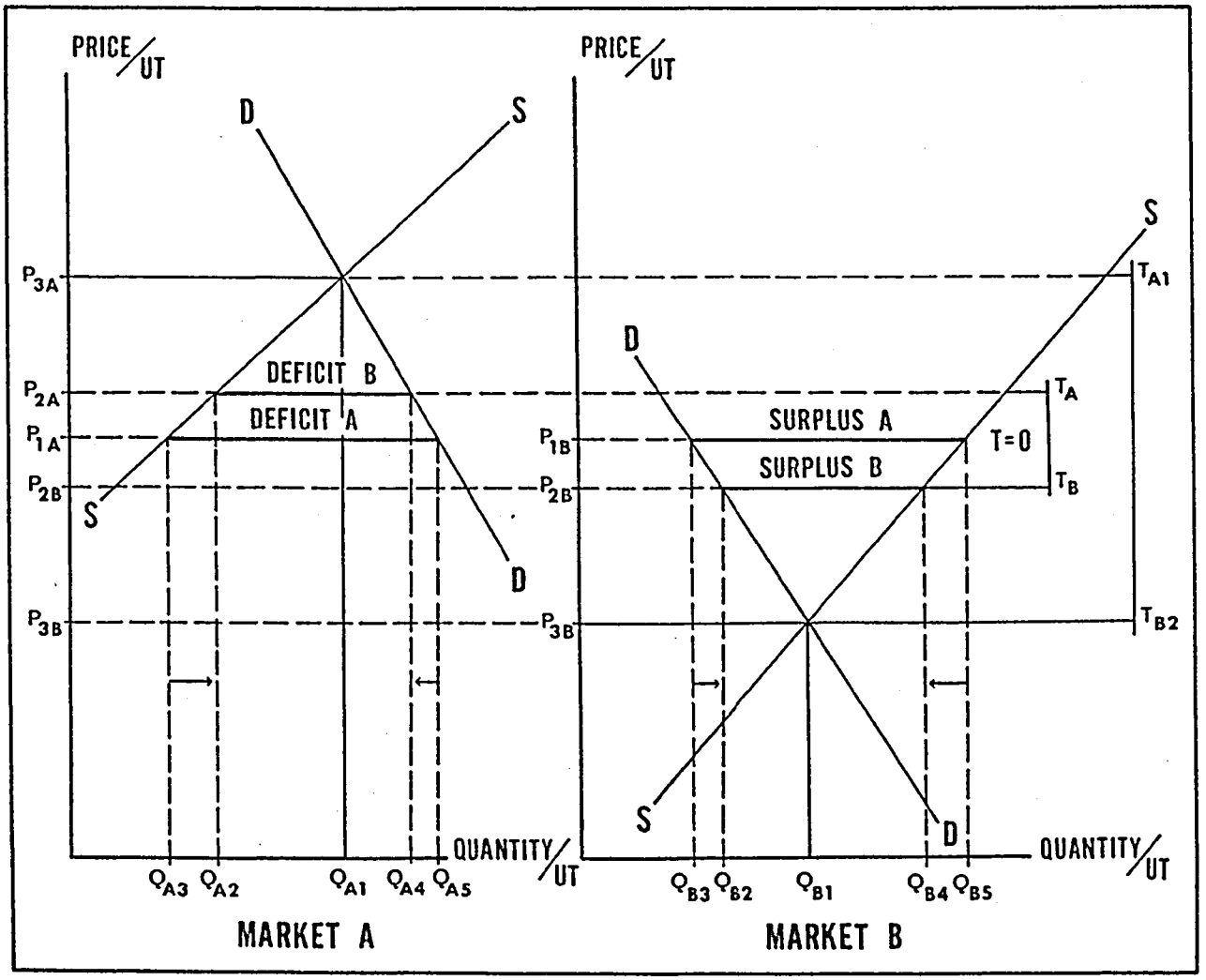

Fig. 7. Model of special transfer between markets.

Introducing a transportation cost equal to the vertical difference between T_A and T_B, the price of the commodity in market A would be P_{2A} and the price in market B, P_{2B}. The difference between the two prices would be equal to the transportation cost. At price P_{2A} in market A the quantity of the commodity supplied would increase to Q_{A2} and the quantity demanded would decrease to Q_{A4}, thus reducing the deficit to deficit B. In market B price P_{2B} would reduce the quantity of the commodity supplied to Q_{B4} and increase the quantity demanded to Q_{B2}. The surplus would be reduced to surplus B and would move to market A to fill the latter's deficit B. Finally, at some transfer cost, in this case the vertical distance between T_{A1} and T_{B2}, there will be no transfer, because in market A, the price of the commodity P_{3A} has increased to the point where demand and supply are in equilibrium. Simultaneously, the price of the commodity P_{3B} in market B would decline to the point where demand and supply in that market were in equilibrium.

From the diagram in Figure 7, a demand curve for one transportation service, that of moving the specific commodity between the specific locations in the diagram can be derived. It was previously shown that the difference between the prices of the commodity in market A and market B reflected the cost of transfer between the two markets. This cost can then be stated in terms of price for the transportation

service per unit of commodity over a fixed distance by the P_s axis in Figure 8. The Q_s axis reflects the quantity of

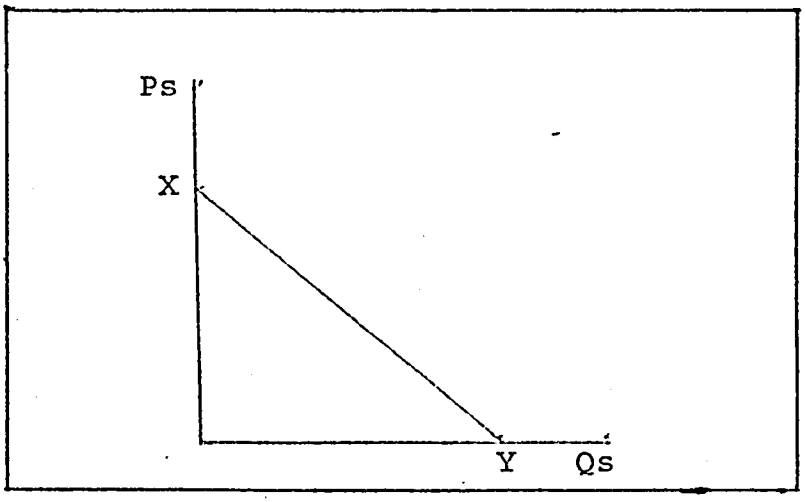

Figure 8. Demand Curve for the Transportation Service.

the commodity shipped over the fixed distance. Point X on the P_s axis represents $P_{3A} - P_{3B}$ in Figure 7 or the price at which there is no deficit or surplus in either market, hence no transfer. Point y is that point where P_{1A} less $P_{1B} = 0$ and therefore the price of the transportation service is zero. At this point the elasticity of demand for the transportation service would be infinite or perfectly elastic.

Market Structure for Transportation Services

There is no clearly defined market structure for the transportation industry. Competition is both intra and inter modal but it varies in intensity, both with location and type of good carried. A given carrier may compete with many firms between two points or have a locational monopoly. Competition

may be severe for types of traffic while some carriers may have exclusive rights to carry a specific commodity. There may be competition at terminal points but none at intermediate points. Norton says, "A carrier may occupy the entire spectrum of market relationship, i.e., monopoly, oligopoly, duopoly, imperfect competition, and to some extent, approaches to pure competition."[5]

Except for exempt truckers, rail and motor carriers generally face an oligopolitic overall market structure (Table 8). Although there are many firms in both modes carrying a wide range of products, individuals usually find themselves dealing with only a few shippers and competing with a limited number of other carriers for specific commodities to specific points. Reasons for the tendency toward oligopoly are attributed to a combination of real cost or sales advantages arising from economies of scale and institutional forces.[6] Rail carriers tend to experience both economies of scale and institutional pressure. On the other hand, economies of scale are not so prevalent in trucking, but institutional forces are just as significant as for railroads.

