71-26,560

SMITH, Raymond Leo, 1925-
AN ANALYSIS OF THE RATE STRUCTURES OF
OKLAHOMA DISTRIBUTION MOTOR CARRIERS AND THE
ECONOMIC CHARACTERISTICS OF THE INDUSTRY.

The University of Oklahoma, Ph.D., 1971
Economics, commerce-business

University Microfilms, A XEROX Company, Ann Arbor, Michigan

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THE UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

AN ANALYSIS OF THE RATE STRUCTURES OF OKLAHOMA DISTRIBUTION MOTOR CARRIERS AND THE ECONOMIC CHARACTERISTICS OF THE INDUSTRY

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

DOCTOR OF PHILOSOPHY

BY

RAYMOND LEO SMITH

Norman, Oklahoma

1971

AN ANALYSIS OF THE RATE STRUCTURES OF OKLAHOMA DISTRIBUTION MOTOR CARRIERS AND THE ECONOMIC CHARACTERISTICS OF THE INDUSTRY

APPROVED BY

DISSERTATION COMMITTEE

ACKNOWLEDGMENTS

The writer wishes to express his deep gratitude and appreciation to the many people who provided encouragement and help in enabling a dream to come to fruition in this study. Dr. Dennis M. Crites and Dr. Vernon H. Upchurch provided solace and comfort through the many years of graduate study. Dr. William R. Southard provided the proper perspectives both for much of the work and mental attitude involved.

To my friend and mentor, Committee Chairman Dr. James A. Constantin, I cannot say more than "thanks" because my vocabulary is not sufficiently large or expressive to say all that this great teacher and student has meant to me.

The writer is grateful for the confidence expressed by the Ozarks Regional Commission for the financial support in developing the data.

The technical aspects provided by E. Weldon Smith, Mrs. Joyce Behnam, Mark Elder, and all the other co-workers in producing this will never be forgotten.

Without the love and patience of the writer's family during the period of this project, nothing could have been accomplished.

To the people of the State of Oklahoma whose dreams and treasures have made possible the University of Oklahoma, the writer bows in humble appreciation.

To Marilyn--

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A wild eyed man with a haunted look and brow and seamed
with care,
With shambling feet and palsied hands and a mop of dishev-
eled hair,
His gaze was fixed on a distant thing, like one who gropes
for Fate,
With mind distraught and loaded down with some oppressive
weight.

He crooned a song unto himself, like a lonely child at
play,
And His sighs were like the rustling breeze on a gusty
autumn day;
"Oh! What is it ails you?" The passers by cried, as they
saw the wreck forlorn,
"A unit, a unit, Oh, which is the unit?" He muttered from
the early morn.

"A ton one mile and a engine mile, and a tractive haul as
well,
A loaded car and an empty car," then his eyes began to
swell;
"A commercial mile, a net ton mile and a gross ton mile,
Oh dear!
Tons and miles and trains and cars, it surely is most
queer."

"If we get five cents for hauling a crab from Boston's
quaint old streets,
To Frisco Town, by the Golden Gate, what are the net
receipts?
How much for coal, for wear and tear, for all the train-
mens pay?
How much dead weight does the engine haul if the crab dies
on the way?

"How many grades to the lineal mile, how many ties in a
section?
The engine loss and the waste of wood? Oh is there any
connection?

Oil, tallow and waste, the water supply and fuel for
        locomo's,
Repairs and renewals of engines and cars, goodness only
        knows.

"What is the weight of the driving wheels, what power
        goes up in the stack?
How much sand is used on the rails, when there is ice on
        the track?
What pressure is on the air brakes, what resistance in the
        air?
Was ever a problem so obtruse--to make you tear your hair?

"How many tons to a pint of oil, how many ton miles to
        boot?
And ton miles to a ton of coal, as the engine goes toot-
        toot?
What is the total tractive power? It is as easy as A,B,C,
C square into S into eighty-five, P divided by D equals T.

"And then those percents so bother my head, of actual to
        potential,
And all the small items that loom up so big, official and
        consequential,
And I get me a unit that'll stand for all time, a talis-
        manic lamp of Aladdin,
(Instead of a maze to the end of my days) my statistical
        heart to gladden,"

And thus he went, crooning the livelong day: "A unit, a
        unit, I want,"
Till his hair grew white, and his back grew bent, and his
        figure lean and gaunt;
He faded away like steam in the air, or a hobo under a
        train,
And the verdict of the jury was, "He died of a unit on the
        brain."

ICC Practitioners Journal, Vol. XX, November 1952, Sec. 2, No. 2, p. 302. Author Unknown.

AN ANALYSIS OF THE RATE STRUCTURES OF OKLAHOMA DISTRIBUTION MOTOR CARRIERS AND THE ECONOMIC CHARACTERISTICS OF THE INDUSTRY

CHAPTER I

INTRODUCTION, SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

Background

The hypothesis underlying this study is that rate structures of distribution motor carriers of Oklahoma are not compatible with the economic characteristics of the industry. While the structure of the industry may leave much to be desired economically, for the purpose of this study we are going to limit our scope, and hope that in the future economics and the industry become harmonious.

One of the prime reasons for our concern with distribution motor carriers is that without good transportation service, the economic development of the state will be retarded. For transportation service to be good the carriers must be economically healthy.

The industry may be divided into at least two groups for present purposes. The long line carriers and the short line or distribution carriers. Our primary concern in this paper is with the latter group for at least two reasons. First, while the label "large" applied to the long line and "small" to the short line carriers does not universally fit, it makes a reasonable generalization. The large carriers are able to obscure in part some of the basic economic problems which beset the industry. For example, the problem of the relation between costs and revenue of small shipments is to some extent obscured because the deficits incurred by them are offset by other operations. In addition, the long line carriers often manage to avoid handling the high cost low revenue shipments. By avoiding, for example, small shipments, short hauls, and other unprofitable shipments whenever possible, the large carriers are able to turn to their advantage some of those very discrepancies in the rate structure with which we are concerned.

A second reason for our attention to the small short line carriers and their problems is that in the event of bad service and/or corporate failure of long line carriers, there are reasonable substitutes: railroads, freight forwarders, airlines. On the other hand failure to provide good service or outright failure leaves the users without a reasonable substitute.

Related to both of these two reasons is a third one. Many, and perhaps most or even all of the managements of large carriers with five, ten and fifty million dollars or more in revenue are generally fully informed about all facets of their business. They know what their costs of specific services are, and they know which traffic lanes and which shipments are most--and least--profitable. Thus, they are able to act more knowledgeably.

This in no way implies that the large carriers do not have problems with the same situations the small ones do. It merely means that the effects of the problems are to some extent obscured.

If the industry can be divided in these two groups, the problems can be similarly divided into several categories. Since our concern is with the small carriers, we now relate the problem groups to them although to some extent they are also the problems of the large carriers. Lack of adequate information about their costs and characteristics of traffic is the major problem this paper explores. Others have to do with general management of their organizations, the regulatory agencies of the nation, wages, rate structures, etc.

An article in the Wall Street Journal of February 24, 1971 at page 21 tells a part of the story. It said:

> Industry sources estimated that 700 of the nation's 14,000 local and short-haul truckers have folded or merged in the past six months. This is in spite

> of rate increases of up to 20% in some states for short-haul carriers who move about half of the freight that goes over U.S. roads each year.
>
> Other truckers have been cutting back operations, refusing to pick up small shipments and reducing or eliminating service to small towns, even though they often are violating their operating charters in doing so. Shippers in some out-of-the-way spots are finding themselves hard pressed to get any service at all.

Even though our focus is on the short haul distribution carriers of Oklahoma and on one facet of their problems, it is necessary at times to discuss the large carriers as well as other problems.

At times many of the distribution carriers go right to the periphery of the problem in their contention that there is nothing wrong with the industry that good rate increases won't cure. The revenue problem is merely a symptom and result of more fundamental economic and operational disorders which afflict the industry nationally and locally. The central cause of the problem is the rate structure. Proof of its bad effect lies in the actions of those carriers who have information about their cost-revenue relationships, the large ones with long lines. Attention is again called to the second paragraph of the quotation from the Wall Street Journal. Also see Figure 1-1 for ICC substantiation which shows some of the reasons cited by shippers for poor carrier service.

It should be pointed out that the reason most frequently mentioned for poor service actually is a

FIGURE 1-1

SUMMARY OF SHIPPER COMPLAINTS RECEIVED BY ICC FIELD OFFICES FOR THE PERIOD JULY 1, 1966 THROUGH MARCH 31, 1967

Reasons for Delayed Pickup or Delivery, Refused, Curtailed, or Abandoned Service	Region 5 (Texas, Oklahoma, Arkansas, Louisiana, Iowa, Missouri, Nebraska, Kansas)		Entire Country	
	Number	Percent	Number	Percent
Shipments too Small	35	7.6	267	8.2
Low Ratio of Traffic from or to Service Point	41	8.9	253	7.8
Excessive Rates	17	3.7	236	7.3
Excessive Minimum Rate of Weight	9	1.9	83	2.6
Inability of Originating Carrier to Obtain Connecting Line Service	96	20.7	507	15.6
Traffic Is:				
Light	28	6.0	197	6.1
Bulky	11	2.4	206	6.4
Fragile	35	7.6	179	5.5
Perishable	8	1.7	106	3.3
Traffic Highly Susceptible to Damage:				
High Claim Ratio	35	7.6	202	6.2
Inadequate Protective Packaging	26	5.6	112	3.5
Inadequate Crating	20	4.3	50	1.5
Labor Difficulties	51	11.0	331	10.2
Other Reasons	51	11.0	512	15.8
Totals	463	100.0%	3,241	100.0%

Source: From Table 24, ICC Bureau of Economics, The Role of Regulated Motor Carriers in the Handling of Small Shipments, Statement No. 67-2 (Washington: U.S. Government Printing Office, 1967), p. 49.

combination of many other factors. When an originating carrier has difficulty getting a connecting carrier to handle a shipment, it is usually for one of the other reasons. Figure 1-1 implies that in the vast majority of the cases of poor service, the underlying cause is the failure of revenue to cover cost adequately.

It is not that carriers have a "thing" against shipments because they are light, bulky, small, etc. It is because the rate structure is incompatible with the cost structure. These problems will continue until an adequate rate structure is designed and/or operating structures are revised. This study provides a starting point for a system of rate structure design.

The Study

The study was conducted on a group of general motor carriers who operated under the authority of the Oklahoma Corporation Commission. Waybill samples were made, and financial data were obtained by interviews with carrier management personnel and by examinations of the forms submitted to the Oklahoma Corporation Commission. The statistical methodology is explained in Appendix A. Appendices B through E provide other information about the sampling technique. The rest of the study is organized in the following manner. The remainder of this chapter consists of a summary of findings, and conclusions concerning those findings which were not obvious in the summary, and a series of recommendations. Chapter II provides some information about classifications and tariffs, particularly the tariff used by Oklahoma Motor Carriers. The basic structure is explained, but more complete discussions are left for other chapters where the information is used. In addition certain revenue characteristics are discussed.

Chapter III is devoted to the development of cost centers. It draws heavily on data in tables in some of the following chapters. Chapter IV discusses the relationship between rates and the cost centers developed in Chapter III. Chapter V explains the characteristics of freight movements and discusses them in light of the present rate structure design and the cost and operating characteristics of the carriers. Finally in Chapter VI, the model which had been emerging in prior chapters is developed.

This is a study of method and not necessarily of all facets of detail. Too much emphasis should not be placed on some of the specific costs involved, because in some instances accurate data were not available. Estimates of some aspects of costs were made from ICC reports and from reports filed with the Oklahoma Corporation Commission by the carriers. In some cases averages were used to develop a model that could be easily used by shippers, carriers and regulatory agencies. It is urged that the reader concentrate on the design of the system.

Some may want to differ with our assignment of costs to one or the other of several cost centers. In most such cases, there would be no difference at all in the end result if we transferred one cost from the pickup and delivery cost center to the dock cost center.

Summary

The carriers in the study received less revenue for a shipment when they participated in an interline movement than when they were the sole carrier. The revenue per shipment handled by large carriers was much larger than for those handled by medium and small carriers.

In Chapter III the economic soundness of the rate structure is first questioned on the grounds that most carriers do not have information in a form useful to them or the regulatory agency and which can serve as the foundation for the design of a sound structure. Even though many large carriers are exceptions, most motor carrier accounting systems do not trace costs to the functions performed.

The study identified six cost centers. Direct costs may be traced and assigned to five of them on a functional or activity basis. The sixth cost center is identified for those costs incurred on behalf of the organization as a whole and which cannot be traced to any special function or activity.

The pickup and delivery cost center is shipment oriented. Cost is not affected materially by size, weight, number of pieces, origin, destination, or nature of the commodity being shipped. Study carrier costs for this center were $2.97 per shipment.

The dock handling costs are affected by the number of pieces in a shipment. Handling costs do not vary substantially except when package densities and weights vary widely from the norm. These variations may be recognized in the model. The average dock cost is 21 cents per piece.

The cost of documentation is also shipment oriented. The only variable cost is when more than one item to be rated appears on the documents. Since this happens only 73 times out of every thousand shipments, and for simplicity, documentation costs are considered constant at $1.44 per shipment.

Line haul costs vary with distance and the time required to go a particular distance. The extent to which the truck is loaded or empty has so little effect on cost as to be practically immeasurable. The basic cost is 47 cents per mile, but when a factor of 6 percent is added as recommended by the Interstate Commerce Commission for circuitous routing, the cost becomes 49.82 cents.

Claim costs are oriented to the product being shipped. Most of the administrative costs of handling claims are borne by the delivering carrier with whom claims are typically filed, and the middle size carriers have the greatest exposure to the administrative process of handling them. Claims are very highly concentrated in ten commodities or commodity groups which account for nearly 70 percent of all claims.

The administrative costs were computed on a per shipment basis, for the sole purpose of using the figure as a comparative one. It was repeatedly emphasized that the allocation of both administrative costs and profit to any one commodity, group of commodities, or traffic lanes is a managerial decision to be evaluated by the regulatory agency.

In Chapter IV the relationship between published rates and the direct costs developed in the study was examined. The minimum charge was the first group of rates studied. The costs developed by the study excluding line haul and administrative costs and a profit factor, are not covered by the highest minimum rate in effect during the study period. Costs were determined to be 23 percent above the charge. If a line haul charge and 6 percent direct cost for administration are added, cost is 53 percent above the minimum charge.

Truckload rates are substantially above the computed costs of performing truckload service between several pairs of cities. Even after allowing for profit and an allocation of overhead in the study calculations, the actual charges on class 50 commodities were 37 percent greater than the study costs.

The less than truckload (LTL) rates on selected commodities were also compared with the costs developed in the study. The commodities chosen for comparison were generally from one of three groups: the ten most important commodities in terms of (1) number of shipments, (2) amount of revenue, and (3) dollar value of claims filed. It was found that rates did not even nearly cover costs when the average cost of claims for each commodity was included in cost calculations.

In Chapter VI a number of comparisons of current traffic movements with those of 1959 were made. It was found that intrastate shipments have become a smaller proportion of total shipments in the past decade or so. It was also found that a larger proportion of shipments are now interlined than formerly.

The percentage of shipments weighing less than 300 pounds declined from 65 to 60 percent of the total. A larger proportion of shipments handled by small and medium carriers were in this size group than was the case for the large carriers.

The average shipment of the large carriers was considerably larger than those of other carriers. The proportion of shipments sent collect declined. As with claims, the greatest share of the administrative burden of collect shipments is apparently borne by medium and small carriers.

Minimum shipments rose from 39 percent of the total to over 46 percent.

Conclusions

The rate structure for motor common carriers of general commodities in Oklahoma is not compatible with the economic and operating characteristics of the industry.

The weight of shipments is not the major cost generating activity. Only when mechanical equipment or two men are required to handle a shipment does weight become a cost factor in any of the cost centers. Density becomes important in the line haul only because of space used and if the cubic capacity of the vehicle is ordinarily filled. In practically all instances pickup and delivery costs and documentation costs are incurred because a shipment is made, and not because of its weight. Dock handling costs are incurred because a package is handled and not because of its weight, unless special handling is required.

Line haul costs are incurred because the trip is made and not because of the lading. Line haul costs per shipment or per piece depend upon the proportion of weight and cubic capacity used by the package. Claims are related to the shipment and perhaps to the individual commodity. The majority of claims are filed on commodities which constitute the largest proportion of shipments.

The costs of performing all of the foregoing functions or activities can be traced to those activities, so they can be assigned to particular shipments moving in specific traffic lanes. That group of costs which cannot be assigned because they are incurred for the organization as a whole must be allocated to the several shipments. This allocation is the responsibility of management, and its evaluation is the responsibility of the regulatory agency. The amount each shipment should contribute to return on investment is also a managerial function subject to review by the regulatory agency.

On those intrastate movements which must be interlined because of the route structure, the rates are improperly designed. If they are properly designed for interline movements, the design is wrong for single carrier movements. The costs are greater on interline movements because an extra set of pickup and delivery, dock handling, and much of the time, documentation costs are incurred. The same situation prevails for interstate shipments.

The basis for the division of revenue from interline shipments is also improperly conceived. In intrastate movements the line haul cost is a very small portion of total cost, yet divisions are mostly based on prorated mileage. The adverse financial effect on Oklahoma carriers is intensified by the practice of having the delivering carrier process claims.

The direct and traceable cost of a large proportion of the shipments handled by Oklahoma carriers is not covered by the present rates. This appears to be especially true of those shipments moving at the minimum charge and those LTL shipments of commodities which seem to be prone to claims. The truckload rates seem to be extraordinarily high when compared with the costs involved. Considering the cost-revenue relationship of other shipments, this is probably all to the good for a subsidy is apparently provided. The general commodity distribution carriers in Oklahoma have apparently been kept from financial disaster by the subsidy provided by some shipments to others.

Recommendations

The basic recommendation within the scope of this study is that the rate structure be redesigned to make it more consistent with the cost, operating, and traffic characteristics of the motor carriers. Several factors should be considered in the general design.

First, without proper information good decisions cannot be made; the Oklahoma Corporation Commission and the carriers should examine and modify for their purposes an accounting system recommended by an accounting firm acting on behalf of all motor carriers. The system would make possible the tracing of costs to functions as has been done in this study.

Second, data from traffic studies such as the one reported here should be gathered to show patterns of freight movements among towns of Oklahoma and the characteristics of the freight which moves.

Third, the difference in costs of two-line hauls in Oklahoma should be ascertained with greater precision than is possible when the ICC estimates are used. This information can be used not only for costing purposes but also for determining just divisions of revenue. Because the burden of administration of claim costs falls on the delivering carrier, this should also be considered in either divisions of revenue or in some other manner deemed appropriate by management and regulators.

Fourth, even though claims paid amount to a small proportion of total revenue (less than two percent nationally) their incidence can be determined; so a special study of several aspects of claims should be made. From such a study, rational measures of pricing to reflect claim costs could be introduced. On the other hand, carriers and regulators may take the position we took in this study; because the cash outlay for claims is such a small part of total cost, the effort involved was not worth the expected results in view of the overall objectives of this study. These costs may be considered overhead costs and allocated accordingly. Also they may be covered by the addition of an appropriate amount to the shipment of certain commodities, the amount to be determined from actual experience.

Fifth, the costs directly related to traffic should be computed and made the basic part of what will ultimately be the published rate. To this basic cost, a managerially determined factor to cover overhead and profit should be added. We recommend the use of our model which reflects the direct costs, plus those allocations based on judgment of management, and that its elements be reviewed periodically to keep costs up to date and constantly refined.

Sixth, we recommend that the Corporation Commission investigate the possibility of creating a third class of carriers patterned after the Missouri system of so-called "pony express" carriers. It is our understanding that these carriers serve mainly small towns and are generally not regulated except to limit the maximum vehicle load to a few hundred pounds.

A modification of this system is in use by Oklahoma carriers who arrange with citizens in some towns to serve as local pickup and delivery agents. We recommend that these local agents be authorized to deliver from certain central points of the state to small towns in the vicinity. The effect would be to create a series of satellite terminals around the state to which goods would be delivered. The local operator would then deliver to the small towns for a fee to be collected from the consignee.

Seventh, if the Commission cannot find either of the two approaches discussed in our sixth recommendation palatable, it should consider the authorization of special rates to the smaller communities which are so costly to serve because of low traffic density. Again, there is nothing new about this approach. The Kansas system could be adopted or adapted to the needs and conditions of Oklahoma. Under the system we propose, rates above the normal would be established to towns with low density of traffic. To prevent the high rates from militating against economic development, automatic rate reductions upon the attainment of certain traffic volume could be included in the Commission order establishing the higher rates.

Eighth, we recommend that the carriers, especially the small and medium sized ones reduce their costs by improvements in efficiency in their major cost centers of pickup and delivery and dock handling. We recommend that they form a consolidated pickup and delivery system which can reduce those costs by 15-20 percent or more. With volume, dock handling costs can also be reduced at least as much by the introduction of very inexpensive conveyor systems, the effectiveness of which has been proven.

CHAPTER II

MOTOR CARRIER CLASSIFICATION, TARIFFS, AND REVENUES

Motor Carrier Classifications

There are so many types of goods with varying characteristics of size, weight, and value and there are so many possible combinations of origins and locations that making separate rates on each item that moves from and to every point in America would be a hopeless task. To simplify the task somewhat commodities are grouped into a limited number of classes, and rates are made on the classes instead of the commodities. Rates of this type are called class rates.[1] There are some 15 criteria prescribed for placing commodities into certain classes as shown below.[2]

---

[1]To meet special situations rates are often made on specific commodities. These rates are called commodity rates. In addition, there is another category of rates based upon exceptions to the classification.

[2]W. J. Hudson and J. A. Constantin, Motor Transportation (New York: The Ronald Press Company, 1958), pp. 399-400.

1. Shipping weight per cubic foot
2. Susceptibility to damage
3. Possibility of causing damage to other commodities
4. Perishability
5. Susceptibility to spontaneous combustion
6. Susceptibility to theft
7. Value per pound in comparison with other articles
8. Ease or difficulty in loading or unloading
9. Stowability
10. Excessive weight
11. Excessive length
12. Care and attention required in loading or transporting
13. Trade conditions
14. Value of service
15. Competition with other commodities transported

By using this type of classification, the Southwestern Motor Freight Bureau has arrived at a workable number of twenty-four divisions or classes for goods.

Obviously with the judgment factors involved in the above categorization, apparent anomalies can occur, but which can be explained in many cases. The following are illustrations of ratings of some of the commonly moved commodities in Oklahoma: rubber tires and tubes, class 70; tires for repair, recapping, or retreading, class 60; miscallaneous plastic products that weigh less than two pounds per cubic foot, class 300; miscellaneous plastic products that weigh more than two pounds but less than four pounds per cubic foot, class 250; miscellaneous plastic products that weigh more than four pounds but less than six pounds, class 150; miscellaneous plastic products that weigh six pounds but less than twelve pounds per cubic foot, class 100; miscellaneous plastic products that weigh twelve pounds or more per cubic foot, class 85; advertising matter, paper or paperboard prepaid, class 77 1/2; displays advertising, store window NOI, prepaid, class 100; electric motors and generators, class 77-1/2; household refrigerators and freezers, class 92-1/2; electric lamps, class 100; electric storage batteries, class 70; new automobile bumpers, class 85; automobile bumpers being returned for refinishing or repair, class 60; automobile fenders with paint or primer, class 300; automobile fenders without paint or primer, class 300. Actually these situations reflect the judgment of the tariff experts as to the appropriate relationship between the cost of service and the demand for that service. Presumably tires being shipped for recapping and bumpers being shipped for repair cannot afford to pay as high a price as the new product. Furthermore, on truckload movements of these commodities minimum weights may be higher for the product with the lower classification rating so that the carrier revenue may be higher for the lower rated shipment.

The classes taken by themselves still do not permit setting a complete price for the movement of goods. Two more factors must be taken into account: the size of the shipment and the distance that the shipment is to move.

Motor Carrier Tariff 27-D

Tariff 27-D as issued by the Southwestern Motor Freight Bureau, Incorporated was in effect for most Oklahoma distribution carriers during the year 1969 when the data for this study were generated. Therefore, the rates in use during most of 1969 will be referred to in this report.

Tariff 27-D uses a series of five columns in which each of the previous twenty-four mentioned classes is divided. The columns give a rating in cents per hundred pounds for various quantities being moved under the classification. The following is a description of the column rates:

Column 1. Rates apply on LTL or AQ (Less Than Truckload or Any Quantity) shipments weighing 500 pounds and less.

Column 2. Rates apply on LTL or AQ shipments weighing over 500 pounds and less than 2,000 pounds.

Column 3. Rates apply on LTL or AQ shipments weighing 2,000 pounds and over; also on all TL (Truckload) shipments.

Column 4. Rates apply on LTL shipments weighing 5,000 pounds and over, but less than 10,000 pounds.

Column 5. Rates apply on LTL shipments weighing 10,000 pounds and over.[3]

---

[3]*Tariff 27-D* (Dallas, Texas: Southwestern Motor Freight Bureau, Inc., 1964), p. 81.

The column 3 reference to truckload shipments takes into account the truckload class rating that is given to a commodity. The truckload class rating runs approximately between 40 percent and 70 percent of the LTL Class Rating. For example, in the case of tires, the new tires that carried a class of 70 as shown above carry a truckload class rating of 37-1/2. The tires for repair, recapping, or retreading are in class 60 for LTL and class 35 for truckload quantities.

The rate between two points is generally set on a mileage basis using rate basis numbers. Different rates are set for each of the classes of commodities. There is a percentage relationship between the classes with class 100 being the base class. The rate on a movement between two points of all commodities in class 100 will be the same. Commodities rated at class 70 will all pay rates equal to 70 percent of those rated 100. The rate basis numbers are given for pairs of named shipment points. Generally, the rate basis number is the distance between two points; so several pairs of cities may have the same rate basis number.

The rate basis numbers in Oklahoma that apply between the cities that we have determined as the fifteen major zip code centers of the state are shown in Table 2-1. Table 2-2 shows the road mileage as given by the official highway map between the same points. Figure 2-1 identifies zip code centers by name and number. A comparison of

FIGURE 2-1

ZIP CODE CENTERS

731--	Oklahoma City	741--	Tulsa
		74301	Vinita
73401	Ardmore	74401	Muskogee
73501	Lawton	74501	McAlester
73601	Clinton	74601	Ponca City
73701	Enid	74701	Durant
73801	Woodward	74801	Shawnee
73942	Guymon	74953	Poteau

TABLE 2-1

RATE BASIS NUMBERS IN OKLAHOMA BETWEEN ZIP CODE CENTERS

731--	15														
73401	104	10													
73501	98	100	15												
73601	88	188	101	15											
73701	82	186	146	108	19										
73801	140	241	173	78	86	20									
73442	266	367	304	221	212	126	20								
741--	117	182	215	198	125	211	337	15							
74301	180	248	274	243	196	267	396	63	18						
74401	143	180	226	241	177	262	389	57	110	15					
74501	125	117	222	217	207	265	385	109	130	62	14				
74601	104	196	202	174	64	145	267	97	122	154	188	15			
74701	146	57	157	239	228	286	415	173	206	138	76	214	14		
74801	39	94	121	121	121	179	304	96	146	118	86	102	114	15	
74953	195	193	264	312	262	335	486	142	153	83	77	239	153	162	15
	731--	73401	73501	73601	73701	73801	73942	741--	74301	74401	74501	74601	74701	74801	74953

Source: Adapted from Tariff 27-D (Dallas, Texas: Southwestern Motor Freight Bureau, Inc., 1964) pp. 67-79.

TABLE 2-2

ROAD MILEAGE BETWEEN ZIP CODE CENTERS

731--	--														
73401	98	--													
73501	99	101	--												
73601	88	184	93	--											
73701	83	182	150	110	--										
73801	142	240	170	78	87	--									
73942	265	363	294	201	210	124	--								
741--	117	186	216	195	125	212	336	--							
74301	180	243	279	258	182	265	384	65	--						
74401	140	178	233	225	178	261	385	53	68	--					
74501	120	114	177	208	203	262	385	107	129	64	--				
74601	103	190	202	176	66	149	266	97	119	150	183	--			
74701	147	53	153	232	228	288	411	174	205	140	76	211	--		
74801	37	93	126	125	120	178	302	95	158	108	83	100	114	--	
74953	191	181	252	277	264	332	456	138	152	84	75	234	142	153	--
	731--	73401	73501	73601	73701	73801	73942	741--	74301	74401	74501	74601	74701	74801	74953

Source: Adapted from Official State Highway Map/1969 (Oklahoma City: State Highway Commission, 1969).

Table 2-1 and Table 2-2 shows that for all practical purposes the numbers are the same. In other words the rate basis numbers are practically the same as the road mileage distances.[4]

The rate tables from which the rate for a particular movement is determined are usually constructed in a matrix with the rate basis numbers shown vertically along the left hand side of the page and the classes horizontally along the top portion of the matrix. At the intersection of a line drawn horizontally from the rate basis number with a line drawn vertically from the class is the rate for a particular movement. Rate base numbers generally reflect mileages, and they are set up in increments in Tariff 27-D. For example, a rate basis number of 10 and under generally will apply to a distance of under ten miles. The next category is 15 and over 10, and it applies to distances of over 10 miles but less than 15. This pattern continues up through 100. From 100 through 240 increments of 10 are used. From 240 through 700 increments of 20 are used.

As an illustration of the way the system works, let us assume a commodity that takes class 100 rates for less than truckload and class 70 for truckload moves a distance of 119 miles. The following tabulation shows the

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[4]A few large exceptions such as between Clinton and Guymon, Clinton and Poteau, Guymon and Poteau, and McAlester and Lawton show what seem to be significant differences, but for the purposes of this paper and this study, they are immaterial.

rate in cents per hundred pounds for shipments in different weight brackets.

Column	Weight Group	Cost per CWT (cents)
1	0 - 499 pounds	198
2	500 - 1,999	187
3	2,000 - 4,999	176
4	5,000 - 9,999	167
5	10,000 - over	158
	Truckload	123

In addition, a minimum charge requirement has been placed on shipments under Tariff 27-D.[5]

Weight Group	Minimum Charge
Less than 100 pounds	$3.15
100 - 199	3.55
200 - 300	3.75

In our example if we rate the truckload quantity of our goods at 100 or place an index of 100 on the charge per hundred weight, our LTL price of over 10,000 pounds would take an index of 128.45 and the various weight groups would have the following index characteristics

Weight Group	Index Number
Truckload	100.00
10,000 pounds	128.45
5,000 - 9,999	135.77
2,000 - 4,999	143.08
500 - 1,999	152.03
499 and under	160.97

Motor Carrier Revenue Characteristics

For the purposes of this study, we grouped the sample carriers into three size groups according to their

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[5]*Tariff 27-D* (Dallas, Texas: Southwestern Motor Freight Bureau, Inc., 1964 with 1969 supplements).

gross revenue: Group I, over $2,500,000; Group II, $100,000 to $2,500,000; and Group III, under $100,000. Our tables in this chapter provide information on each size group and for all of the groups combined.