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5. Norton, op. cit., p. 129.

6. For a more complete discussion of the conditions and cases of oligopoly, see Fellner, William J., Competition Among the Few, Alfred A. Knopf, Inc., New York, 1947, pp. 41-50.

TABLE 8. Approximate Market Status for Transportation Modes

Least Competitive		Tends Toward Monopoly
	Pipelines Termini routes and products highly specialized, few firms, legal regulations controlled entry.	
	Water Carriers Termini and routes fixed, products limited, and few firms. Legal regulation and controlled entry.	
	Air Carriers Termini, routes fixed, wide range of products, many firms, legal regulation, controlled entry.	
	Motor Carriers 1. Contract and specialized: termini and routes fixed, few products regulated, many firms, controlled entry. 2. General Commodity Carriers: termini and routes fixed, wide range of products, many firms, controlled entry. 3. "Exempt" Carriers: No fixed termini or routes, many products, very large number of carriers, no economic regulation, free entry.	
Most Competitive		Tends Toward Perfect Competition

Source: Hugh S. Norton, Modern Transportation Economics, Charles E. Merrill Books, Inc., Columbus, Ohio, 1963, p. 131.

Since this study is primarily concerned with grain and livestock transportation, special mention should be given the market structure of "exempt" trucking. The Motor Carrier Act of 1935 exempts certain basic agricultural products, including livestock and grain from economic regulation when carried on trucks, but not on railroads. Within itself "exempt" trucking approaches a pure competition market structure limited by some institutionally imposed barriers. On the other hand, taken as a whole, it approaches a monopoly in the transportation of agricultural commodities--especially livestock. At best it may be termed as the dominant partner with railroads in a duopolistic market structure. The effects of exempt trucking and the underlying institutional factors will be discussed in detail in the next chapter.

CHAPTER IV

INSTITUTIONS AND THE PRICING OF THE TRANSPORTATION SERVICE

In the previous chapter pricing the transportation service was omitted because it is so directly influenced by institutional forces that standard economic theory is obscured.

What is an institution? W. B. Back's description is:

> Institutional forces are more difficult to describe than Economic. The subject of institutions is vast, complex, and vague. First, institutions are formal and informal rules prescribing our individual rights and conducts in groups or society. By this definition, institutions would encompass laws, administrative regulations and procedures, rights and obligations by common assent, customs and traditions adherred to, etc. How economic opportunities were distributed among individuals would be determined by institutions. A second meaning of institutions in Social Science usage is that they are organizational attributes of groups or society.[1]

By this definition institutions originate in human behavior and can be termed the collective action on humans by humans. Institutional forces then furnish individuals or groups of individuals with the power or freedom to enhance

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1. W. B. Back, "The Economic and Institutional Forces," Land Use Policy and Problems in the United States, Lincoln, Nebraska, University of Nebraska Press, 1963, p. 177.

or maintain their positions in their sociological environment. F. D. Graham describes such "power" as positive if each individual access to power increases the aggregate of power. It is relative if such access to power reduces the power of another individual.

> The processes of gilding the lily and gelding the lowly have always gone hand in hand and, so long as either survives always will. Positive power tends to decline thereunder since the gilded lily will quickly wither on the vine and the gelded lowly are progressively deprived of the ability to generate power.[2]

Graham further asserts that for the social goals to be met, power must be widely diffused and simultaneously concentratable for specific purposes; but when concentrated, it must be as nearly as possible on the basis of general consent.[3] Surely, then, one would believe that concentration of power to achieve the goals set forth in the preamble to the Interstate Commerce Act which constitutes national transportation policy would be on the basis of general, if not universal consent.

> It is hereby declared to be the national transportation policy of the Congress to provide for fair and impartial regulation of all modes of transportation subject to the provisions of the Act, so administered as to recognize and preserve the inherent advantages of each; to promote safe, adequate, economical and efficient service and foster sound

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2. Frank D. Graham, Social Goals and Economic Institutions, Princeton, New Jersey, Princeton University Press, p. 15., 1942.

3. Ibid.

> economic conditions in transportation and among the several carriers; to encourage the establishment and maintenance of reasonable charges for transportation services, without unjust discriminations, undue preferences or advantages, or unfair or destructive competitive practices; to cooperate with the several States and the duly authorized officials thereof; and to encourage fair wages and equitable working conditions; and all to the end of developing, coordinating and preserving a national transportation system by water, highway, and rail as well as other means, adequate to meet the needs of the commerce of the United States, of the Postal Service, and of the national defense. All of the provisions of the Act shall be administered and enforced with a view to carrying out the above declaration of policy.[4]

Federal Regulation of Interstate Rail and Truck Transportation

Social and Economic Origins. After the Civil War, the extremely rapid growth of the Railroads led to a consequential growth and concentration of economic power. Like any business enterprise, the railroads were not adverse to taking advantage of that power. The aggregate market structure was oligopolistic with intensive competition among the few in some areas and almost pure monopoly in other (primarily rural) areas. Triffin's conclusion that such a situation "usually results in fighting and chaos unless determinateness is inserted through extra economic influences"[5] was borne out. The influence of the powerful farm

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4. Hugh S. Norton, op. cit., p. 163.

5. Robert Triffin, "Monopolistic Competition and General Equilibrium Theory," Harvard Economic Studies, Vol. LXVII, Harvard University Press, Cambridge, 1949.

organizations led to the passage in 1887 of the Interstate Commerce Act placing the railroads under economic regulation. The Act also provided for the Interstate Commerce Commission to administer the regulation. Subsequent legislation has enhanced the powers of the Commission, placed other carriers under regulations and clarified the various sections of the Act--all this culminating in the Transportation Act of 1958. In the early years institutional thinking was based on a fear of excess profits to the detriment of the public. Since the depression of the 1930's, the fear of excess profits has been gradually replaced by a growing concern for the economic welfare of the transportation industry. The ultimate goal, however, to provide efficient transportation services at reasonable cost to the public, has never changed.

Common Carrier Concept. Norton describes a common carrier as a carrier who

> holds himself out to transport within the limits of his capabilities for all who wish to avail themselves of his services. The services are offered to the public on a non-discriminatory basis and are a matter of common knowledge. Anyone who wishes to avail himself of these services may do so on the basis of which they are generally offered. Schedules, rates and charges are posted.[6]

The primary responsibility of a common carrier is to serve the convenience and necessity of the public, and service must be available at all times. All common carriers are

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6. Hugh S. Norton, op. cit., p. 81.

subject to federal and state economic regulation and the common carrier concept is imbedded in the regulation.

All railroads are common carriers and hence subject to full regulations. The motor carriers industry is more complex. Some carriers are contract carriers providing service to only one or more shippers under specific contract terms. They obviously enjoy the privilege of knowing and controlling to some extent their traffic volume. Other motor carriers move only their own products and are referred to as private carriers. The latter and carriers moving unprocessed agricultural commodities are the only motor carriers exempt from federal economic regulation in this study.

Interstate Commerce Commission. The task of administering interstate rail and motor transportation regulation is the responsibility of the Interstate Commerce Commission. This is a quasi judicial organization whose members are appointed by the President and whose function is to carry out the will of Congress. Thus, the Commission is actually an arm of Congress executing policy made by Congress. In order to reduce dominance by the executive branch, members are appointed by the President only with the advice and consent of Congress and for terms independent of the President's terms. Party balance must also be maintained. Some pressure can be exerted by the executive branch through the Bureau of the Budget which finances the Commission; but this is subject to appropriations procedure in the legislative branch.

Probably the strongest force the President has at hand to influence transportation policy and Commission activities lies in the power and prestige inherent in the office of the Presidency itself. In 1967 a Department of Transportation was established by President Johnson as a Cabinet Post. The magnitude of its influence will certainly be great but as yet cannot be determined.

Although, theoretically, the Commission looks to Congress for policy making, the line between policy formation and policy execution is at best blurred. Thus, the Commission can interpret policy if not make it. In addition the Commission can influence policy through its consultation with Congressional committees on proposed legislation. Specifically, the responsibilities of the Commission are outlined in the statement issued by the Special Subcommittee on Legislative Oversight found in Appendix 2.

State Regulation of Intrastate Traffic

The philosophy behind state regulation of transportation is largely the same as that of federal. In fact, it was the Illinois Railroad Act passed by the Illinois legislature in 1870 which instituted the first economic regulation of both inter and intrastate traffic. However, in the Wabash Case,[7] the Supreme Court held that the states could not

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7. Wabash, St. Louis and Pacific Railway v. Illinois, 118 U.S. 580 (1872).

regulate commerce between or among the states thus establishing the superiority of federal authority in interstate commerce.

The states concerned in this study, California, Arizona and Texas, all regulate rail and truck movements within their respective boundaries. The difference between state and federal regulations related to this study is the absence of the agricultural exemption for trucks. The significance of this difference is that interstate carriers of agricultural commodities are subject primarily to normal economic influences while institutional forces dominate the economies of intrastate agricultural carriers. The price of a move within any one of these states can vary substantially from the price of a move of the same commodity over the same distance within another state or which crosses a state boundary.

Rate Making Regulation and Procedure

The special subcommittee statement in Appendix 2 illustrates the wide range of regulatory responsibilities of the Interstate Commerce Commission. Although some are not direct economic controls, all have economic implications. Time and space, however, limit this discussion to that portion of the Committee's statement which impels the Commission "to require that rate and practices of all common carriers, including freight forwarders subject to the Act, be just, reasonable, and non-discriminatory, and that such

rates be published, filed with the Commission and observed." Obviously, this statement can lead to highly subjective interpretation. Perhaps the most difficult word in the statement to interpret is "non-discriminatory." What constitutes discrimination?

> Under condition of perfect competition price discrimination could not exist even if the market could be easily divided into separate parts. In each section of the market, the demand would be perfectly elastic and every seller would prefer to sell his whole output in that section of the market in which he could obtain the highest price. The attempt to do so would of course, drive the price down to the competitive level, and there would only be one price throughout the market.[8]

Since the market for transportation is certainly not one of perfect competition, discrimination can and does exist. Even when approved by a regulatory industry freight rates are highly discriminatory. The problem, then, is the determination between just and unjust discrimination, and this is a difficult problem, indeed. Generally speaking, rate discrimination falls into three categories, geographical, personal and commodity discrimination.

Geographic rate discrimination by its nomenclature generally implies rate differences for transporting the same commodity over equal distances with at least one terminal being in a different region. This type of discrimination

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8. Joan Robinson, The Economics of Imperfect Competition (London: The Macmillan Co., 1948), p. 179 and Chapter XVI for a discussion of the moral aspects and social implication of discrimination.

very often arises from natural or locational advantages of certain regions and naturally is subject to regional political controversy. Generally the Commission has refused to allow adjustment of rates to reflect such advantages.[9] But the Commission does tend to be more lenient to rate adjustments, regardless of natural advantages, in regions where competition from unregulated modes is strong, provided reduced rates are reasonably compensatory.

Personal discrimination is reasonably simple and is usually found between large and small shippers. It is generally accepted as unjust with the major exception that rates to shippers of less than carload lots higher than those to shippers of full carload lots is considered just.

The line between just and unjust commodity discrimination is the most difficult to determine. Weight, volume, value, cost of service, carrier competition, use, desirability, bulk are all factors that must be considered. The complexity of all these relationships in the discriminatory problem is such that each situation must be determined on an ad hoc basis.

There is one universal ingredient that must be found to label (rate) discrimination as unjust. That is damage,

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9. Port Arthur Board of Trade v. Abilene and Southern Railway Company 27 ICC 388, 402 (1913); Sheridan Chamber of Commerce v. Chicago, Burlington & Quincy R.R. Co., 28 ICC, 250, 262 (1913); Florida Pulp & Paper Co. v. Alabama Great Southern RR Co., 266 ICC 331, 334 (1948).

which, when used in this context, means that discrimination results in certain individuals being made worse off. However, even if damage is shown, as it must be to determine discrimination as unjust, such discrimination may be justified if there are other off-setting factors.

The reasonableness of the magnitude of freight rates must also be determined. Normally one would think that prime test for a just rate would be cost plus a reasonable return to the carrier. This, however, is not the case--especially for railroads. Table 9 shows freight revenues may be well above or well below fully distributed cost. This situation is explained by the multiplicity of services and heterogeneous character of markets combined with the heavy fixed costs faced by railroads. The policy implication is that the transportation of certain commodities should subsidize the transportation of other commodities for the promotion of aggregate economic welfare.

There is, however, an institutionally imposed maximum and minimum reasonable rate. The area between the two is termed the zone of reasonableness and it is within this area that transportation management is relatively free to determine its rate schedule in interstate commerce.

The maximum reasonable rate is referred to as the Value of Service. It is determined by the maximum the public is willing to pay without foregoing the service. Shinn

TABLE 9. Selected Items, U. S. Class 1 Railroads, 1955 Ratio of Carload Freight Revenue to Fully Distributed Cost by ICC Commodity Classes

Item	Ratio to Fully Distributed Cost (Percentage)
Explosives	370
Bathroom Fixtures	157
Tobacco, unmanufactured	131
Asphalt	111
Lumber	100
Oranges, Grapefruit	84
Coke	76
Animal Feed	71
Copper Ore	28

Source: U. S. Congress, Senate, Subcommittee on Interstate and Foreign Commerce, Hearings, Problems of the Railroads, 1958, Part 2, pp. 1218 ff.

includes four concepts in determining what this amount should be.

1. Consideration of value which would tend to justify higher rates for a high priced than for a low priced commodity where the two have similar transportation characteristics in other respects.

2. Consideration as to what has been termed public policy regarding the advantage to a community of having some kinds of freight carried at a lower rate than other kinds.
3. Consideration of economic and commercial conditions surrounding the production and sale of a given commodity.
4. Consideration to the relative cost to shippers of transporting a competitive commodity, or in other words, relative value of service is considered.[10]

The minimum reasonable rate is determined by out-of-pocket costs or costs which would not occur if the service were not performed. Under certain circumstances, the I.C.C. can impose specific rates, but such a rate can not be below out-of-pocket plus fixed cost nor above value of service.

It is interesting to note that the I.C.C. has not included as a factor of determining the reasonableness of freight rates, the production costs of a particular shipper or of producers in a given industry.[11] However, commercial

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10. Glen L. Shinn, Reasonable Freight Rates, The Traffic Service Corporation, Washington, D. C., 1952, pp. 67-68.

11. State of Alabama v. New York Central R.R. Company, 235 I.C.C. 255, 320 (1939).

and industrial conditions in the whole of an industry have been given strong consideration by the I.C.C.[12]

The ability of transportation managers to change freight rates within the zone of reasonableness would indicate at first glance wide discretionary authority, especially for railroad managers with heavy fixed costs. However, the procedure for changing rates which allows opposing interests to state their position can hamper this discretionary authority.