The rates quoted in the tariff for a given rate basis number apply regardless of the number of carriers required to move the shipment between its origin and destination. This is a significant factor in view of the extra costs involved in interline shipments. We explore this subject more fully in other chapters. Quite obviously then, for an overall picture we cannot assume that the carrier we are looking at receives the entire price as revenue to his firm. Table 2-3 indicates the situation we found in the study of shipments handled by a sample group of Oklahoma carriers of different size groups and when they were handled by two or more carriers (interline shipments) or by only one carrier. For all shipments, regardless of the size or number of carriers involved in the movement, the average revenue per shipment was $11.02. When a single carrier was involved, the average was $15.59. On interlined shipments (more than one carrier involved) the average revenue to a single carrier was $8.95. The other categories in Table 2-3 indicate the variances in the average revenues between carriers of different total revenue sizes. These variances are an indication of the difference

TABLE 2-3

STUDY CARRIERS
AVERAGE REVENUE PER SHIPMENT BY SHIPMENT
CHARACTERISTIC AND CARRIER SIZE

Carrier Size	Shipments: Interlined	Single Carrier	All
Over $2,500,000	$17.89	$27.35	$22.39
$100,000 to $2,500,000	7.11	8.81	7.92
Under $100,000	6.87	9.60	6.72
All Carriers	8.95	15.59	11.02

Source: Waybill study.

in types of business done by small, medium, and large carriers.

Summary

There are some fifteen criteria considered before placing commodities in a particular classification. Most of these relate to the cost of performing the total transport service. We showed by illustration the application of these criteria and briefly described the process in determining rates or movements between two points.

The carriers involved in an interline shipment receive less revenue per shipment than when they are sole carriers.

CHAPTER III

MOTOR CARRIER COST CENTERS

The Need for Cost Information

Effect of Lack of Information

While motor carriers generally know how much money they spend, they do not know what their costs are. Certainly, there are exceptions to this statement among carriers of all sizes, but it applies to such a large portion of the industry that rate making is substantially an intuitive process. Without adequate cost data the regulatory agency and carrier management are forced to view rate making in the light of total revenue needs of the carriers, from what is almost certain to be the wrong point of view. Further, the rate makers establish rates, using what is almost certain to be the wrong criteria.

When the operating ratio of expenses to revenue rises to a financially untenable level and the carriers have exhausted all expense cutting measures acceptable to them, they turn to an increase in revenue as the only alternative means of improving their financial situation. They know the number of dollars required to ease their financial burden; so a request for a percentage increase in rates of, for example 10 percent, is prepared.

This percentage increase may have several variations. It may be a flat 10 percent across the board. A common approach is to propose increases of varying amounts on different segments of traffic. For example, a flat increase in the minimum charge of so many cents may be proposed; a 15 percent increase in rates in one weight group; a five percent increase in another; and no change in a third. The end result, it is hoped, will result in an average increase in revenue.

This approach is presumably market oriented, in that each weight group is assessed the amount the carriers feel they can charge without driving away a substantial amount of traffic. In many instances, the knowledge of costs is limited to an intuitive feeling that the carrier cost per hundred pounds falls as the weight of the shipment rises. Since rates are made on the basis of weight, the revenue received from an increased rate will become a larger proportion of the cost per hundred pounds. Thus, the ratemaking process has cost overtones and is considered to reflect a balance between cost orientation and market orientation.

On its face, the reasoning underlying this approach to rate making is rooted in concepts of economic analysis. From the demand point of view, presumably some attention has been given to the relative elasticity of demand in applying different rates of increase to the different weight categories. From the supply point of view, the principle that costs decrease as the rate of output increases has been considered. However sound it may be on its face, the approach is not economically sound because: (1) it assumes that the existing rate structure is an economically sound one; and (2) it assumes that certain percentage increases added to an economically sound structure will not materially unbalance that structure.

The validity of these assumptions can be questioned from the point of view of both demand and supply. Our emphasis is primarily directed to the supply point of view, since our concern is not with setting rates. We are concerned with designing a structure to serve as a foundation for setting rates. Once the foundation of the structure is established, the requirements of the market, the needs of the carriers, and the philosophies of the regulators can relate market considerations, public interest factors, and carrier revenue needs to the basic cost structure. The result within our scope can be a rate system built around an economically sound cost based structure.

For an economically sound rate structure to be designed, its designers must have sufficient information about the economic nature of the industry and the carriers of which it consists. This type of information is not available for the motor carrier industry as a whole. The tragic aspect of this situation is that the required information can be obtained. Some of it is contained in this report. A number of large motor carriers, fewer smaller ones with sophisticated management, and at least one consulting firm have developed such information.

While the context of the discussion was not the same as this one--the unsoundness of the rate structure--the Interstate Commerce Commission expressed concern over the lack of information for regulatory purposes. It said:

> We recognize the need for additional study in many areas including, but not necessarily limited to the following:
> (1) Possible alternative approaches to costing generally, including the forecasting of future costs as opposed to reliance solely on historical data.
> (2) The nature of deficiencies in the systems of accounting and reporting for regulatory costing purposes.
> (3) Design and implementation of probability sampling and statistical analysis for the development of cost data.
> (4) Development of reasonable methods for allocating constant costs and of common or of joint costs as between various segments of traffic.
> (5) Development of variability factors relating to carrier costs.
> (6) The establishment of clear definitions of terms to be used in the area of transportation costings.[1]

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[1]Interstate Commerce Commission, Rules to Govern the Assembling and Presenting of Cost Evidence (Washington, D.C.: U.S. Government Printing Office, 1970), p. 322.

A second reason for challenging the assumption is closely related to the first, but more specifically applicable. Carrier cost information is not available for adequate managerial control purposes, to say nothing of it being adequate for structural design purposes.[2] It is axiomatic that for managers to control costs, to say nothing of managing them, they must know what their costs are. It is not sufficient to be able to add up costs and divide by the number of shipments, or the number of vehicle miles, and so determine the average cost per shipment, or per vehicle mile. The resulting information is important only when it is necessary for one to prove that fifth grade arithmetic is still remembered.

The preceding statements about the lack of cost data for managerial, regulatory, and rate making purposes should not be taken to mean that dollar figures are not available for expenditures of certain types. They are. The ICC uniform system of accounts requires the breakdown of expenses into a large number of categories, but the resulting figures are not useful for managerial control or rate making purposes. They probably have some real use, but not in management control. As previously stated, some individual carriers, generally the larger ones, have all of the appropriate information needed for control and rate making purposes.

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[2] As emphasized in "Revising the Uniform System of Accounts," Southern Motor Cargo, May, 1970, pp. 18-24.

It is difficult to prove the nonexistence of something. In this instance, we quote extensively from a statement by ICC Commissioner Howard Freas. He said:

> In spite of the number of cases which come before the suspension board, there are relatively few instances where the proponents offer costs which can be used in evaluating the reasonableness of the proposed rates.
>
> Some rates disclose almost on sight that they are unreasonable. We have had cases in which the one way line haul cost alone approximates twice the total revenue yield. Sometimes this occurs because the carriers do not know the cost of performing a particular service. In other instances noncompensatory rates have been published to satisfy shippers--carriers have frankly admitted that they hope for suspension.
>
> The problem of obtaining adequate data is not limited to the suspension level. The commission constantly strives to find ways to secure better evidence in contested rate cases. Many cases go to formal hearing before the commission either without any costs or with data which do not adequately reflect the transportation characteristics of the traffic involved.
>
> I might mention here two types of evidence frequently resorted to by the parties which by themselves are ordinarily of little value in determining compensativeness; the first is system average expense per vehicle or a car mile. This figure is obtained by dividing total expenses by the total inter-city vehicle miles operated. The parties then compare the resulting expense per vehicle mile with the revenue per mile produced by the proposed rates at the proposed minimum weight. This method assumes that all expenses are caused by miles operated. However, in addition to distance there are many other factors which affect costs: weight of shipment, density, terminal services performed, whether the traffic is single line or inter line, special services such as refrigeration--all these factors must be considered in designing rates that produce adequate revenues for carriers handling a wide variety of commodities in different quantities.
>
> The second type is based on the added traffic theory. Some carriers faced with the prospect of an empty vehicle coming back to the terminal feel that any revenue they can get will be profit. Rates based on this theory almost invariably ignore joint costs. In motor carriage, consideration is at times limited

> to loading and unloading expense and to the extra expense of fuel required in returning the equipment loaded rather than empty.[3]

Types of Information Available

The carriers which use the ICC uniform system of accounts have information on the cost of such things as: wages paid pickup and delivery drivers; fuel and oil for over the road trucks; wages paid dock workers, etc. It is something of a paradox that with such raw data available, carriers do not seem to have it in a form useful for managerial and rate making purposes. The only reasonable explanation we can offer is to suggest that the designers of the ICC systems were oriented more toward an accounting system rooted in a "natural accounts" basis than to a "functional accounts" basis. Under the natural accounts system, expenses are classified on the basis of what the expenditure buys: labor; taxes; office supplies. A functional accounting system allocates costs to the function performed: pickup and delivery; line haul; dock; administration.

The ICC system is something of a hybrid of the two. While it emphasizes the functional accounts concept, the resulting figures are too coarse to provide managerial control data. Of course, it is the function of management

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[3]Howard Freas, "Rate Regulation Today," ICC Practitioners' Journal, Volume XXXIII, No. 6, March, 1966, p. 779.

to provide itself with appropriate managerial data, which most carriers apparently do not do. For example, to determine--even on a system basis--the total cost of pickup and delivery function, the manager should be able to combine a series of accounts to arrive at the total figure. Except for the types of carriers previously mentioned, this is not possible. For instance, dock wages, administrative salaries and terminal rent as totals are not particularly useful in determining the costs of pickup and delivery. To be useful for managerial and price making purposes, a reasonably accurate functional system of accounts designed around the major cost centers is necessary. Typically under existing systems, costs of certain functions are isolated in part (wages of pickup truck drivers) and grouped in part (administrative and general salaries).

In several of the cost centers, from the point of view of its cost generating nature, one shipment is very much like another, almost without regard to its weight. This leads us to our third reason for questioning the assumption that the rate structure is economically sound. Underlying the rate making structure is the implicit assumption that the two major cost generating elements are the weight of the shipment and distance it moves. Later in this study it will be shown that for distribution carriers in Oklahoma the <u>total</u> cost to the carrier of moving a shipment from origin to destination is relatively independent of the weight of the shipment.

Time is the relevant factor and the amount of time spent on one shipment of a given weight is not materially different from that spent on another shipment weighing substantially more or less. While this point is more fully and reliably analyzed elsewhere in this study, it is briefly explored here. The data discussed were developed in an unpublished pilot study made as a forerunner to this one from the operations of an Oklahoma distribution carrier during one week in 1968. Because the data are for only one carrier, they are not conclusive; but they are indicative. Because this study and others which are scientifically designed show the same general relationships, we believe that these data cannot be ignored or brushed aside merely because they reflect operations of one carrier, with revenue at that time of approximately $2,000,000.

The study used 11 weight groups, the first two of which had 500 pound intervals (0-499 pounds and 500-999 pounds). The other nine weight groups had 1,000 pound intervals (1,000-1,999; 2,000-2,999; ...; 9,000-9,999 pounds). The first five weight groups from zero through 3,999 pounds accounted for 89.0 percent of the total number of shipments moved. Those shipments also accounted for:

a. 79.6 percent of the total minutes the truck spent at customers' docks;
b. 95.0 percent of the total number of stops made for pickup and delivery;
c. 70.1 percent of the total weight of goods picked up or delivered;
d. 89.0 percent of the total number of shipments handled.

The average number of minutes spent at the docks to receive and deliver shipments for all five weight groups was 7.97 minutes. The lowest time required was 1.02 minutes less than the average, and the highest was 1.02 minutes greater than the average. The five weight groups, the number of hundredweight (CWT) in each weight group, and the number of minutes per shipment are shown in the following tabulation. For illustrative purposes we use a cost figure of 12 cents per minute for the full cost of driver and truck.

Group Number	Weight Group	CWT per Group	Minutes per Shipment	Cost per Shipment (cents)
I	0- 499	863	6.95	83.4
II	500- 999	1103	8.20	98.4
III	1,000-1,999	1695	8.99	107.9
IV	2,000-2,999	1125	8.96	107.5
V	3,000-3,999	770	8.11	97.3
Average			7.97	95.6

These figures partially explain our statement that one shipment is very much like another so far as the cost of handling is concerned. Using the cost of 12 cents per minute, the average vehicle-driver cost for pickup and delivery is 95.6 cents per shipment for all shipments in all weight categories shown. The highest cost is for shipments weighing from 1,000-1,999 pounds, yet that cost is only 24.5 cents greater than that for shipments whose average weight is much less; in the 0-499 pound group.

The time spent by the vehicle-driver unit in moving from one dock to another (stem time) is of course completely independent of the weight of the shipment, as are the paperwork required for a shipment, administrative costs for supervision, maintenance, terminal rent, etc.

The Nature of Cost Centers

The Cost Centers

Figure 3-1 illustrates the several operating components of the motor freight carrier and identifies the related costs. This report is primarily concerned with the cost centers, as distinct from related cost items which arise from the movements of less than truckload shipments. There are four major cost centers in the motor carrier industry. One center where costs are generated is in the operation of the pickup and delivery system. Every cost associated with this function is a part of this center including all equipment, labor, supplies, depreciation, taxes, fringe beneifts, and rental costs. The second cost center embraces all costs associated with the operation of the dock facilities, including rent if it can be traced to the dock operation, depreciation, and dock administrative and clerical costs. The costs of the line haul or intercity

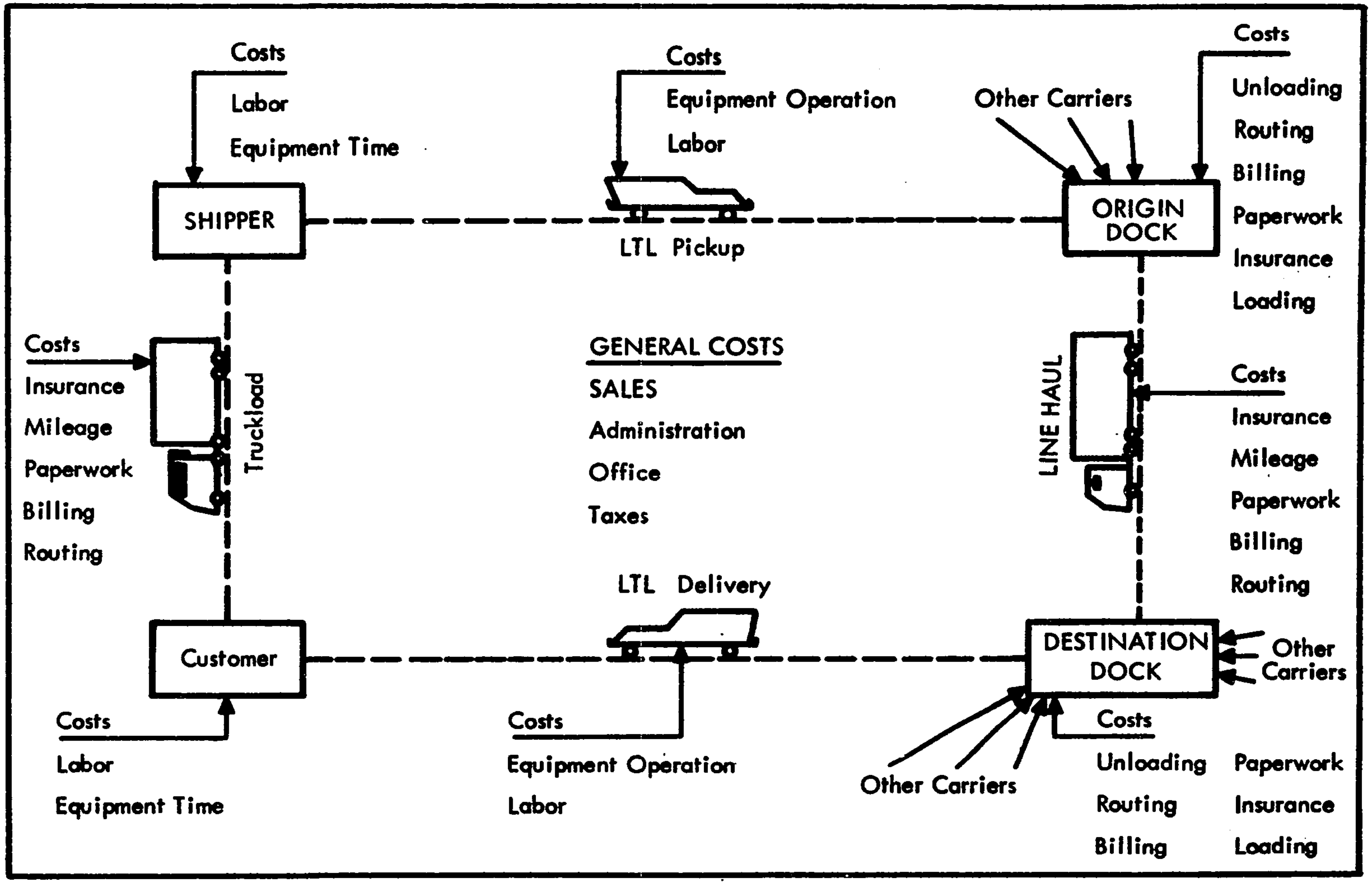

FIGURE 3-1

THE MOTOR FREIGHT PROCESS

operating function comprise the third cost center. While each of these three centers include administrative costs directly traceable to them, there are certain overhead costs which are incurred for the operation as a whole and cannot be traced to any one function. These are in the administrative cost center and include such costs as the salary of the president, depreciation on his secretary's office equipment, advertising costs, insurance, and rent which cannot be traced to a specific activity.

For purposes of simplifying analysis, these four centers have been expanded to six by identifying a separate center for paperwork, related to the pickup and delivery (PUD), dock, line haul, and administrative activities. Also a separate center for loss and damage claims has been identified. A study of Figure 3-1 which illustrates the several steps involved in the motor freight process shows the basic cost centers, each related to a definite portion of the production of transportation of goods. These cost centers are:

1. Pickup and delivery operations
2. Dock handling operations
3. Costs of documentation, routing, and other involved paper work
4. Over the road or line haul operations
5. The insurance costs or those costs that arise because of the bailee, bailor relationship of the carrier to the shipper.
6. Administrative costs

In turn, each of the cost centers has distinctive costs identified with them: paper work costs, labor costs, equipment costs, administrative costs, insurance costs, rents, taxes.

All motor carriers have these cost centers in common even though the magnitude of individual costs may vary considerably among carriers of different sizes.

Much of the data developed for the cost portions of this study were extracted from carrier reports to the Interstate Commerce Commission and the Oklahoma Corporation Commission and were refined and combined to accomplish our purposes. While the basic method used by the ICC in its cost studies was used, we made some adaptations of it to fit our needs. As stated earlier, some of the data required of carriers by the ICC is too coarse to be of much help in managerial control efforts, but it was realigned to fit the pattern of the cost centers. In this manner costs could be assigned on a functional basis to the proper activity.

One method of obtaining more precise carrier cost data is to conduct individual carrier studies such as the one briefly mentioned earlier in this chapter. Also, more precise data can be obtained from the carriers themselves in many instances. The regulatory authorities can obtain the necessary data merely by making minor refinements in the forms used for reporting purposes, or in the uniform system of accounts. It may be necessary to conduct special studies periodically in order to develop specific data on a current basis.

One of the major stated purposes of this study was to design a method of approach and analysis which could be adapted for use in designing a structure for rate making. The concepts for this purpose do not require the refinement of data that could be obtained and these refinements have not been pursued. For example, for the following discussion, certain data on vehicle operating costs and labor costs for the group of small carriers were not readily available. To proceed toward the more fundamental structure-design objectives, it was assumed that those costs for that group of carriers would be the same as those for the middle group of carriers, if the small carrier data had been developed. We then proceeded to offer a brief support statement for the assumption which may or may not be adequate. For our purposes in designing a structural framework for rate making the assumption was a reasonable one. For actual rate making purposes, the assumption may, or may not be reasonable.

For convenience we have segregated the carriers into three sizes. The first size category consists of those with annual revenue of more than $2,500,000. The second category includes those with revenue of $100,000 to

$2,500,000, while those carriers with revenues under $100,000 are in the third category. These groups are referred to in this study as large, medium, and small carriers.

While we show the appropriate costs for each size group, we use a weighted average of these costs in our discussion. The various cost items which are aggregated to develop costs for each of the centers are listed in Appendix A.

The Pickup and Delivery Cost Center

An examination of the pickup and delivery cost center shows that its costs may properly be called shipment oriented costs, because they are about the same magnitude for most shipments. Various studies, including our own, support this statement because they show that cost is not materially affected by the number of pieces in a shipment.

Under similar circumstances of pickup and delivery, the costs of each activity are the same. Of course costs will differ if the traffic density in the two locations is different or if pickups are made in large amounts from one customer at the origin and delivered to many customers at the destination. Accordingly in our analysis of the costs we took into account the four ways carriers handle a shipment from origin to destination. First, the shipment may be originated and terminated by the same carrier in which case it is picked up and delivered by that carrier. Second, it may be originated by one carrier which performs the pickup service and only a part of the line haul service. Third, another carrier provides the other part of the line haul and is responsible for delivery to the consignee at destination. A fourth situation arises when a third carrier is involved in the movement. In this case, that carrier receives the shipment from the originating carrier, performs part of the line haul and turns it over to the third carrier for additional line haul and final delivery to consignee. When a carrier serves in this manner he is sometimes called a bridge carrier, for obvious reasons. In some cases there may be more than one bridge carrier. In Chapter V the relative importance of these four procedures is discussed.

The cost implications of these four types of operations were taken into account in the development of the per shipment cost of pickup and delivery. These costs are of two types: Those related to ownership, maintenance, and operation of vehicles used in the service; and those concerned with supervisory, clerical, driver, and other people involved in the same service. To arrive at vehicle costs it was assumed that the vehicles would be depreciated over a five year period. Salaries and wages were increased by an assumed 16 percent to account for fringe benefits of all kinds.

Table 3-1 shows the vehicle and wage costs as components of the total cost incurred per shipment by carriers in the two largest size categories. There were insufficient data for the carriers in the smallest size category; so it was necessary to assume that these costs would not be materially different from those of the middle size groups. Since the same kinds of trucks are used, the assumption seems reasonable. Wage costs may be a little lower per hour for the smaller carriers, but that difference should be offset by lighter traffic density and thus higher costs per hour. In addition union wages will dominate costs. Since more than one level of rates for identical service is impractical, the higher wage costs of larger carriers will probably have a stronger influence on rate levels than will those with lower wage costs.

While information on the smaller carriers comparable to that on the larger ones would have been desirable to have, the small carriers accounted for such a small percentage of both revenue (6.1 percent) and tonnage (10.7 percent) of the study carriers, that even very substantial errors in the assumptions pertaining to them would not materially affect the results of the analysis. For example, if the small carrier costs in this category are 20 percent greater than we assume they are, the average total costs of all carriers would rise less than two percent. If their costs were 20 percent less than we

TABLE 3-1

VEHICLE, WAGE, AND TOTAL COSTS PER SHIPMENT

Shipment Cost	Carrier Size	
	Over $2,500,000	$100,000-$2,500,000
Vehicle Cost	$0.88	$0.32
Wage Cost	2.81	2.32
Total	3.69	2.64

Source: Waybill Study.

assume them to be, total costs for all carriers would decline less than two percent.

The weighted average cost for the pickup and delivery function was found to be $2.97 per shipment.

The Dock Cost Center

The number of pieces in a shipment appear to affect dock operating costs. Several factors were considered in the process of developing these costs. The number of times that a shipment was handled is one factor considered. On shipments originated and terminated by the same carrier it would be handled twice, once at origin docks and once at destination docks. If a two line haul was involved, the "consignee" at the intermediate city would in effect be the second carrier who would handle it on his docks at the connecting point and again at the ultimate destination resulting in the shipment being handled three times.

The practice of most Oklahoma carriers of "loading to ride" shipments of 10,000 pounds or more was another consideration. When the practice is feasible, these and other large shipments are picked up by the road trailer at origin and delivered by it to the consignee in order to avoid dock handling. Even though every large shipment cannot be handled this way, it was assumed that shipments weighing 10,000 pounds or more were not handled across the docks. Of course to the extent that they are docked, the cost figures are understated.

Many tables which show the characteristics of shipments are in Chapter V. For example, Table 5-5 shows the number of shipments in the study. The average weight of shipments handled by carriers in the three size categories is shown in Table 5-15, and Table 5-18 presents the average number of pieces per shipment. The source of data on handling time per piece is the Department of Defence (DOD) Materials Handling Standard Time Data Manual.[4]

The DOD manual shows that handling time per package decreases as the density of the package increases. It takes 1.3 times as long to handle a 35 pound package with density of two pounds per cubic foot as it does when the package density is 15 pounds per cubic foot, which in turn requires more handling time than does a 35 pound package, the density of which is 30 pounds per cubic foot.

The explanation lies in the package sizes. A 40 pound package requires 20 cubic feet of space if its density is two pounds, but it needs only 2.66 cubic feet of space if its density is 15 pounds per cubic foot.

The DOD manual states that, in using its standard data, when a package exceeds 75 pounds two men should be computed in the handling of it, and when a package exceeds

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[4]Department of Defense, Materials Handling Standard Time Data (Washington: U.S. Government Printing Office, 1967).

150 pounds it should be handled by mechanical equipment. For this study we have assumed 15 pounds per cubic foot as the average density. The Michigan study[5] indicated that a range of ±5 pounds about this average has no material effect on costs.

The analysis of the dock handling costs resulted in the following costs per piece for carriers in different size categories:

Large	22 cents per piece
Medium	20 cents per piece
Small	1 cent per piece
Average	21 cents per piece

Adjustments in the per piece costs are made according to the suggestion of the DOD Manual:[6]

1. If a piece weighs more than 75 pounds, the time required for handling is doubled.

2. If it exceeds 150 pounds, 10 cents per piece is added.

3. If the package density is less than 5 pounds per cubic foot, 3 cents per piece is added.

The Documentation Cost Center

There are several steps involved in the documentation of a shipment, which center on the preparation of the

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[5]A. T. Kearney Co., Michigan Intra-State Motor Transportation Costs Report No. 2 (Lansing: Michigan Public Service Commission, 1961).

[6]Department of Defense, Materials Handling Standard Time Data (Washington: U.S. Government Printing Office, 1967), p. 131.

waybill. If there are several different commodities in one shipment, the charge for each has to be determined. Table 5-19 shows that there are very few waybills which have more than one item to be rated. From that table it can be determined that of every 1,000 waybills 923 have 1 item to be rated, 43 have two, and 34 have more than two items.

A second activity is the actual typing (cutting) of the waybill. This involves showing the name, address, and town of both shipper and consignee and all relevant information about each separate group of commodities which constitute the shipment. A third cost factor is the set of forms used in order to provide the required number of copies.

Except for one factor the cost of documentation is the same for one shipment as for another. The only variation in costs arises when the shipment consists of two or more separate items which must be rated.

For example, the cost incurred in documenting a shipment of tires and tubes consisting of 32 tires rated class 70 and weighing 800 pounds moving from Oklahoma City to Enid would be the same as that incurred in documenting a second shipment consisting of pieces of food products rated class 100 weighing 1,005 pounds and moving from Oklahoma City to San Francisco. The steps required to document each shipment are the same. On the other hand, if a third shipment consisted of both the tires and the food products, the process of rating would have to be done twice, once for each separate type item.

Documentation costs have been treated in this study as varying with the number of shipments for two reasons. First, almost all shipments (92.3 percent) have only one rated item, and even a larger proportion (96.6 percent) have no more than two items to be rated. Accordingly, the extra cost of rating more than one item is incurred infrequently. Second, it is not necessary to rate many shipments in the sense of having to determine the rating. Carriers of over half of the shipments handled in Oklahoma were either terminating carriers or bridge carriers. (Table 5-3) This means that some other carrier had already rated the shipments, and because over 76 percent of the shipments were interstate, a large portion of them had been rated by an originating carrier.[7] Of more importance however, is that 46 percent (Table 5-22) of the shipments are minimum shipments. For the most part the rating of those shipments can be done at a glance. The rate clerk knows that the minimum charge will apply, for example, to a shipment weighing 200 pounds moving from Oklahoma City to Lawton; so he does not have to look up or even recall the rating which would normally apply.

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[7]Of course, some carrier incurred the cost, but since our immediate concern is with Oklahoma rates, the point seems relevant.

For these reasons we treat documentation costs as costs per shipment, since neither weight, distance, nor number of pieces have any effect on cost. The number of separate items in a shipment have only a small influence. The cost items charged against each shipment for documentation include such things as direct wages, supplies, and depreciation on equipment used in this process.

The average documentation cost of the study carriers was $1.44 per shipment with the costs of the carriers in the three size groups being as follows:

Large	$1.54
Medium	0.97
Small	0.93

The Line Haul Cost Center

The costs associated with the line haul, or over the road, function include direct supervisory, clerical, driver, maintenance, and helper salaries, wages and fringe benefits, fuel and oil, depreciation calculated on a 350,000 mile life of the vehicles, insurance, etc. Distance and time are the two relevant cost factors in the line haul operation.

One authority commented:

> Cost per line haul mile is generally conceived as a function of distance and time. Significantly, this relationship omits any weight factor. Most of the literature, perhaps reflecting ICC cost studies,

assumes that the change in cost as the payload and the trailer increases is virtually zero.[8]

Our study showed that the average over the road speed for Oklahoma carriers was 32.33 miles per hour with a standard deviation of 4.17 m.p.h. The average cost for all study carriers was 47 cents per mile.[9] Again we did not have sufficient data to determine the line haul costs of the smaller carriers, so the figure for the medium size carriers was used. We are not completely comfortable with this assumption, but there did not seem to be a reasonable alternative. The computed line haul costs for the other two groups are:

Large	42 cents per mile
Medium	57 cents per mile

Even though the average cost is 47 cents per mile, it seemed desirable to allow for circuitous routes which may not be the same as the ratemaking mileage.

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[8]Merrell J. Roberts and Associates, Intermodal Freight Transportation Coordination: Problems and Potential (Pittsburgh, Pennsylvania: Graduate School of Business, University of Pittsburgh, 1966), p. 369.

[9]This compares with the ICC estimate for larger carriers in the southwest region of 43 cents per mile, at this speed. When this figure is adjusted by the increase in the wholesale price index of 4.3 percent, the figure becomes slightly over 45 cents per mile. Because the ICC study did not include carriers as small as many of our study carriers, the two figures are not completely comparable. The ICC figure is included merely as a bench mark. Bureau of Accounts, Interstate Commerce Commission, Statement 7-69, Cost of Transporting Freight by Class I and Class II Motor Common Carriers of General Commodities (Washington, D.C.: U.S. Government Printing Office, 1969), p. 182.