Rate adjustments by regulated carriers may be voluntary and are described as rate proposals. The proposals can originate from either the shipper or carrier and are referred to a rate committee representing most of the carriers of the mode concerned operating in the applicable rate territory. A public hearing is held where both shippers and carriers state their position. If the rate proposal is approved by the committee, the new rate will be published and become effective if there is no suspension by the I.C.C. If the committee disapproves, normally the matter is closed; however, an individual carrier may proceed with the adjusted rate against the will of the committee. The new rate will then also be published and become effective if there is no suspension by the I.C.C. Obviously such action would place the

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12. Ann Arbor Ry. Co. v. United States, 281 U.S. 658, 666-667 (1930). Alden Coal Co. v. Central RR. Co. of New Jersey, 263, I.C.C. 639 (1934). Keery Co. Inc. v. New York O & W Ry. Co. 206 I.C.C. 585 (1935).

new rate in greater jeopardy of suspension than if it were approved by the committee.

The I.C.C.'s power to suspend can be exercised without formal protest, but in practice, it is exercised when protest is filed and there is reason to believe that a rate adjustment is in violation of the Act.

In the event of suspension, a formal hearing is held before a representative of the I.C.C. with the burden of proving reasonableness resting with the carrier sponsoring the adjusted rate. If there is no suspension or other adverse action by the I.C.C., the adjusted rates, when published, can only be attacked by dissatisfied parties by a formal complaint filed before the commission. In this case, the burden of proof rests on the complainant to prove unlawfulness. The published rates, in the meantime, will remain in effect until and only if the I.C.C. finds against them.

The Agricultural Exemption and Its Effects on the Arizona Livestock Industry

Section 203 of the Interstate Commerce Act (Appendix 3) describes the agriculture exemption. Basically it exempts from economic regulation motor carriers who transport unprocessed agricultural commodities in such motor vehicles which are not at the same time carrying other property or passengers for compensation in interstate commerce. Most states do not include such an exemption in their regulatory laws for movements within their own boundaries.

The agricultural exemption has been in being since 1935 when motor carriers were first placed under regulation. Since that time the exemption has been subject to much controversy and legislation, but Congress has always supported it. Every amendment that Congress has made to the exemption clause has broadened and liberalized its provisions in favor of exemption. On the other hand, in spite of many opportunities to do so, Congress has repeatedly refused to curtail the exemption in any way.

The general objective of the agricultural exemption is expressed in the U.S. Supreme Court's decision in favor of Frozen Food Express in its case against the I.C.C. in 1956.

> The exemption of motor vehicles carrying agricultural (including horticultural) commodities (not including manufactured products thereof) was designed to preserve for farmers the advantage of low cost motor transportation . . . . The victory in Congress for the exemption was recognition that the price which the farmer obtains for his products is greatly affected by the cost of transporting them to the consuming market in their raw state or after they have become marketable by incidental processing.[13]

Whether or not these exemplary goals have been reached is debatable, but space does not permit this study to delve into this. One thing is certain, however, the exemption has permitted farmers whose product market is generally accepted to approach pure competition, to purchase one

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13. Frozen Food Express v. United States of America and Interstate Commerce Commission (S.D. Texas 1955) 128 F. Supp. 374; 351 U.S. 40, 49 (S.D. Texas 1956) 148 F. Supp.

service in another market that also approaches pure competition and benefit (or suffer) from the price structure thereunder.

The agriculture exemption has affected the Arizona livestock industry in two ways--one a decided advantage. Regulated commodities coming into Arizona from California on trucks that are convertible to cattle haulers have created a back-haul situation and a low transportation cost for cattle shipped to California. At the same time it has a detrimental effect on the purely exempt hauler who has difficulty competing with back-haul prices.

The interstate exemption is surely a factor leading to the heavy export of both feeder and fat cattle from the state. Because of the non-regulated movement out of state, transportation costs are often less to shippers sending their cattle to California or New Mexico than to shippers who are subjected to regulated intrastate movements in spite of longer distances.

The concentration of cattle feeding in the Yuma area and the movement of the cattle to the large Southern California markets seems logical in view of Yuma's proximity to these markets. But the even heaver concentration of cattle feeding in Maricopa and Pinal counties and the movement of live cattle instead of carcasses raises a question. It would seem more economically feasible for slaughter houses to move into the Phoenix area to be near their source of

supply. One has done this very thing but many live fed cattle continue to move to California. This suggests that the agricultural exemption is an important factor.

CHAPTER V

THE TRANSPORTATION COST

In 1965, based on the data available in Appendix 4, a feedlot operator in Arizona feeding cattle imported from Fort Worth, Texas could spend or cause to be spent on transportation alone between $2.31 and $6.87 for every hundred pounds of carcass delivered to the area in which it is to be consumed. The amount it would be varies with the source of raw materials, the mode of transportation, where fed and where slaughtered. Appendix 4 shows the cost for most of the combinations available to Arizona cattle feeders. As can be expected, the closer the raw materials are to the feeding area, the lower the cost of transportation. However, the mode of transportation is also important. Table 10 compares the cost of hauling necessary grain per 100 pounds of gain by truck and by rail in 1967. At that time it would have cost less to haul Texas grain into the state by truck than by rail. Intrastate moves, however, were less costly by rail. In fact, the rail rate for moving grain from Wilcox to Yuma was only slightly more than one quarter the truck rate. Certainly very little intrastate hauling of grain by truck for any significant distance would be feasible at these

TABLE 10. Costs of Inter- and Intrastate Movement per Hundred Pounds of Gain at 7 to 1 Conversion with Grain Making up 65% of Total Feed Fed in 1967

Origin	To Yuma Valley			To Central Arizona		
		Truck			Truck	
	Rail	Back-Haul	No Back-Haul	Rail	Back-Haul	No Back-Haul
	$	$	$	$	$	$
Lubbock, Texas	2.85	1.68	2.14	2.30	1.59	2.05
Coastal Bend, Texas	2.75	2.00	2.46	2.53	1.91	2.37
Willcox, Arizona	1.09	a	3.68	.77	a	2.37
Casa Grande, Arizona	.77	a	2.18	N/A	a	.18

a. Only one way exists.

Source: Arizona Motor Traffic Bureau, M.F.A.C.C., No. 151 original p. 4, Phoenix, Arizona, 1956.

regulated rates. However, cattle feeders who haul their feed grains in their own vehicles are not subject to rates set by the Arizona Motor Tariff Bureau and may realize substantial savings. This could be an important factor and a study on private carrier costs would be interesting. This study, unfortunately, is limited to published rates approved by regulatory authorities.

Transportation Cost for Texas Cattle Feeders

It was pointed out earlier in this study that Texas was a major source of both feed grains and feeder cattle for

Arizona feeders. Some concern was indicated for the increased competition both for feed grains and feeder cattle resulting from the rapid expansion of cattle feeding in Texas. A comparison of Appendix 4 with Appendix 5 shows that in many cases Texas did enjoy an overall cost advantage in regard to transportation. Fort Worth, Texas cattle fed locally grown feed in Lubbock feedlots and shipped to Amarillo for slaughter and consumption incurred a transportation cost per hundred pounds of carcass as low as $2.03. The same cattle shipped to Los Angeles for slaughter and consumption incurred a cost as low as $3.12. At the same time, Fort Worth cattle fed, slaughtered and consumed in Phoenix incurred a transportation cost of $2.31 per hundred pounds of carcass if fed on nearby Casa Grande raised feed. The same cattle slaughtered and consumed in Los Angeles could have incurred a cost of $2.78. If feed grain prices in Arizona were substantially higher than those in Texas, the advantage derived from Arizona's proximity to the West Coast markets would have been reduced and possibly eliminated.