> Circuity is defined as the percentage by which the actual miles of haul exceed the ratemaking miles. Where a comparison is needed between rates stated in terms of ratemaking or short-line mile and costs stated on a comparable basis, a circuity percent is required. Where the actual circuity is known, the preferred cost finding procedure is to use such a known percent. If not known, six percent is an acceptable figure for average conditions.[10]

For our purposes the circuity percentage of six was used.

We have said that line haul costs are time and distance related, which is another way of saying mile related. However, to determine the line haul cost of an individual shipment, some relationship must be found between the capacity of the vehicle and the shipment. A weight-density relationship must be considered.

Table 4-4 shows factors by which the weight of a shipment of a given density should be multiplied in order to determine the portion of truckload capacity used by that commodity. For example, assume a shipment of 800 pounds of tires with density of 12.8 pounds per cubic foot. The weight is multiplied by a factor of 0.00006. The result is 0.048, which means that 4.8 percent of the vehicle capacity is used by that shipment. Accordingly, 4.8 percent of the total cost of 47 cents per mile should be charged to that commodity.[11]

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[10]Interstate Commerce Commission, <u>Cost of Transportating Freight by Class I and Class II Motor Common Carriers of General Commodities Statement 7-69</u> (Washington, D.C.: U.S. Government Printing Office, 1969), p. 14.

[11]It was noted in Chapter II that Table 2-2 showed distances between the ZIP code centers only. The ZIP code

The Claims Cost Center

This cost center represents a very special situation, for the costs of claims can be traced to particular commodities. In the pickup and delivery, and documentation cost centers, the cost is incurred because the shipment is made almost regardless of the commodity being shipped, its weight, its destination, etc. In the dock handling cost center, the major cost generating factor is the number of pieces, again irrespective of the commodity, the origin, destination, and almost regardless of the weight. In the line haul cost center the only cost factors of importance were the distance between two points and the time required to travel the distance; and the density of a shipment, determined the allocation of costs.

None of these cost factors has any bearing on the cost of claims: that cost is traceable directly to the commodity. In several instances the commodities which had large numbers of claims were also commodities which ranked high in number of shipments. For practical purposes the

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centers lie in areas ranging from about 300 square miles to 600 square miles. A single ZIP code usually covers only a small portion of this area, and is associated with a community. Appendix G shows the distances from the ZIP code center to the community represented by a single ZIP code.

ZIP codes were chosen for this study because: (1) the widening statistical use being made of them; (2) the necessity to determine the code for billing or other written communications; and (3) the possibility that shippers can use postal rates in their decision process for small shipments.

common carrier is responsible for losses and damage to goods in his care unless that loss and damage occurred before the carrier's control of the shipment started or after the control ended. In this sense, it can be said that the bill of lading is an insurance policy and that the carrier acts as an insurance company.

Table 3-2 shows that the major burden of claims falls on the middle size carriers, which should be no surprise to anyone familiar with the carrier system. One reason is that this group of carriers handles over half of the total number of shipments (52.7 percent). Obviously their exposure to claims is greater than that of either of the other two groups. In addition, the typical practice is for the consignee to file claims with the delivering carrier which handles it, on behalf of all participating carriers if they have a share of the liability. Table 5-7 shows that the middle group of carriers originates and terminates 27.9 percent of the shipments and it handles as terminating carrier only 53.7 percent of this total. Thus, members of this group are the delivering carriers for over 80 percent of the shipments.

The average claim size and the percent of the costs of claims borne by the middle carrier group is misleading. The dollar amount of the claim filed is only a part of the total cost. Most of the "hidden" costs are borne by the carrier with whom the claim is filed, and this is usually

TABLE 3-2

CLAIMS TO SHIPMENTS RELATIONSHIPS BY CARRIER SIZE

Carrier Size	Average Claim Size	Percent of Total Number of Claims	Percent of Total Cost of Claims	Average Number of Shipments Handled per Claim
Over $2,500,000	$132.70	17.1%	42.7%	314.8
$100,000 to $2,500,000	35.60	64.5	43.3	1,504.5
Under $100,000	40.62	18.4	14.0	62.0
All Carriers	53.13	100.0	100.0	1,036.5

Source: Waybill Study.

the delivering carrier. These "hidden" include such costs as inspection of the damage or verification of the losses as well as all of the routine detail of negotiating with prior carriers (if any, and if they share responsibility), billing, receiving and accounting for payments made by prior carriers, settling the account with the claimant, the transportation of salvaged goods to the carrier's salvage disposal terminal, and the disposition of the salvage.

Because the middle group of carriers handles such a large proportion of the total shipments the average number of shipments per claim for the group is very high (over 1,500) compared with 315 for the large carriers and 62 for the small ones. (Table 3-2) This also explains in part the fact that the costs of claims per shipment is so low compared with other carriers.[12] Table 3-3 shows that cost to be only 2 cents compared with 42 and 66 cents for the large and small carriers. The cost per shipment for all carriers is 5 cents. The large carriers handle 35.5 percent of the shipments and terminate 69.6 percent. Comparable figures for medium carriers are: 52.7 percent of shipments handled by medium carriers with 81.6 percent

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[12]Another explanation MAY be traced to practices of salvage disposal. Carriers participating in a claim are supposed to have a proportionate share of the salvage. Because of differences in timing of claim payment and sale of salvage together with incomplete control measures proper shares may not be remitted.

TABLE 3-3

CLAIM COST PER SHIPMENT HANDLED
BY CARRIER SIZE

Carrier Size	Claim Cost per Shipment
Over $2,500,000	$0.42
$100,000 to $2,500,000	0.02
Under $100,000	0.66
All Carriers	0.05

Source: Waybill Study.

terminated. The small carriers handled only 11.8 percent of the shipments, but terminate 91.3 percent of their shipments.

In view of earlier comments that claims have nothing to do with the number of shipments but are related to the commodity, it may be charged that the reduction of claims costs to a per shipment basis is merely an exercise in arithmetic. The charge is not denied! It was done in order to have a number to insert in the cost finding model developed in Chapter VI. A number instead of a letter or Greek symbol representing claims cost was considered desirable in order to avoid a cumbersome presentation and discussion. The model is not a rate making model but a base cost model. A number of variables are to be inserted in it including distance, number of shipments, number of pieces in shipments, claims experience, etc. accordingly the calculated cost of claims based upon experience can be easily and realistically substituted for the 5 cent per shipment figure.

Table 3-4 lists the ten products and relatively narrow product groups. This list accounted for nearly 70 percent of the dollar value of claims. It also shows that there has been practically no change in the 1958-1969 period in the importance of the commodities shipped on which claims were filled. Table 3-5 provides similar but more complete data on broader categories of products. It

TABLE 3-4

PERCENT OF COST OF CLAIMS FOR ALL SHIPMENTS FROM TEN MOST IMPORTANT* COMMODITIES

Commodity	Percent of All Claims 1958[a]	1969[b]
Tires and Tubes, Rubber	10.9	10.9
Women's and Misses Outerwear	9.2	9.2
Furniture and Fixtures	8.8	8.9
Miscellaneous Manufactured Products	6.9	7.1
Household Refrigerators and Freezers	6.9	6.9
Construction Machinery	5.2	5.2
Food and Kindred Products	4.8	4.9
Engineering and Scientific Instruments	4.3	4.3
Soap and Other Detergents	2.1	2.1
Valves and Pipe Fittings	1.8	1.8
Total	69.0	69.4

* As measured by total dollars paid for loss, shortage, and damage claims.

Sources:

[a] J. A. Constantin, The Characteristics of Motor Freight Movements by General Commodity Carriers in Oklahoma (Norman, Oklahoma: The Bureau of Business Research, University of Oklahoma, 1963), p. 109.

[b] Waybill Study.

TABLE 3-5

PERCENT OF TOTAL NUMBER, TOTAL DOLLAR AND AVERAGE SIZE OF CLAIMS FILED

Commodity Group	Number	Cumulative Number	Dollars	Cumulative Dollars	Average Size (Dollars)
Electrical Equipment and Supplies	15.4	15.4	15.4	15.4	53.03
*Appliances	*7.7	--	*9.5	--	*65.60
Stone, Clay, and Glass Products	11.9	27.3	4.0	19.4	17.56
Chemicals and Allied Products	11.1	38.4	5.8	25.2	27.92
Furniture and Fixtures	9.8	48.2	8.9	34.1	47.72
Miscellaneous Manufactured Products	9.8	58.0	7.1	41.2	37.52
Food and Kindred Products	7.7	65.7	4.9	46.1	32.86
Fabricated Material Products	6.4	72.1	5.8	51.9	45.73
Rubber and Plastic Products	4.3	76.4	12.9	64.8	9.37
**Tires and Tubes	**2.1	--	**10.9	--	**272.13
Apparel and Other Textile Products	3.8	80.2	11.6	76.4	153.32
***Women's Outer Wear	***2.1	--	***9.2	--	***381.33
Machinery excepting Electrical	3.0	83.2	6.2	82.6	155.60
Lumber and Wood Products	3.0	86.2	0.5	83.1	9.57
Primary Material Products	2.6	88.8	2.0	85.1	42.15
Paper and Allied Products	2.1	90.9	0.7	85.8	14.83
Instruments and Related Products	1.7	92.6	6.2	92.0	183.63
Printing and Publishing Products	1.7	94.3	2.9	94.9	87.46
Non-Manufactured Products	1.3	95.6	0.6	95.5	23.79
Vehicle Parts	1.3	96.9	0.4	95.9	17.40
Tobacco Products	0.9	97.8	2.2	98.1	133.51
Textile Mill Products	0.9	98.7	1.6	99.7	88.39

TABLE 3-5 (continued)

Commodity Group	Number	Cumulative Number	Dollars	Cumulative Dollars	Average Size (Dollars)
Petroleum and Coal Products	0.9	99.6	0.2	99.9	9.37
Ordnance and Accessories	0.4	100.0	0.1	100.0	16.84
Leather and Leather Products	0.0	100.0	0.0	100.0	0.00
Total	100.0	100.0	100.0	100.0	53.13

* Included in Electrical Equipment and Supplies

** Included in Rubber and Plastics Products

*** Included in Apparel and Other Textile Products

Source: Waybill Study.

can be seen that relatively few product groups account for a disproportionately large share of both claims filed and the dollar value of those claims. Columns 3 and 5 show the cumulative percentages of the number and value of claims filed.

Because of the ability to trace claims to specific commodities, a special claims study should be made to improve the soundness of pricing the transportation service. Such a study could determine which commodities are the most claims prone and pricing decisions made in accordance with the findings. In addition, correlation analyses of claims filed and frequency of shipment, among other things, could be determined. Under the present pricing system, one of the factors considered in the classification of goods is the susceptibility of the commodity to loss and damage.

If those commodities which are most claim prone are improperly classified or rated and priced, appropriate adjustments may be made. There are at least two ways in which this can be handled. One method is to place those items in a class which would result in rates sufficiently high to compensate the carriers properly. Another means is to add a factor to the regularly computed rate to reflect extraordinary claim situations. A third alternative to consider is to allow the shifting of the burden of insuring, on certain commodities, to the shipper by allowing for more released value rates.

While the burden of claims is on the middle size carriers, the cost effect on the small ones is very great. They only handle 12 percent of the shipments, but they terminate over 91 percent of the shipments they handle; so their exposure to the cost of handling claims is high.

The Administrative Cost Center

Costs in this category are those indirect costs which cannot be assigned to any other activity and which are incurred on behalf of the organization as a whole. They include such items as general office costs, telephone, office equipment, supplies, utilities, office rental, property insurance, cost of purchasing, etc. A 5 year depreciation schedule is used on equipment and a 16 percent fringe benefit cost factor on wages and salaries. For our purposes these costs were assigned on a per shipment basis in order to have each shipment bear a proportionate share of overhead costs.

This allocation is not necessarily the best cost method of assigning those costs, but then any cost allocation method can be criticized. We used it for two reasons. First, it is a simple and easily understood method and on the surface, at least, appears to be a very democratic approach. Second, it was desirable to have a specific figure to insert in the model in order to show how the model works, and to make it possible to develop direct costs for specific movements which can be compared with present price of those movements.

We will comment further on this in the next section of this chapter.

When we allocated the administrative costs on a shipment basis, we found that the weighted average cost per shipment for carriers of all sizes was $1.27, with the following relationships among the carriers of different sizes:

Large	$1.34
Medium	.87
Small	1.40

Return on Investment

The foregoing has been concerned with cost centers. The return on investment is a very real factor which must be covered whether it is considered as a cost item or something else; so in that sense it is a cost.

The administrative cost center which consists of indirect costs and the rate of return have one thing in common. Both have to be covered, but the proportion of this mass of costs which any one service or product should cover is a matter for managerial discretion in light of market circumstances and regulatory agency evaluation in light of the public convenience and necessity. This is stated again, differently for emphasis. The direct costs plus some contribution to both the administrative costs and profit constitute the point below which rates should not fall. The amount of the contribution to the mass of administrative costs and profits which each product or service should make should be determined by management in light of public need. The contributions of each product or service must be great enough so that in the aggregate they will cover all of these costs and result in an operating ratio considered suitable by the regulatory agency.

The ICC has considered that an operating ratio of 93 is adequate to provide a revenue level high enough to assure the necessary return, and attract capital into the industry. The operating ratio is computed before payment of both federal and state corporate income taxes and excluding return on investment. In commenting on revenue need, the commission said:

> The total revenue need, sometimes called fully distributed cost, is presumed to be that revenue which is sufficient to cover all expenses, rent, taxes (excluding income taxes), interest on investment, and to provide that return which is necessary to attract capital to the transportation industry. For purposes of motor carrier cost finding the amount of revenue need is based on a procedure which involves the use of an operating ratio which is computed before payment of both federal and state corporate income taxes and excluding interest on investment. To illustrate the effect of this procedure upon territorial cost-study an operating ratio of 93 percent is generally used and the amount thus obtained is added to reported costs. This level of motor carrier cost provides a degree of comparability with fully distributed costs for rail and water carrier when such costs include an allowance for return on all property.
>
> Because interest on investment is not included in the computation of operating ratios and the fact the interest on investment is different for each region, the out-of-pocket costs herein should be increased by

the following percent to provide revenue need based on an operating ratio of 93 percent: Southwest region 17.89 percent.[13]

The ICC recognizes that any allocation of those constant costs which are not influenced by any one segment of traffic are assignable to traffic only on an arbitrary basis. The two bases most commonly used by the ICC are: (1) out-of-pocket expense allocation; and (2) the prorata ton and ton-mile basis.

In the approach used in this study, all direct assignable costs of a particular service were assigned to one of the functional cost centers. All of the remaining costs incurred on behalf of the organization as a whole were assigned to the administrative cost center. In this way, total costs are covered. Those cost centers and the percentage of total cost assigned to each are:

Pickup and Delivery	22.6
Dock	13.6
Documentation	7.2
Claims	0.2
Line Haul	50.1
Administration	6.3
Total	100.0

These represent 100 percent of the expenses. If rates were made on the basis of the model, they would yield revenue equal to expenses, and the operating ratio would be equal to 100. This approach leaves no room for profit, so the rates would have to be increased by an amount which would yield a given operating ratio of, for example, 93. If expenses are multiplied by a factor of

[13]Interstate Commerce Commission, Cost of Transporting Freight by Class I and Class II Motor Common Carriers of General Commodities Statement 7-69 (Washington, D.C.: U.S. Government Printing Office, 1969), p. 5.

1.075268, the result will be the amount of revenue needed for an operating ratio of 93. Thus:

Expenses	100.000
Revenue	107.530
Operating Ratio	92.997

This approach has allocated, for illustrative purposes only, the administrative expenses to the traffic on the basis of the number of shipments and leaves only the return on investment to be determined and allocated to traffic.

We emphasized above that the allocation of overhead and profit factors to traffic is a managerial decision subject to review and modification by the regulatory agency. Accordingly for purposes of clarity, the cost center allocations tabulated above are slightly realigned to show the total revenue need:

Direct Costs		
Pickup and Delivery	22.6	
Dock	13.6	
Documentation	7.2	
Claims	0.2	
Line Haul	50.1	
Total Direct Costs		93.7
Indirect Costs		
Administration	6.3	
Profit	7.5	
Total Indirect Costs		13.8
Total Costs/Revenue Need		107.5

The result of this alignment of costs is that the model can be used to develop the direct cost of movements as a first step in rate making. This is a mechanical step requiring no discretion; so it can be easily computerized or handled by a desk calculator.

The second step involves managerial discretion in allocating the indirect costs to particular traffic lanes or commodities. The third step is that of the regulatory agency which reviews and approves or modifies the managerial allocation. This review, of course, implies that the counsel of shippers will be sought in open hearing to help it determine the extent to which the public need and welfare is being served by a particular managerial allocation.

Summary

The economic soundness of the existing rate structure is questionable because of the lack of cost information to be used as a basis for designing the structure. Many carriers do not know the costs of performing certain functions even though most do know what they spend their money for. Since data on expenditures is available, the major problem is one of arranging those expenditures according to the function performed. Five cost centers are identified to which direct costs may be assigned on a functional basis. A sixth center is identified for those costs incurred on behalf of the operation as a whole and which cannot be traced to a particular activity.

The pickup and delivery cost center is shipment oriented. For practically all shipments, cost is not affected by the size, weight, number of pieces, nature of commodity being shipped, or the origin and destination of the shipment. The weighted average pickup and delivery costs are $2.97 per shipment.

Costs in the dock handling cost center are oriented mainly to the number of pieces in a shipment. The cost of handling does not vary substantially from package to package except when package densities and package weights vary widely from the norm. These variations are considered in the analysis and may be recognized in the model as variables. For this study, package density was assumed to be 15 pounds per cubic foot, plus or minus 5 pounds per cubic foot. This assumption is not crucial because provision is made in the model for adjustment to lower, actual, or higher densities than the range assumed. The average cost per piece is 21 cents.

The cost of documentation is also shipment oriented for the most part since practically all of the shipments (92.3 percent) have only one item to be rated and another 4.3 percent have only two. The number of items rated is the only activity which would cause variation in this cost center. A large proportion of shipments are minimum shipments (about 46 percent); so they are rated almost automatically. Too, 76 percent of the shipments are interstate, so those inbound to Oklahoma would already be rated as would those for which the carrier is either a terminating or a bridge carrier (over half). Accordingly, documentation costs were allocated to the shipment and calculated to be $1.44 per shipment.

Line haul costs vary with the distance and the time required to cover a given distance. The wages of the driver and ownership and operating costs of the vehicle are the same whether the trailer is full or empty. There may be greater fuel consumption if the truck is loaded, but fuel costs are such a small proportion of total cost (less than 3 percent) that the increase or decrease in consumption because of lading would be negligible. The basic cost is 47 cents per mile, but when circuity is added, the cost rises to 49.82 cents.

Claims costs are a different matter. They are traceable to particular commodities. Most of the claims are filed with carriers in the middle size group. This is predictable because they terminate over 80 percent of their shipments and handle nearly 53 percent of all shipments. The typical practice is for the consignee to file a claim for loss or damage with the delivering carrier.

Ten products or product groups account for nearly 70 percent of the dollar value of claims filed. Relatively few of the broader product groups account for a disproportionately large share of both the number and the value of claims.

We computed the cost of claims per shipment and found it to be 5 cents. It was emphasized that this is an arbitrary approach, but for illustration purposes only, it was done.

The costs incurred for the organization as a whole and which could not be traced to any one function were assigned to the administrative cost center. While we computed these costs on a per shipment basis for the same reasons we used for claims, we recognize it as an improper allocation economically and beyond the purpose of this paper to recommend on. The actual costs of claims on specific commodities and the share of administrative costs management and regulators deem desirable can be inserted into the model.

The allocation of administrative costs and profit to individual commodities and/or traffic lanes is the function of management and the regulatory agency; so no method of allocation was suggested. After emphasizing these points and in order to provide a clue to the magnitude of the administrative costs, we did the necessary arithmetic and found that the weighted average administrative cost per shipment is $1.40. The arithmetic exercise is not completely futile for it was used as a very gross illustration.

The return on investment is a very real cost of doing business, but again the share to be borne by any commodity or traffic lane is a managerial and regulatory decision. While the model provides for a profit, we do not include any in our illustration.

The cost allocations made are:

Pickup and Delivery	$2.97 per shipment
Dock	0.21 per piece
Documentation	1.44 per shipment
Line Haul	0.4982 per mile
Claims	0.05 per shipment[14]
Administrative	1.27 per shipment[14]

[14] Computed for purposes of illustration only.

CHAPTER IV

THE RELATIONSHIP OF RATES AND COST STRUCTURE OF STUDY CARRIERS

Background

We have expressed concern that the rate structure in Oklahoma does not reflect the economic characteristics of the carriers. The classification system presumably reflects differences in certain costs associated with various commodities. Too, it presumably reflects the nature of the demand for transportation of certain commodities. The effect of the classification system is that cost and demand factors are first considered at the point of classifying and a first judgment is made on the differences among certain basic costs of providing the full transport service. The presumed ability of commodities to pay a given rate is a second element considered in the classification of commodities. The third element or factor considered is the carriers' judgment of the influence of other market considerations such as competition of other carriers, the need for revenue, etc. Since we said that the second factor was the ability to pay, the third one may be called the willingness to pay for motor carrier service.

Somehow these three elements--cost of service, ability to pay, and willingness to pay for motor carrier service--are jointly and subjectively considered for each commodity. After this sbujective consideration, a commodity is placed in a given class (or is given a rating). As shown in Chapter II, the rating of a commodity establishes a relationship between the rate it will pay and the rate paid by another commodity with a different rating.

The actual rate charged between two points is then established for the base class, Class 100. This rate presumably reflects the same three factors: the costs of the carrier, and to a lesser extent the ability and willingness of the commodity to pay a rate of a given magnitude.

Cost and/or market considerations are further considered in LTL rate making in Oklahoma. The base price on the base class is typically established for a given weight group. Then, as is shown in Chapter II, adjustments are made in prices for shipments falling in different weight categories. One presumed purpose of making different rates for different weight groups is to recognize that carrier costs are not the same per hundred pounds for shipments in a high weight group as they are for those in a low weight group. For example, in the pickup and delivery service we have seen that it costs the carrier no more or less to pick up a shipment weighing 1,000 pounds than it does for one weighing 100 pounds. Obviously, the cost per hundred pounds for one shipment is less than for the other. Thus, the lower cost per hundred pounds in the higher weight group is reflected in a lower rate per hundred pounds.

"Other things remaining the same" the rate structure constructed as described should reflect the cost or economic characteristics of the industry. However, those other things apparently do not remain the same. As discussed in Chapter III, the information required to establish direct costs for the several cost centers is not available except to some of the very large carriers. We also stated in that Chapter that if the rate structure was at one time accidentally reasonably related to the carrier cost characteristics, that relationship has long since been destroyed by successive percentage increases in rates.

We now turn to an examination of costs as developed in Chapter III and current rates charged for certain shipments.

Cost Structures

Costs and Rates: Minimum Shipments

Table 4-1 is a restatement of the costs in the several cost centers as developed in Chapter III. It shows the costs for each size group of carriers and a weighted average for all carriers combined. Again attention is called to two things. First, the administrative costs per

TABLE 4-1

STUDY CARRIER COSTS BY TRANSPORTATION ACTIVITY BY CARRIER SIZE

Cost Center	Cost Basis	Carrier Size: Over $2,500,000	Carrier Size: $100,000 to $2,500,000	Carrier Size: Under $100,000	Carrier Size: All Carriers
Pickup and Delivery	Shipment	$3.69	$2.64	$2.64	$2.97
Documentation	Shipment	1.54	0.96	0.93	1.44
Administration	Shipment	1.34	0.87	1.40	1.27
Claims	Shipment	0.42	0.02	0.62	0.05
Dock Handling	Piece	0.22	0.20	0.01	0.21
	If piece weighs more than 75 pounds, multiply above cost by 2.				
	If piece has a density of less than 5 pounds per cubic foot, add $0.03 to above cost.				
Line Haul	Mile	0.42	0.57	0.57	0.47

Source: Waybill Study.

shipment were calculated for illustrative purposes only. Second, there is no provision made for return on investment.

Figure 4-1 shows certain information concerning special charges. The minimum charges shown are in the three low weight categories. For our illustration the highest minimum will be used, \$3.75 per shipment. The question arises: does this charge cover the direct cost of handling the shipment? The following costs are from Table 4-1.

Pickup and Delivery	\$2.97	per shipment
Documentation	1.44	per shipment
Dock Handling	.21	per piece
Total	\$4.62	

Assumed above is that the shipment consisted of only one piece. Of course, the cost tabulation above does not include anything for the line haul movement, administration, claims, or profit. The partial cost of \$4.62 is 23 percent above the minimum charge of \$3.75 (and 47 percent above the \$3.15 minimum for less than 100 pounds) and no provision is made for any other costs!

Using the formula for calculating over the road costs, this shipment would cost 84 cents to transport a distance of 100 miles. If instead of a per shipment allocation of \$1.27 (Table 4-1) for administration we should add 6 percent to direct cost of \$5.46 (\$4.62 + .84) for overhead, an additional cost of 33 cents would be incurred. This brings the total cost (excluding profit and any charge for claims) to \$5.79, which is 54 percent above cost.

FIGURE 4-1

SPECIAL CHARGES AS SHOWN IN TARIFF 27-D

Minimum charge per shipment		
	Less than 100 pounds	$3.15
	100-199 pounds	3.55
	200-300 pounds	3.75
Capacity load for truck		23,000 pounds
Capacity size for truck		6-1/2 feet high, 7 feet wide, 27½ feet long
Minimum weight for TL Classes in NMFC		
	Class 100 and over	10,000 pounds
	85 and below 100	12,000
	70 and below 85	16,000
	55 and below 70	20,000
	50 and below	24,000
Redelivery charge		
	Minimum per shipment	$2.00
Storage charge (first 10 days)		$0.10 percent

Source: <u>Tariff 27-D</u> (Dallas, Texas: Southwestern Motor Freight Bureau, Inc., 1964), pp. 40-42.

Assuming no charge for administration the cost would exceed revenue by 46 percent.

Because of the influence of higher costs of the large carriers in the average costs, we now show the same information for the medium group. The sum of the pickup and delivery, documentation, and dock costs is $3.80 (5 cents above revenue). Still using average per mile costs of 47 cents, the line haul charge would bring the direct cost to $4.64 (24 percent above revenue).

From these comparisons it can be seen that the highest minimum charge does not cover even the direct charges incurred by the carrier.

Although all of the carriers are not entirely aware of their actual cost of performing a particular service, it becomes apparent that their inclinations are directionally correct when they try to cure their problems of minimum shipments by trying to avoid the shipments, and by attempting to raise the rates on those minimum shipments. Truly the "small shipments problem" is founded in fact. Once again, since all shipments irrespective of size, are faced with many of the same costs (documentation, pickup and delivery, dock handling) it is not surprising to find a problem. The economics of the situation, it would appear, are going to require a new approach to the handling of minimum shipments. It is entirely possible that some other agency, such as the Post Office, may fall heir to the handling of minimum shipments.

Costs and Rates: Truckload Shipments

Because the published rates do not seem to be made by building up the costs of the several cost centers (Table 4-2), we cannot break them down into cost centers. Instead we show the total truckload charges for specific classes of shipments between cities when the published rates are used and when the study costs are used. Table 4-2 shows the pairs of cities used. The truckload minimum weights for the several classes as shown in Figure 4-1 were used.

In arriving at the study costs, the fact that the truck had to return from destination was considered; so a set of load factors representing the round trip movement was developed from the sample data.

Table 4-4 shows these load factors which reflect the directional flow of weight between the ZIP code centers of the state. They were obtained by determining the total pounds of freight that went from point A to point B, then determining the total pounds of freight that went from point B to point A. Since a truck obviously has to return to its base, equal weight transported in both directions would carry an equal portion of the costs, and the cost per mile determined by time and distance would be the true cost per mile. An analysis of Table 4-4 indicates there

TABLE 4-2

MINIMUM TRUCKLOAD CHARGES FOR SELECTED CLASSES AND SELECTED CITIES

Cities	Classes				
	35	50	60	70	100
Oklahoma City and Enid	$132.00	$187.20	$188.00	$174.40	$156.00
Oklahoma City and Ardmore	144.00	206.40	206.00	192.00	172.00
Oklahoma City and Tulsa	148.80	211.20	212.00	196.80	176.00
Tulsa and Vinita	120.00	172.80	172.00	161.60	144.00
Tulsa and Shawnee	139.20	199.20	198.00	185.60	165.00

Source: Adapted from *Tariff 27-D* (Dallas, Texas: Southwestern Motor Freight Bureau, Inc., 1964).

TABLE 4-3

MILEAGE COSTS FOR SELECTED CITIES BY CARRIER SIZE INCLUDING LOAD FACTOR INCREASE

Cities	Load Factor	Carrier Size		
		Over $2,500,000	$100,000--$2,500,000 $100,000 and Under	All Carriers
Oklahoma City and Enid	1.7787	$62.01	$ 84.15	$69.39
Oklahoma City and Ardmore	1.9973	82.21	111.57	92.00
Oklahoma City and Tulsa	1.1957	58.76	79.74	65.75
Tulsa and Vinita	2.0000	54.60	74.10	61.10
Tulsa and Shawnee	2.0000	79.80	108.30	89.30

Source: Waybill Study.

TABLE 4-4

LOAD FACTOR DUE TO DIRECTIONAL FLOW OF WEIGHT BETWEEN ZIP CODE CENTERS

	731--	73401	73501	73601	73701	73801	73942	741--	74301	74401	74501	74601	74701	74801	74953
731--	--														
73401	1.9973	--													
73501	1.8218	2.0	--												
73601	1.8234	2.0	2.0	--											
73701	1.7787	2.0	2.0	2.0	--										
73801	2.0	2.0	2.0	2.0	2.0	--									
73942	2.0	2.0	2.0	2.0	2.0	2.0	--								
741--	1.1957	2.0	1.5955	2.0	1.5713	1.5757	2.0	--							
74301	1.8938	2.0	2.0	2.0	2.0	2.0	2.0	2.0	--						
74401	1.8750	2.0	2.0	2.0	2.0	2.0	2.0	1.6379	1.9786	--					
74501	1.9403	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	--				
74601	1.5151	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	--			
74701	1.9660	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.8750	2.0	--		
74801	1.9400	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.6660	1.4350	2.0	2.0	--	
74953	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	--

Source: Waybill Study.

TABLE 4-4 (Continued)

ZIP CODE CENTERS

731--	Oklahoma City	741--	Tulsa
73401	Ardmore	74301	Vinita
73501	Lawton	74401	Muskogee
73601	Clinton	74501	McAlester
73701	Enid	74601	Ponca City
73801	Woodward	74701	Durant
73901	Guymon	74801	Shawnee
		74953	Poteau

are no load factors of 1.0; there are no pairs of ZIP Code Centers which exchange equal amounts of weight. The factor assumes that a round trip costs twice what a one way trip would cost. If for all practical purposes all traffic flowed one way, the load factor would be 2.0, or all over the road costs would have to be borne by the traffic going in the one direction. Therefore, perfect balance of traffic would have a number of 1.0. Perfect imbalance of traffic would have a number of 2.0. The table indicates the high degree of imbalance found. Although some traffic did flow in both directions, in a number of cases, the amount of back flow was negligible and was ignored, thereby giving a load factor of 2.0.[1] As shown in Table 4-4, the load factor between Tulsa (741--) and Oklahoma City (731--) is 1.1957 indicating an almost perfect balance of traffic. Table 4-3 was developed by using the road distance between the two cities and the average cost of line haul of $0.47 cents per mile. The load factors from Table 4-4 were applied to arrive at the round trip cost.