In general, Appendices 4 and 5 brought out an overall freight rate structure which favors Texas fed cattle moving both within and to points outside of the state. They also showed Texas to have a wider diversification of potential markets with a narrower spread of the transportation cost burden than Arizona.

Appendix 5, in addition, disclosed that the transportation costs for beef carcasses moving east by rail, TOFC and carload lot, from Omaha, Kansas City and Denver were more than those for beef carcasses moving west to Los Angeles from the same points. This could lead to heavier movements to the West Coast and lower meat prices in Los Angeles.

What has been mentioned indicated that Texas feeders enjoy a locational advantage over Arizona feeders with regard to the movement of raw materials as well as products. However, there may be other factors which may offset this situation. The feeding efficiency of the Arizona Cattle Feeding Industry is reputed to be greater than anywhere in the country except Southern California. Estimates of the conversion ratio averages from 7 to 1 to 8 to 1. Texas estimates its conversion to average around 9 or 10 to 1.[1] Using the examples from which Appendices 4 and 5 are derived whereby 65 percent of the total feed consumed is grain concentrate, requirements for a Texas fed steer are 2,925 pounds of grain versus 2,275 pounds for an Arizona fed steer, or 29 percent greater. In dollars, using the average monthly price received by Texas farmers for grain sorghums in 1965, Texas cattle feeders would have paid $55.56 for grain to bring a

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1. Arizona conversion ratios are estimates by Arizona cattle feeders and University of Arizona Agricultural College personnel. The Texas estimated ratios were from: Edward Uvachek, Agricultural Economist, Department of Agricultural Economics, Texas A&M University, College Station, Texas. Personal correspondence, 1966.

steer from 450 pounds to 950 pounds. Arizona cattle feeders would have paid only $43.22 or $8.64 grain cost per hundred pounds of gain versus $11.11 in Texas. From Table 10 it can be calculated that Arizona feeders would have been able to pay for most of their grain plus grain transportation costs for the same dollar amount Texas Feeders paid for their grain alone. This left more leverage for remaining costs of gain, which again would have been less than that of Texas because of Arizona's greater feeding efficiency, as well as for other transportation costs and downward price fluctuations.

The cost of moving cattle within the state of Arizona in 1967 is set forth in Table 11. The truck size and load weight were considered to be those most frequently experienced in intrastate moves. The costs outlined in the table were all lower than the $1.34 per hundred pounds which an Arizona feeder had to pay to bring cattle into Central Arizona from Fort Worth, Texas. Yet relatively few native cattle are fed in Arizona feedlots. Chapter II of this study pointed out that upgrading in the feed lot and greater feeding efficiency of cross bred and "okie" type cattle explained this phenomenon. The importance of high feeding efficiency was demonstrated by the contrast between the Texas cost of feed grain per hundred pounds of gain and that of Arizona. There is little specific information about the feeding efficiency of Arizona native pure bred cattle except the claim by most Arizona cattle feeders that these cattle feed less efficiently.

TABLE 11. Rates per 100 Pounds of Hauling Cattle in Arizona in 1967

Miles	Truck Size and Weight Carried			
	17 to 20 feet 15,000 lbs.	31 to 35 feet 22,000 lbs.	36 to 40 feet 28,000 lbs.	41 to 46 feet 35,000 lbs.
	$ per cwt.	$ per cwt.	$ per cwt.	$ per cwt.
10	.11	.10	.09	.08
30	.20	.16	.15	.13
50	.28	.24	.20	.17
70	.36	.31	.26	.22
90	.44	.38	.32	.27
110	.52	.45	.36	.32
130	.59	.49	.40	.35
150	.65	.53	.44	.38
170	.71	.56	.47	.41
190	.76	.60	.51	.43
210	.81	.64	.54	.46
230	.90	.69	.58	.50
250	.97	.75	.62	.54

Source: The Arizona Motor Tariff Bureau, Livestock Tariff No. 2, first revised page No. 9, Phoenix, 1960.

If this is true, then the cost benefits of transporting native cattle would have to be substantial to offset the combined advantages of greater feeding efficiency and upgrading that imported cattle seem to enjoy over the native pure bred cattle.

CHAPTER VI

SUMMARY AND CONCLUSIONS

The transportation costs brought out in this study are influenced by standard economic forces in the interstate movement of cattle and feed exempted from economic regulation by the Motor Carrier Act of 1935. Institutional forces also play an important role in transportation costs. All interstate movement of carcasses is federally regulated, and most states regulate all intrastate transportation.

Early economic regulation of transportation was designed primarily to protect the shipper. In more recent years the economic welfare of the carriers has become increasingly important in legislative action.

All economic regulation of interstate traffic is administered by the Interstate Commerce Commission which carries out the policies set forth by Congress. In rare instances the Commission can impose specific rates, but its primary function is to review the rate changes made by the carriers and take action to suspend or revoke such changes if the carriers exceed their limitations.

Out of the conglomeration of inter and intrastate regulation and nonregulation, transportation rates and charges

develop which make up the expenditure for the transfer of the economic goods with which this study is concerned; namely, cattle, feed and beef carcasses. These commodities are demanded within the state of Arizona both as raw materials and as finished consumer goods. Some cattle, both fed and non-fed are shipped out of state, mostly to California. Some dressed beef is also shipped to California. Movement is primarily made by rail or truck or a combination of both. This mix of origins, destinations, commodities and modes leads to a variety of dollar amounts spent on transportation in bringing the finished product, hundredweights of carcass beef, to the consumer.

Carcass beef fed in Arizona is marketed almost exclusively in Arizona and California. Total transportation costs associated with production and delivery ranged from $2.31 to $6.87 per hundred pounds of carcass. The wide range depended not only on variations in charges but on markets used.

Texas cattle feeders have been Arizona's strongest competitors for feed grain and feeder cattle. They are also potential competitors in Arizona's market for beef. Texas fed cattle have been primarily slaughtered and consumed within the state. However, many Texas cattle move to Northern markets in Denver, Omaha and Kansas City where they are slaughtered and the carcasses have been shipped either to Eastern markets or to Los Angeles and San Francisco.

Transportation costs have not prohibited some Texas fat cattle from being shipped to Los Angeles by truck. However, the numbers declined between 1955 and 1965. Alternative movements available to Texas fed cattle led to transportation expenditures varying from $2.03 to $5.67 per hundred pounds of finished Texas fed carcass in the consumption area. In the Los Angeles area alone, Texas fed carcasses could have incurred expenditures for transportation from $3.12 to $4.79, depending where in Texas the cattle were fed and the source of feed.

Transportation costs for Arizona fed carcasses shipped to Los Angeles markets ranged from $2.31 to $6.87 per hundredweight. Certainly the bulk of shipments would be made through the lower cost transportation channels (see Appendices 4 and 5) if shippers were aware of the alternatives. The extent of awareness could be determined by the amount of traffic flowing through each alternative system, but complete data were unobtainable for this study.

Arizona enjoys a climatic advantage over Texas which leads to greater feeding efficiency for Arizona cattle feeders. The amount of feed grain required per pound of gain is estimated to be less in Arizona than in Texas. This is a major factor in overcoming the higher transportation costs of importing cattle and feed from Texas, as well as higher cost of Arizona raised feed grain.

Based on conversion rates of 7 to 1 for Arizona versus 9 to 1 for Texas, it was concluded that this advantage was sufficient to offset the higher transportation costs to Arizona feeders. However, the reliability of the conclusions reached in this study are highly dependent on the accuracy of the conversion ratios of feeding cattle in Arizona and Texas. These ratios were determined from informal discussions with Arizona cattle feeders, University of Arizona personnel, and correspondence with personnel of the Agricultural Economics Department of Texas A&M University. There is a need for a more detailed study on this aspect to verify the accuracy of these estimates and to determine more precisely the relative competitive position of Arizona producers.

Finally, in order to take advantage of lower intrastate rates for transporting cattle, a study of the advantages that might be gained from producing calves in Arizona meeting the requirements of the state's feeders would seem appropriate.

APPENDIX 1

ESTIMATES OF ANNUAL FEED GRAIN CONSUMPTION, HOGS, SHEEP, CHICKENS, TURKEYS AND DAIRY CATTLE

TABLE 1A. Estimates of Annual Feed Grain Consumption by Hogs, 1961-1968

Year	Pigs Saved[a]	x	Average Slaughter Weight[a]	=	Total Pounds	x	Conversion[b]	=	Pounds of Feed Consumed	x	% Feed Grain[b]	=	Total lbs. of Grain Consumed	Tons of Grain
	1,000s				1,000s		lbs.		1,000s		%		1,000s	1,000
1961	36		228		8,208		3.75		30,758		75		22,968	11.48
1962	35		229		8,015		3.75		30,056		75		22,542	11.27
1963	39		228		8,892		3.75		33,345		75		25,009	12.50
1964	41		231		9,471		3.75		35,516		75		26,637	13.31
1965	42		233		9,786		3.75		36,698		75		27,523	13.76
1966	53		234		12,402		3.75		46,508		75		34,885	17.44
1967	77		232		17,864		3.75		66,990		75		50,243	25.12
1968	86		236		20,296		3.75		76,110		75		57,082	28.54

a. Source: Arizona Crop and Livestock Reporting Service. Arizona Agricultural Statistics. Statistical Reporting Service, U.S. Department of Agriculture, Phoenix, 1965-1969.

b. Estimates by Department of Animal Science, College of Agriculture, University of Arizona.

TABLE 1B. Estimates of Annual Feed Grain Consumption by Sheep, 1961-1968

Year	Sheep on Feed Jan. 1[a]	Lbs. of Gr. Consumed Per Head[b]	Total Lbs. of Gr. Fed	Tons of Grain
	1,000s		1,000s	1,000s
1961	46	30	1,380	.69
1962	76	30	2,280	1.14
1963	66	30	1,980	.99
1964	89	30	2,670	1.33
1965	111	30	3,330	1.66
1966	130	30	3,900	1.95
1967	106	30	3,180	1.59
1968	73	30	2,190	1.09

a. Source: Arizona Crop and Livestock Reporting Service. Arizona Agricultural Statistics. Statistical Reporting Service, U.S. Department of Agriculture, Phoenix, 1965-1969.

b. Estimates by Department of Animal Science, College of Agriculture, University of Arizona.

TABLE 1C. Consumption of Feed Grains by Chickens in Arizona, 1961-1968

YEAR	AVERAGE NUMBER LAYERS ON HAND[a]	× POUNDS OF GRAIN PER BIRD[b]	= TOTAL POUNDS OF GRAIN CONSUMED	AVERAGE NUMBER LAYER REPLACEMENTS ON HAND[c]	× POUNDS OF GRAIN PER BIRD[d]	= TOTAL POUNDS OF GRAIN CONSUMED	MEAT CHICKENS TOTAL POUNDS OF GRAIN CONSUMED[e]	TOTAL POUNDS OF GRAIN ALL CHICKENS	TONS OF GRAIN CONSUMED
	1,000s		1,000s	1,000s		1,000s	1,000s	1,000s	1,000s
1961	778	54	42,012	389	35	13,615	1,600	57,227	28.61
1962	868	54	46,872	434	35	15,190	1,600	63,662	31.83
1963	992	54	53,568	496	35	17,360	1,600	72,528	36.26
1964	1,067	54	57,618	534	35	18,690	1,600	77,908	38.95
1965	988	54	53,352	494	35	17,290	1,600	72,242	36.12
1966	1,063	54	57,402	531	35	18,585	1,600	77,587	38.77
1967	1,149	54	62,046	575	35	20,125	1,600	83,771	41.89
1968	1,126	54	60,804	563	35	19,704	1,600	82,109	41.05

a. Arizona Crop and Livestock Reporting Service. Arizona Agricultural Statistics. Ibid., 1965-1969.

b. Pounds of feed grain per bird per year: 90; percent feed grain: 60. Department of Poultry Science, College of Agriculture, University of Arizona, Tucson, Arizona.

c. Based on estimated 50% annual replacement by young chickens not yet producing kept on hand.

TABLE 1C--Continued

d. Pounds of feed per bird per year: 70; percent feed grains: 50.
Source: Department of Poultry Science, College of Agriculture, University of Arizona, Tucson, Arizona.

e. All producers were contacted and they indicated their total production was 500,000 birds per year. Pounds of feed per bird per year: 8; percent feed grains: 40.
Source: Department of Poultry Science, College of Agriculture, University of Arizona, Tucson, Arizona.

TABLE 1D. Estimates of Annual Feed Grain Consumption by Turkeys, 1961-1969

Year	Turkeys Raised[a]	+ Turkeys on Hand 1-1[a]	= Total Turkeys Fed	x Lbs. Feed Grs. Fed[b]	= Total lbs. of Feed	= Tons of Feed
	1,000s	1,000s	1,000s	1,000s	1,000s	1,000s
1961	107	13	120	28	3,760	2
1962	180	12	192	28	5,376	3
1963	209	14	223	28	6,604	3
1964	190	19	209	28	5,852	3
1965	105	12	117	28	3,276	2
1966	N/A	15	-	28	-	2[c]
1967	N/A	17	-	28	-	2[c]
1968	N/A	18	-	28	-	2[c]
1969	N/A	5	-	28	-	1[c]

a. Source: Arizona Crop and Livestock Reporting Service. Arizona Agricultural Statistics. Ibid., 1965-1969.

b. Estimates by Department of Animal Sciences, College of Agriculture, University of Arizona.

c. Since data on turkeys raised was not available after 1965, these figures are estimates.

TABLE 1E. Estimate of Annual Feed Grain Consumption by Dairy Cattle, 1961-1968

YEAR	COWS IN PRODUCTION[a]	× NUMBER OF DAYS FED[b]	× POUNDS OF GRAIN PER DAY[b]	= TOTAL POUNDS CONSUMED DURING YEAR	REPLACEMENTS 0-6 MOS. OLD[c]	× NUMBER OF DAYS FED[b]	× POUNDS OF GRAIN PER DAY[b]	= TOTAL POUNDS CONSUMED PER YEAR	REPLACEMENTS 23-24 MOS. OLD[c]	× NUMBER OF DAYS FED[b]	× POUNDS OF GRAIN PER DAY[b]	= TOTAL POUNDS CONSUMED PER YEAR	TOTAL POUNDS GRAIN CONSUMED PER YEAR ALL DAIRY CATTLE	TONS GRAIN CONSUMED PER YEAR
	1,000.			1,000.	1,000.			1,000.	1,000.			1,000.	1,000.	1,000.
1961	50	305	8	122,000	7.50	365	4	2,737.5	1.3	365	4	1,898	134,848	72.4
1962	50	305	8	122,000	7.50	365	4	2,737.5	1.3	365	4	1,898	134,848	72.4
1963	51	305	9	139,995	7.65	365	4	2,791.3	1.3	365	4	1,898	152,998	76.5
1964	52	305	10	158,600	7.80	365	4	2,847.0	1.3	365	4	1,898	171,886	85.9
1965	52	305	10	158,600	7.80	365	4	2,847.0	1.3	365	4	1,898	171,886	85.9
1966	52	305	10	158,600	7.80	365	4	2,847.0	1.3	365	4	1,898	171,886	85.9
1967	51	305	10	155,550	7.65	365	4	2,791.3	1.3	365	4	1,898	168,553	84.3
1968	51	305	10	155,550	7.65	365	4	2,791.3	1.3	365	4	1,898	168,553	84.3

a. Source: Arizona Crop and Livestock Reporting Service. Arizona Agricultural Statistics. Ibid., 1965-1969.

b. Source: Department of Dairy and Food Sciences, College of Agriculture, University of Arizona.

c. Based on 15% annual replacement being fed four pounds of grain a day the first six months and again for four weeks before they calve at two years.