Published rates presumably are sufficiently high to cover direct costs and make some contribution to overhead. The charges for truckload movements of goods in several

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[1]These load factors did not take into account any out-of-state traffic, because the data did not indicate the possible entrance to the state, at say, Oklahoma City with a destination at Enid. Therefore, the assumption was made that the same directionality took place for interstate traffic as was shown for intrastate traffic.

classes between specific points are shown in Table 4-2. Those rates also should be sufficiently high to cover return movements of vehicles.

The figures in Table 4-3 reflect only the direct cost per vehicle mile which was explained previously. To illustrate the differences between the two tables, note that the movement yielding the highest revenue to the carrier is on Class 50 commodities between Tulsa and Shawnee. Compare that revenue with the average line haul costs of providing the service in Table 4-3: $119.20 compared with $89.30, or 120 percent more.

Of course the published rate as stated includes all costs; so to make the study cost comparable, we add documentation costs of $1.44, something for administration, profit, and pickup and delivery. Since we have rejected the notion of a per shipment charge for administration, we can add a "mark up" of 20 percent of direct cost. For profit, we can add enough for an operating ratio of 93, or $10. The pickup and delivery costs on truckload lots usually consist of the time required to spot and pick up the trailer for loading and unloading by the shipper and the consignee. We can put a reasonable figure of $20 for this activity. There are no dock costs. We will assume 1.5 percent of revenue as a claim cost, since this is the approximate cost of cargo insurance.

Line Haul	$89.30	
Pickup and Delivery	20.00	
Documentation	1.44	
Dock	0.00	
Direct Costs		$110.77
Administration (20% of Direct)	22.15	
Total Cost		132.92
Profit (To result in O.R. of 93)	10.00	
Total		142.92
Insurance	2.14	
Total Cost/Revenue		$145.06

Because an allocation of overhead and provision for profit has been made, this total cost can be equated with total revenue. The $145.06 is 73 percent of the charge resulting from the application of the published rate. Or, the latter is 37 percent greater than the direct costing method.

Using the minimum weight of 24,000 pounds for Class 50 commodities from Figure 4-1, the actual "rate" per hundred using the study formula is 60.44 cents which covers costs in both directions. The actual charge of $199.20 works out to be 83 cents per hundred for the one way movement. The ICC cost formula results in a charge of $146.05 or 60.85 cents per hundred. The fact that the two charges are so very close should not be given too much weight. That study was of the entire Southwest Region and embraced larger carriers than ours. We use the figure to indicate that our result is reasonably near that of the ICC; both are in the same ball park.

The implications of these figures are clear, but they become more sharply focused if the published rates and our costs are put on approximately the same basis. There is not much question about the cost of operating vehicles over the road being somewhere in the neighborhood of the ICC figure of 45 cents. Our mileage figure is 47 cents. The round trip distance between Tulsa and Shawnee is 190 miles. At 47 cents per mile the cost is $89.30 as shown in Table 4-3. At 45 cents the cost is $85.50. When $85.50, the mileage cost is removed from the total charge, $199.20 as shown on Table 4-2 the remainder, or $113.70 is available for all other costs including return on investment. Returning to the tabulation above with its itemized costs, we can see that they total $55.76 which covers costs in all other cost centers.

One of the implications of these comparisons is that the rates on truckload movements are so far above cost that the movements are vulnerable to the inroads of private carriage. Also, their profitability helps subsidize the other high cost, low revenue shipments. This in turn obscures the basic problem of the rate structure: it does not reflect the economic characteristics of the carriers.

Costs and Rates: LTL Shipments

We chose six commodities to use as illustrations in our examination of the relationship between costs and rates of LTL shipments. The same pairs of cities used previously were again used here.

The characteristics of the average shipments as determined by our study of these six commodities are shown in Table 4-5. The class number indicated is the LTL classification as given by the National Motor Freight Classification. The dollar claim per shipment figure is an average developed by totaling all loss and damage claims for that commodity and dividing by the number of shipments. Weights and number of pieces per shipment were determined the same way.

Table 4-6 shows the total charges between the five pairs of cities for shipping each of the products.

Figures 4-2 through 4-7 show how the costs of handling the same products were developed between the same pairs of cities using the costs developed in Chapter II. The mileage cost was determined by modifying the cost per mile for a truck between a pair of cities by the load factor and then further modifying it by the relation of the average weight shipment to the minimum truckload quantity of that same commodity. For example, the average shipment of food products is equal to 0.0418 of a full minimum truck. The average shipment of paper and allied

TABLE 4-5

CHARACTERISTICS OF AVERAGE SHIPMENTS OF SELECTED COMMODITIES

Commodity	Class	Weight per Shipment	Claim per Shipment	Number of Pieces per Shipment
Food Products, not Frozen	100	1,005 lbs.	$ 45.18	50
Paper and Allied Products	85	884	6.77	15**
Furniture and Fixtures	175	224	19.47	2
Tires and Tubes, Rubber	70	800	219.77*	32
Household Refrigerators and Freezers	92½	511	5.11	2
Leather and Leather Products	100	239	-0-	4**

* Damage claims were $0 in this category; loss and shortage accounted for all claims with one single claim approaching $1,000.00.

** Assumed on basis 13 pieces occur in average shipment of 804 pounds.

Source: Waybill Study.

TABLE 4-6

CHARGES FOR AVERAGE WEIGHT SHIPMENTS OF SELECTED COMMODITIES BETWEEN SELECTED CITIES

Cities	Commodities					
	Food Products	Paper Products	Furniture	Tires	Refriger-ators	Leather Products
Oklahoma City and Enid	$16.58	$12.37	$7.97	$ 9.28	$7.82	$4.18
Oklahoma City and Ardmore	18.29	13.70	8.25	10.16	8.58	4.61
Oklahoma City and Tulsa	18.79	14.06	8.47	13.36	8.84	4.73
Tulsa and Vinita	15.38	11.49	6.93	8.56	7.26	3.87
Tulsa and Shawnee	17.59	13.17	7.95	9.89	8.28	4.45

Source: Adapted from Tariff 27-D (Dallas, Texas: Southwestern Motor Freight Bureau, Inc., 1964).

FIGURE 4-2

AVERAGE TOTAL COSTS FOR SHIPPING FOOD PRODUCTS BETWEEN SELECTED CITIES

Cities	Cost Category	Cost	Total Cost
Oklahoma City and Enid	Mileage	$ 2.90	
	Pickup and Delivery	2.97	
	Documentation	1.44	
	Claims	45.18	
	Dock	10.18	$62.99
Oklahoma City and Ardmore	Mileage	$ 3.85	
	All Other	60.09	$63.94
Oklahoma City and Tulsa	Mileage	$ 2.56	
	All Other	60.09	$62.65
Tulsa and Vinita	Mileage	$ 1.28	
	All Other	60.09	$61.37
Tulsa and Shawnee	Mileage	$ 3.74	
	All Other	60.09	$63.83

Source: Waybill Study.

FIGURE 4-3

AVERAGE TOTAL COSTS FOR SHIPPING PAPER AND ALLIED PRODUCTS BETWEEN SELECTED CITIES

Cities	Cost Category	Cost	Total Cost
Oklahoma City and Enid	Mileage	$ 2.56	
	Pickup and Delivery	2.97	
	Documentation	1.44	
	Claims	6.77	
	Dock	3.15	$16.89
Oklahoma City and Ardmore	Mileage	$ 3.40	
	All Other	14.33	$17.73
Oklahoma City and Tulsa	Mileage	$ 2.42	
	All Other	14.33	$16.75
Tulsa and Vinita	Mileage	$ 2.24	
	All Other	14.33	$16.57
Tulsa and Shawnee	Mileage	$ 3.28	
	All Other	14.33	$17.61

Source: Waybill Study.

FIGURE 4-4

AVERAGE TOTAL COSTS FOR SHIPPING FURNITURE AND FIXTURES BETWEEN SELECTED CITIES

Cities	Cost Category	Cost	Total Cost
Oklahoma City and Enid	Mileage	$ 1.41	
	Pickup and Delivery	2.97	
	Documentation	1.44	
	Claims	19.47	
	Dock	0.42	$25.71
Oklahoma City and Ardmore	Mileage	$ 1.88	
	All Other	24.30	$26.18
Oklahoma City and Tulsa	Mileage	$ 1.34	
	All Other	24.30	$25.64
Tulsa to Vinita	Mileage	$ 1.24	
	All Other	24.30	$25.54
Tulsa to Shawnee	Mileage	$ 1.82	
	All Other	24.30	$26.12

Source: Waybill Study.

FIGURE 4-5

AVERAGE TOTAL COSTS FOR SHIPPING TIRES AND TUBES BETWEEN SELECTED CITIES

Cities	Cost Category	Cost	Total Cost
Oklahoma City and Enid	Mileage	$ 2.37	
	Pickup and Delivery	2.97	
	Documentation	1.44	
	Claims*	219.77	
	Dock	6.72	$233.27
	*Claims (assumed)	21.98	*35.48
Oklahoma City and Ardmore	Mileage	$ 3.06	
	All Other	230.90	$233.96
	*Assumption	*33.11	*36.17
Oklahoma City and Tulsa	Mileage	$ 2.19	
	All Other	230.90	$233.09
	*Assumption	*33.11	*35.30
Tulsa and Vinita	Mileage	$ 2.04	
	All Other	230.90	$232.94
	*Assumption	*33.11	*35.15
Tulsa and Shawnee	Mileage	$ 2.98	
	All Other	230.90	$233.88
	*Assumption	*33.11	*36.09

* Assuming that the claim factor is extraordinary by a factor of ten.

Source: Waybill Study.

FIGURE 4-6

AVERAGE TOTAL COSTS FOR SHIPPING HOUSEHOLD REFRIGERATORS AND FREEZERS BETWEEN SELECTED CITIES

Cities	Cost Category	Cost	Total Cost
Oklahoma City and Enid	Mileage	$1.76	
	Pickup and Delivery	2.97	
	Documentation	1.44	
	Claims	5.11	
	Dock	0.42	$11.70
Oklahoma City and Ardmore	Mileage	$2.34	
	All Other	9.94	$12.28
Oklahoma City and Tulsa	Mileage	$1.67	
	All Other	9.94	$11.61
Tulsa and Vinita	Mileage	$1.56	
	All Other	9.44	$11.50
Tulsa and Shawnee	Mileage	$2.88	
	All Other	9.44	$12.82

Source: Waybill Study.

FIGURE 4-7

AVERAGE TOTAL COSTS FOR SHIPPING LEATHER AND LEATHER PRODUCTS BETWEEN SELECTED CITIES

Cities	Cost Category	Cost	Total Cost
Oklahoma City and Enid	Mileage	$1.03	
	Pickup and Delivery	2.97	
	Documentation	1.44	
	Claims	0.00	
	Dock	0.84	$6.28
Oklahoma City and Ardmore	Mileage	$1.38	
	All Other	5.25	$6.63
Oklahoma City and Tulsa	Mileage	$0.98	
	All Other	5.25	$6.23
Tulsa and Vinita	Mileage	$0.92	
	All Other	5.25	$6.17
Tulsa and Shawnee	Mileage	$1.34	
	All Other	5.25	$6.59

Source: Waybill Study.

products is equal to 0.0368 of a minimum truckload of paper products. For furniture and fixtures, the average shipment is equal to 0.0203 of a minimum truckload. The average shipment of rubber tires and tubes is equal to 0.0333 of a minimum truckload. In like manner, the factor for household refrigerators and freezers is 0.0255 and for leather products is 0.0149.

For reasons explained before, we have not considered costs in either the administrative or profit centers. Pickup and delivery and documentation costs are constant for each shipment. The cost of claims is the average cost of claims per shipment of that particular commodity, and dock handling costs are determined by the number of pieces in the average shipment. Thus for a particular commodity, all costs are fixed per shipment except the mileage costs.

Figure 4-2 shows the cost of handling the average shipment of food products between each of the five pairs of cities. In like manner, Figure 4-3 shows cost of shipping paper and allied products between the same cities. Our study showed that the average paper products shipment (all types of movement throughout Oklahoma) contained 13 pieces and weighed 804 pounds. This relationship was used in obtaining a 15 piece paper product cost for dock handling.

Figures 4-4 and 4-5 show the average total costs of moving furniture and fixtures, and tires and tubes between the same cities. Statistically, the average claim cost per shipment for tires and tubes was $219.77, as indicated in Table 4-5; loss and shortage accounted for all claims. The claims in this category were exceedingly high; a single claim approached $1,000. We have made the computations showing the effect of costs if this is in fact the true average cost. We have further made computations assuming that our claims factor was exaggerated by as much as a factor of 10 (in other words that our average was ten times higher than the actual average). This assumption, we feel, errs on the side of conservatism. The average total cost per shipment of tires and tubes using the assumed factor (denoted by asterisks) is also shown in Figure 4-5.

Figures 4-6 and 4-7 show the costs of movement of household refrigerators and freezers, and leather and leather products. Interestingly, the sample picked up no damage or loss claims for leather. The average of four pieces per shipment was obtained in the same manner used to obtain the average number of pieces for paper and allied products.

To ascertain whether a cost price variation exists between commodities and distance, Figures 4-2 through 4-7 can be compared with the columns of Table 4-6 for like categories. This comparison indicates that no relationship exists between the cost of handling the shipment and the price charged or received for handling that same shipment for the commodities and cities selected for the illustration.

The question remains: are commodities classified by the 15 criteria presented and what weight is given each criterion, or are commodities classified by rhetoric?

Table 4-7 summarizes and compares the data recorded in Table 4-6 and Figures 4-2 through 4-7. Column 2 shows the lowest charge for shipping the commodity between one pair of the five pairs of cities and the highest charge for shipping between another pair of cities. Column 3 shows the range of costs from the lowest to the highest. For example, $15.38 for shipping food products between one pair of cities is lower than the cost of shipping that commodity between any of the other four pairs of cities. While Table 4-7 does not provide the names of the pairs of cities, the Tulsa-Vinita movement is the least expensive. The charge for shipping between the most expensive pair of cities (Oklahoma City-Tulsa) was $18.79.

The range of cost of shipping food products was from a low of $61.37 (Tulsa-Vinita) to a high of $63.94 (Oklahoma City-Ardmore).

The approach throughout this study has been to use average figures wherever possible. That approach was abandoned when the commodities were selected for the illustrations. In the first place, we don't really know what an average product is. Second, since one of the goals of

TABLE 4-7

RANGE OF TRANSPORTATION CHARGES AND COSTS OF SHIPPING SELECTED COMMODITIES[a]

Commodity	Range of Charges for Shipment[b] (dollars)	Range of Costs for shipment[c] (dollars)
Food Products	15.38 - 18.79	61.37 - 63.94
Paper Products	11.49 - 14.06	16.57 - 17.73
Furniture	6.93 - 8.47	25.54 - 26.18
Tires	8.56 - 13.36	232.44 -233.96 35.15 - 36.17[d]
Refrigerators	7.26 - 8.84	11.50 - 12.82
Leather Products	3.87 - 4.73	6.17 - 6.59

[a]The five pairs of cities used for computations are those shown on Table 4-6.