APPENDIX 2

STATEMENT ISSUED BY THE SPECIAL SUBCOMMITTEE ON LEGISLATIVE OVERSIGHT

The Commission has been vested with authority to regulate various types of surface transportation in interstate and foreign commerce. The scope of this authority is briefly as follows: (1) to issue certificates of public convenience and necessity for the construction, extension and abandonment of lines of railroads; certificates of public convenience and necessity for the establishment or extension of motor common carrier and water common carrier operations; the issuance of permits for the institution and extension of motor contract carrier operations, water contract carrier operations, and freight forwarder operations; (2) to require that rates and practices of all common carriers, including freight forwarders, subject to the act be just, reasonable, and non-discriminatory, and that such rates be published, filed with the Commission and observed; and to require that motor contract carriers and water contract carriers establish and observe just and reasonable minimum rates; (3) to regulate railroads and motor carriers, including private carriers by motor vehicles, with respect to safety of operations, standards of equipment, and hours of service of personnel whose activities affect safety of operations; (4) to require personal injury, death, and property damage insurance of motor carriers and freight forwarders for the protection of the public and cargo insurance for the protection of shippers; (5) to pass upon the unification, mergers, and common control of two or more railroads, motor carriers, water carriers, express companies or sleeping car companies, and to approve or disapprove the pooling or division of traffic, service or earnings by two or more such carriers; (6) to regulate the issuance of securities by railroads and motor carriers, the financial reorganization of railroads, and the guarantee of loans to railroads; (7) to prescribe regulations governing the packaging, marking and handling of explosives and other dangerous articles which are binding upon all carriers subject to the Interstate Commerce Act and shippers, and which regulations as to marking and packing are adopted by the Coast Guard for

application to water carriers; and (8) to investigate alleged violations, prosecute in court and assist the Department of Justice in prosecuting civil and criminal proceedings arising under all parts of the act and related acts such as the Elkins Act, the Clayton Antitrust Act, and the Transportation of Explosives Act. In addition to the above, the Commission has various other duties such as the prescribing of time zones under the Standard Time Act, determining reasonableness of parcel post increased rates, prescribing charges by railroads for the transportation of mail, investigations under the Medals of Honor Act, and others.[1]

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1. U.S. Congress, Senate, Special Subcommittee on Legislative Oversight of the Committee on Interstate and Foreign Commerce, Independent Regulatory Commissions; Comparative Operating Data, etc., Subcommittee Print, 86th Congress, 2nd Session. U.S. Government Printing Office, Washington, 1960.

APPENDIX 3

SECTION 203--THE MOTOR CARRIER ACT OF 1935

Sec. 203

. . . (b) Nothing in this part, except the provisions of section 204 relative to qualifications and maximum hours of service employees and safety of operation or standards of equipment shall be construed to include . . .

(4a) motor vehicles controlled and operated by any farmer when used in the transportation of his agricultural (including horticultural) commodities and products thereof, or in the transportation of supplies to his farm; or

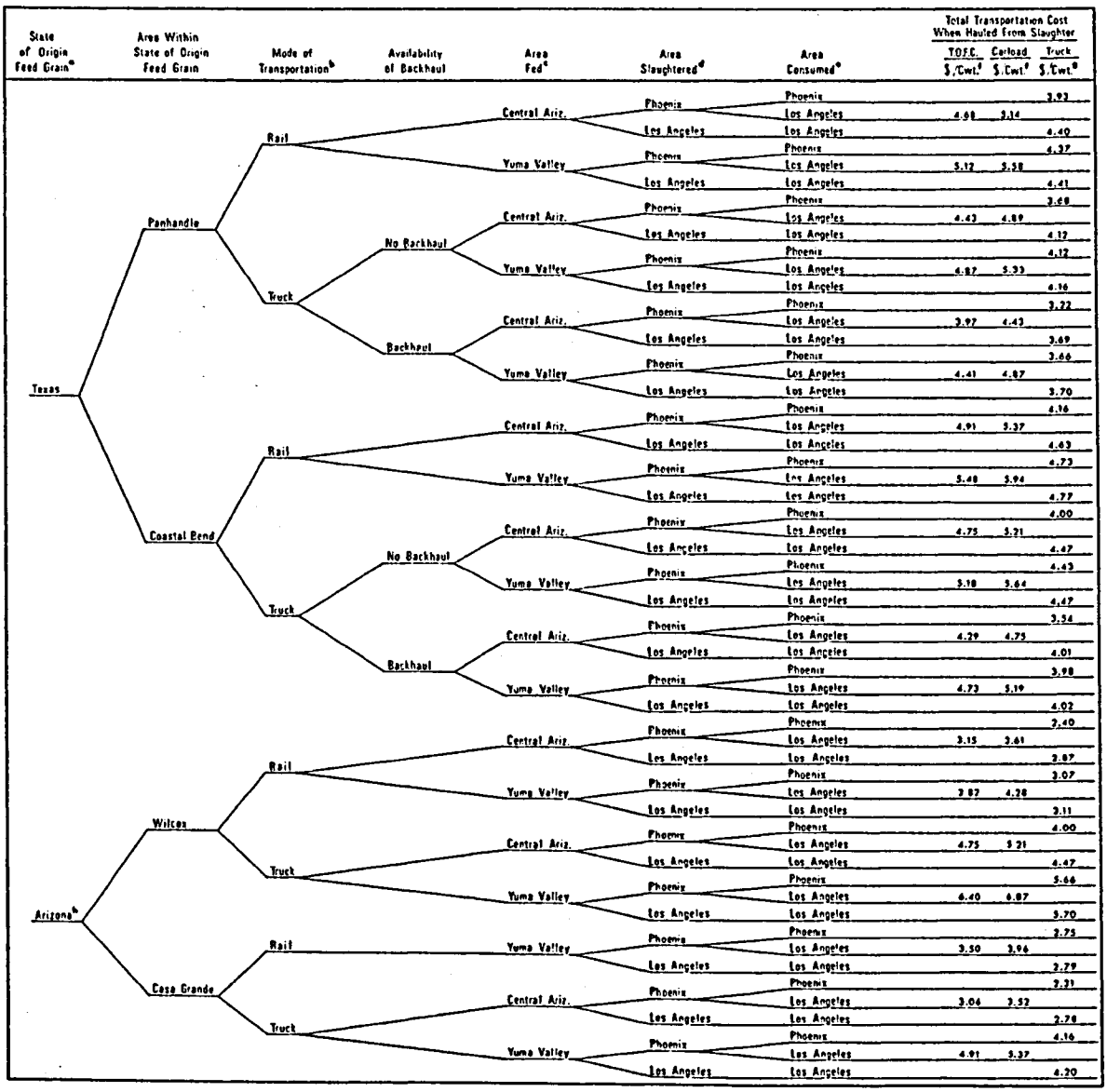
(5) motor vehicles controlled and operated by a cooperative association as defined in the Agricultural Marketing Act, approved June 15, 1929, as amended, or by a federation of such cooperative associations, if such federation possesses no greater powers of purposes than cooperative associations so defined; or

(6) motor vehicles used in carrying property consisting of ordinary livestock, fish (including shellfish), or agricultural (including horticultural) commodities (not including manufactured products thereof), if such motor vehicles are not used in carrying any other property, or passengers, for compensation;

Source: Celia Sperling, "Exemption in Interstate Trucking," Journal of Farm Economics, Vol. XL, May, 1958, No. 2. The American Farm Association, p. 374.

APPENDIX 4

VARIOUS TRANSPORTATION COSTS IN BEEF CARCASSES OF CATTLE ORIGINATING IN FORT WORTH AND FED IN ARIZONA FROM 450 TO 950 POUNDS WITH 8:1 CONVERSION



a. Unpublished data at the University of Arizona Department of Agricultural Economics, produced evidence that live cattle hauled by rail was not of significant volume.

b. Basis for determining the cost of hauling feed grains was the amount of grain required per cwt. of gain at 7 to 1 conversion and 65% of the total feed being feed grains.

Rates per cwt. and sources were as follows:

For feed grains by rail--	
Texas Panhandle to Central Arizona	50½¢
Texas Coastal Bend to Central Arizona	55½¢
Texas Panhandle to Yuma Valley	52½¢
Texas Coastal Bend to Yuma Valley	60½¢

Source: Charles E. Blaine and Son, Registered Practitioners. Unpublished Records, Phoenix, 1965.

Willcox, Arizona to Central Arizona	17¢
Willcox, Arizona to Yuma Valley	24¢
Casa Grande to Yuma Valley	17¢

Source: Southern Pacific Company. Personal interview, Phoenix, Arizona, 1966.

For feed grains by truck--	
Texas Panhandle to Central Arizona, backhaul	35¢
Texas Panhandle to Central Ariz., no backhaul	45¢
Texas Panhandle to Yuma Valley, backhaul	37¢
Texas Panhandle to Yuma Valley, no backhaul	47¢
Texas Coastal Bend to Central Ariz., backhaul	42¢
Texas Coastal Bend to Central Ariz., no backhaul	52¢
Texas Coastal Bend to Yuma Valley, backhaul	44¢
Texas Coastal Bend to Yuma Valley, no backhaul	54¢

Source: Archie M. Kroloff, Feeders Grain Association. Personal interview, Phoenix, Arizona, 1966.

Willcox to Central Arizona (Casa Grande)	52¢
Willcox to Yuma Valley	81¢
Casa Grande to Central Arizona (assume 50 mi.)	15¢
Casa Grande to Yuma Valley	48¢

Source: Arizona Motor Traffic Bureau, M.F.A.C.C., No. 151 original p. 4, Phoenix, Arizona, 1956.

c. A roughage haul by truck was assumed to be 60 miles. Basis in determining transportation cost was per cwt. of gain at 7 to 1 conversion and roughage being 25% of total feed used.

Rate--18¢ per cwt.

Source: Arizona Motor Traffic Bureau, M.F.A.C.C., No. 151 original p. 4, Phoenix, Arizona, 1956.

d. Fat cattle fed in Central Arizona and slaughtered in Phoenix were assumed to be hauled 30 miles in a truck with 41-46 ft. load space holding 35 head of 1,000 pound cattle. No shrinkage allowance was made.
rate--13¢ per cwt.

Source: The Arizona Motor Tariff Bureau, Livestock Tariff No. 2, first revised page No. 9, Phoenix, 1960.

e. No cost was contributed to intra-urban movement of cattle.

f. Carcass freight rate by rail from Phoenix to Los Angeles--

TFOC:	75¢ per cwt.
Carload Lot:	$1.21 per cwt.

Source: Southern Pacific Company. Personal interview, Phoenix, Arizona, 1966.

g. Live cattle freight rates by truck:

Fort Worth to Central Arizona (Casa Grande)	$1.34
Central Arizona (Casa Grande) to Los Angeles	.55

Source: Milton Leo David, unpublished data, University of Arizona, College of Agriculture, Department of Agricultural Economics, Tucson, 1964.

h. All costs were computed using maximum advantages permitted by regulatory agencies such as optimum load weights.

APPENDIX 5

VARIOUS TRANSPORTATION COSTS IN BEEF CARCASSES OF CATTLE ORIGINATING IN FORT WORTH AND FED IN TEXAS FROM 450 TO 950 POUNDS WITH 9:1 CONVERSION

Origin of Feed Grain[a]	Area Fed[b]	Area Slaughtered[c]	Area Consumed[d]	Transportation Cost at Consumption Area when Hauled by TFOC, Rail Carload, Truck or Not Hauled, from Slaughterhouse[e,f]			
				TOFC	Rail-Carload	Truck	Not Hauled
				$/cwt	$/cwt	$/cwt	$/cwt
Texas Panhandle by truck (Lubbock)	Dallas	Dallas	Dallas	N/A	N/A	N/A	2.81
	Abilene	Fort Worth	Fort Worth	N/A	N/A	N/A	2.45
		Denver	New York	5.59	5.14		N/A
			Denver	N/A	N/A	N/A	2.96
			Los Angeles	4.22	4.06		N/A
		Omaha	New York	5.67	4.81		N/A
			Omaha	N/A	N/A	N/A	3.04
			Los Angeles	4.79	4.31		N/A
		Kansas City	New York	5.53	4.61		N/A
			Kansas City	N/A	N/A	N/A	2.90
			Los Angeles	4.72	4.17		N/A
		Los Angeles	Los Angeles	N/A	N/A	N/A	3.77
	Lubbock	Amarillo	Amarillo	N/A	N/A	N/A	2.03
		Denver	New York	5.10	4.65		N/A
			Denver	N/A	N/A	N/A	2.47
			Los Angeles	3.73	3.57		N/A
		Omaha	New York	5.44	4.58		N/A
			Omaha	N/A	N/A	N/A	2.81
			Los Angeles	4.56	4.08		N/A
		Kansas City	New York	5.30	4.38		N/A
			Kansas City	N/A	N/A	N/A	2.67
			Los Angeles	4.49	3.98		N/A
		Los Angeles	Los Angeles	N/A	N/A	N/A	3.12
S.E. Texas (San Antonio)	San Antonio	Houston	Houston	N/A	N/A	N/A	4.20
		San Antonio	San Antonio	N/A	N/A	N/A	3.86

a. Highway mileage within Texas was obtained from Mileage Table Number 1958 issued by the Texas Motor Transportation Association, Inc., Box 92, Austin, Texas. Source of Texas intrastate truck rates for Cattle, Hay and Feed Grains: Supplement No. 7-8 and 8B to Railroad Commission of Texas Motor Freight Commodity Tariff No. 8B, Sept. 2, 1964. Basis for determining the cost of hauling feed grain was the amount consumed per cwt of gain at 9 to 1 conversion ratio and 65% feed grain.

b. Roughage haul was assumed to be 50 miles. Basis for determining transportation cost was the amount used per cwt of gain at 9 to 1 conversion with 25% roughage.

c. Five cattle truck rates from points in Texas to Omaha, Kansas City, Denver and Los Angeles were estimated from data at The University of Arizona, Department of Agricultural Economics giving such rates from points in Texas to Arizona destinations. The average mileage and $.00134 per cwt/mile resulted. This figure was applied to mileage from points in Texas to the above cities as determined by American Automobile Association highway maps. Cattle fed and slaughtered in the same area were assumed to be moved 50 miles from feed pens to slaughter house.

d. No cost was attributed to intra-urban movement of cattle.

e. Source of carcass beef freight rates by rail car-load and TFOC: Southern Pacific Company, 727 Security Building, Phoenix, Arizona.

f. All costs were computed using all advantages allowed by regulatory agencies such as optimum load weights.

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