[b]For transportation between pairs of cities which yielded lowest revenue and those which yielded the highest revenue, Table 4-6 is the source.

[c]For transportation between pairs of cities for which costs were lowest and those for which costs were highest. Administrative costs and profit are not included. Figures 4-2 through 4-7 are sources.

[d]Assuming that the claim factor is extraordinary by a factor of ten.

Source: Waybill Study.

this research is to explore the relationship between costs and rates, it seemed desirable to examine some of the commodities which moved most frequently. Ten products or product groups account for 56.8 percent of all shipments (Table 5-16). Also ten products or product groups account for 55.5 percent of carrier revenue (Table 5-26). Furniture and paper products are separately listed items in the top ten contributors to shipments. Food is in the revenue list.

Tires and tubes are in one product group (Rubber and Plastics) which is in the top ten shipment list. Refrigerators are in a group which made both lists.

Third, these commodities appear to be especially claim prone; so that was a selection factor. Leather was the first item noted on the computer print out which had no claims, so it was used.

The effect of this selection process is that there is nothing "average" or "typical" about any of the products. Five of the six were chosen because they were important contributors to the number of shipments, and/or the carrier revenue, and/or claims. The sixth is there as a non-typical illustration.

Table 4-7 shows that computed costs for these mostly "non-average" commodities moving in heavily traveled traffic lanes are substantially higher than revenues received from them. Once more, it can be seen that the rate structure for these extraordinary commodities moving in atypical traffic lanes does not reflect the direct cost of providing the service.

Since no examination was made of all of the other commodities, it cannot be said whether their rate pattern reflects direct costs. It may be that the other LTL movements of commodities with low claim experience combine with volume movements in subsidizing the other commodities.

Summary

This chapter has been concerned with showing the relationship between published rates and direct cost of performing the transportation service. The rates are made in two steps which are related very closely to one another. The first step involves placing the commodity in one of several classes. While some 15 cost and demand factors are considered in making the classification decision, they may be grouped into three broad categories: the cost of the service to the carrier; the ability of the commodity to pay; and the willingness of the commodity to pay for motor transportation. These are the traditional factors of supply and demand at work.

The next step is the actual pricing of the service. The price--or rate--making process also involves consideration of the supply and demand factors. The manner in which weight of the commodity is considered is the tangible way in which this combination is shown. For example, minimum charges are set for shipments which do not weigh enough to produce a minimum amount of revenue to cover, presumably, at least the direct cost. Also, different rates are made for shipments in different weight groups.

The classification of the commodity directly affects the rate it will pay. The table of rates is so constructed that if a commodity is in Class 100 it will pay a given rate between two points. If the same commodity were to be placed in Class 50, it would pay a rate equal to 50 percent of the Class 100 rate.

To examine the relationship between cost and rates for the different services (minimum shipments, volume shipments, and other LTL shipments) the actual rates charged were compared with the direct cost of service. In the case of the minimum rate, it was found that the rate did not nearly cover the direct cost of pickup and delivery, documentation, dock handling, and the line haul operation. No consideration was given to the administrative costs and no element of profit was included.

The truckload rates on several classes were found to be far in excess of the direct cost. For comparative and illustrative purposes only, cost factors for administration and profit were included to provide what may be called a full cost illustration. The revenue received from published rates in the low Class 50 comparison made was still 37 percent greater than the full cost.

Several commodities and several pairs of cities were selected for the comparison of rates and costs of other LTL shipments. In these cases are included the average cost of claims filed for loss or damage to the commodities. The commodities were chosen for several reasons including their large contribution to the number of shipments and the amount of revenue and because some were claim prone. The direct costs in each case were far above the revenue they would produce, again indicating a deleterious cost-price relationship for these items which constitute a large proportion of shipments and costs. The cost of transportation of these commodities is apparently subsidized by the volume shipments. Since the analysis did not cover all commodities, we could not draw inferences about them with any degree of assurance. It is likely, however, that many of them also contributed to the subsidy of the high cost commodities.

On the basis of the comparisons made between the cost structure and the rate structure, it is reasonable to infer that costs are not given sufficient weight in the design of the rate structure. Some of these costs arise from the method of operation of the carriers (single line, interchange movements); some from the nature of the commodity (claim prone); and some from the availability of a two way flow of traffic.

CHAPTER V

ANALYSIS OF CHARACTERISTICS OF FREIGHT HANDLED BY OKLAHOMA DISTRIBUTION CARRIERS

> All motor carriers have available in their files the basic data necessary for an analysis of their freight movements, but most of them do not use them to their advantage. Probably the main reason they do not is the expense of making periodic traffic analyses. Accordingly, much of the knowledge of traffic composition comes from observation and "Hunches"--both of which may be accidentally correct at times.
>
> Motor carriers all over the country are currently worried about "the small shipment problem" and are trying to find some solution to it. They know that minimum shipments are very costly to handle, but most have made no attempt to determine how costly. Surely, carriers often times have already lost money on minimum and other small shipments before they are ever loaded on the over-the-road trailer![1]

The above quotation is from a comprehensive study of the characteristics of motor freight traffic in the state of Oklahoma made in 1963. The information developed for this chapter in this study is basically the same type developed in the 1963 study. Where possible we have attempted to directly compare characteristics of the two

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[1]J. A. Constantin, <u>The Characteristics of Motor Freight Movements by General Commodity Carriers in Oklahoma</u> (Norman, Oklahoma: Bureau of Business Research, University of Oklahoma, 1963), p. 6.

studies. Sometimes direct comparisons are not possible because of differences in organization resulting from different objectives and scope of the two studies. Our organization attempts to relate the characteristics of the traffic to the cost centers discussed in Chapter III.

Origins and Destinations

Table 5-1 indicates that there has been approximately a 40 percent drop in the percentage of shipments moving wholly within Oklahoma since 1958, the year of the sample. This reflects the changing pattern of distribution many large companies have followed. Table 5-2 shows us that the large carriers (over $2,500,000 annual revenue) do only a very small portion (about 5 percent) of their total volume of business in intrastate shipments. Since the small and medium size carriers do almost their entire volume within the state of Oklahoma, these figures show that the long haul is being handled by the largest carriers. This is particularly significant because previous analyses have shown that charges for shipping are related to mileage; but mileage costs, as applied to a single shipment, are only a small part of total costs. Therefore, the spread between the costs and revenue for long haul shipments is greater than for the short haul movements.

Table 5-3 shows another facet of the changed characteristics of the manner in which freight moves now compared with over a decade ago. Then nearly 46 percent of

TABLE 5-1

PERCENT OF ALL SHIPMENTS WHICH ARE INTERSTATE AND INTRASTATE

Type of Shipment	1958[a]	1969[b]
Interstate	60.4%	76.1%
Intrastate	39.6	23.9
Total	100.0%	100.0%

Sources:

[a] J. A. Constantin, The Characteristics of Motor Freight Movements by General Commodity Carriers in Oklahoma (Norman, Oklahoma: Bureau of Business Research, University of Oklahoma, 1963), p. 97.

[b] Waybill Study.

TABLE 5-2

PERCENT OF ALL SHIPMENTS WHICH ARE
INTERSTATE AND INTRASTATE
BY CARRIER SIZE

Carrier Size	Interstate Shipments	Intrastate Shipments
Over $2,500,000	95.0%	5.0%
$100,000 to $2,500,000	70.0	30.0
Under $100,000	72.1	27.9
All Carriers	76.1	23.9

Source: Waybill Study.

TABLE 5-3

PERCENT OF SHIPMENTS HANDLED WHEN CARRIER IS ORIGINATING AND TERMINATING CARRIER, ORIGINATING CARRIER ONLY, TERMINATING CARRIER ONLY, AND INTERMEDIATE CARRIER ONLY

Type of Service	1958[a]	1969[b]
O and T	45.9%	31.4%
O Only	16.9	16.0
T Only	33.0	49.8
I Only	4.2	2.8
Total	100.0%	100.0%

Sources:

[a] J. A. Constantin, The Characteristics of Motor Freight Movements by General Commodity Carriers in Oklahoma (Norman, Oklahoma: Bureau of Business Research, University of Oklahoma, 1963), p. 100.

[b] Waybill Study.

the shipments were originated and terminated by the same carrier. Now only 31 percent are so handled. Extra carrier costs are incurred because of the increased proportion of shipments that are handled by more than one carrier. So far in our analysis we have seen two differences in motor carrier operating characteristics: a much greater proportion of shipments moving interstate; and a much greater proportion of shipments requiring an interchange. The latter change especially would have a profound effect on operating characteristics of the carriers. Because a shipment is interlined, an extra set of pickup and delivery costs is incurred as are an extra set of documentation costs, dock handling costs, administrative costs and an extra exposure of the shipment to loss and damage; because of this situation, it may be desirable to review the basis upon which divisions of revenues in interline movements are made.

Since 1958 Oklahoma carriers have had increases in rates, but they have been percentage increases for the most part. By asking for these percentage increases, the carriers have tacitly assumed that their operating characteristics had not changed since 1958 and that the economic structure of the motor carrier system as a whole was unchanged. Even assuming that in 1958 the rate structure reflected the economic operating characteristics of the carriers, by 1969 it no longer was compatible in at least one way. This incompatibility works to the disadvantage of the carriers.

The fact that so few of the intrastate shipments are handled by the large carriers is also significant. The large carriers' financial condition may be given more consideration in intrastate rate cases than their participation warrants.

The earlier study made no distinction among carriers of different sizes; so we have no basis for making a comparison with the current situation to examine change. However, Table 5-4 shows the magnitude of the interline business done by the carriers in the two smaller size groups. The medium size carriers interline all but about 28 percent of their shipments while the small ones interline all but about 22 percent of theirs.

The rate structure is not designed today to reflect the high incidence of interline shipments, if it ever was, because the rate changes of recent years have been made to reflect changes in revenue needs, not changes in the structure of rates. The effect is about the same as putting a bandage on a boil: it hides an unsightly mess but does nothing to cure the cause.

Tables 5-5 and 5-6 show the number of shipments and number of pounds respectively which originate or terminate in the several ZIP code centers of the state. All traffic originating or terminating in the area of the

TABLE 5-4

PERCENT OF SHIPMENTS HANDLED WHEN CARRIER IS ORIGINATING AND TERMINATING CARRIER, ORIGINATING CARRIER ONLY, AND INTERMEDIATE CARRIER ONLY BY CARRIER SIZE

Study Carrier Size	Type of Service			
	O and T	O Only	T Only	I Only
Over $2,500,000	50.1%	24.5%	19.5%	5.9%
$100,000 to $2,500,000	27.9	15.7	53.7	2.7
Under $100,000	21.9	8.6	69.4	0.1
All Carriers	31.4	16.0	49.8	2.8

Source: Waybill Study.

TABLE 5-5

ANNUAL NUMBER OF SHIPMENTS ORIGINATING AND/OR TERMINATING IN ZIP CODE CENTERS

ZIP Code Center		Shipments	
		Originating	Terminating
Out of State		513,410	1,223,784
731--	Oklahoma City	1,106,375	137,891
73401	Ardmore	9,255	20.642
73501	Lawton	8,634	63,895
73601	Clinton	821	5,450
73701	Enid	5,304	15,544
73801	Woodward	951	14,556
73942	Guymon	92	4,073
741--	Tulsa	146,993	179,127
74301	Vinita	28,108	43,571
74401	Muskogee	34,891	43,548
74501	McAlester	1,700	18,717
74601	Ponca City	3,523	4,550
74701	Durant	10,399	8,125
74801	Shawnee	13,172	78,229
74953	Poteau	1,027	22,953
Total		1,884,665	1,884,655

Source: Waybill Study.

TABLE 5-6

NUMBER OF DAILY AVERAGE HUNDRED POUNDS SHIPPED ORIGINATING AND/OR TERMINATING IN ZIP CODE CENTERS

ZIP Code Center		Hundred Pounds	
		Originating	Terminating
Out of State		16,198	38,587
731--	Oklahoma City	35,923	4,349
73401	Ardmore	293	1,689
73501	Lawton	275	2,026
74601	Clinton	25	174
73701	Enid	168	491
73801	Woodward	31	459
73942	Guymon	3	128
741--	Tulsa	4,637	5,649
74301	Vinita	887	1,376
74401	Muskogee	1,101	1,373
74501	McAlester	53	590
74601	Ponca City	111	143
74701	Durant	328	256
73801	Shawnee	416	2,467
74953	Poteau	32	724
Total		60,481	60,481

Source: Waybill Study.

ZIP code center is credited to the center. In like manner, Tables 5-7 and 5-8 give complete breakdowns of both shipments and weight on a "from where" to a "to where" basis.

Weight

Table 5-9 indicates a decline in the volume of shipments in the 0 to 300 pound weight category from 1958, and a very slight increase in shipments weighing over 10,000 pounds. The other weight categories all show slight increases during the period, in the percent of shipments. The small and the medium size carriers handle the greatest number of small shipments, as shown in Table 5-10. It is interesting to compare the volume shipments (10,000 pounds or more) handled by the medium carrier (0.6 percent of their total business) with those handled by large carriers (1.3 percent of their total business). In 1969 the percent of total weight moving in the 0 to 300 pounds range dropped slightly, as shown in Table 5-11, as did the volume shipments between the two periods. Table 5-12 shows that 6 percent of the total weight handled by the large carriers is in the 0 to 300 pound bracket while 12.8 percent of the weight handled by the medium carriers is in that bracket. Conversely, volume shipments accounted for only 22.3 percent of the medium carriers' business while the large carriers had more than 50 percent of their total traffic in these brackets. One explanation is that some of the large carriers

TABLE 5-7

ANNUAL NUMBER OF SHIPMENTS BETWEEN ZIP CODE CENTER AREAS

From \ To	Out of State	731--	73401	73501	73601	73701	73801	73942	741--	74301	74401	74501	74601	74701	74801	74953
Out of State	17,087	84,203	16,600	51,112	2,620	11,087	12,841	3,281	152,623	28,798	34,197	11,587	3,282	4,198	60,360	19,534
731--	1,012,863	32,644	3,656	7,840	2,140	3,577	331	252	12,248	4,198	5,325	4,801	499	1,856	11,092	3,053
73401	8,938	93	*	*	175	*	*	*	*	*	*	49	*	*	*	*
73501	5,298	1,386	*	*	15	*	57	*	1,736	55	*	*	*	87	*	*
73601	426	395	*	*	*	*	*	*	*	*	*	*	*	*	*	*
73701	3,227	786	*	612	*	*	*	*	380	176	*	*	*	*	123	*
73801	499	*	20	*	*	*	*	*	432	*	*	*	*	*	*	*
73942	57	*	*	*	*	*	*	*	*	35	*	*	*	*	*	*
741--	96,755	15,221	330	4,309	417	880	1,053	540	9,819	7,344	1,023	1,832	769	1,367	4,968	366
74301	26,168	448	*	*	*	*	*	*	1,224	*	46	*	*	*	222	*
74401	27,248	661	27	22	83	*	*	*	503	2,965	2,919	*	*	355	108	*
74501	245	276	*	*	*	*	*	*	*	*	*	*	*	262	737	*
74601	2,073	1,047	*	*	*	*	274	*	*	*	*	*	*	*	129	*
74701	9,874	55	*	*	*	*	*	*	*	*	*	39	*	*	431	*
74801	11,819	676	9	*	*	*	*	*	162	*	38	409	*	*	59	*
74953	1,027	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

* No shipments between these areas were found in the random sample of waybills.

TABLE 5-8

AVERAGE NUMBER OF POUNDS IN HUNDRED-WEIGHT DAILY BETWEEN ZIP CODE CENTER AREAS

To / From	Out of State	731--	73401	73501	73601	73701	73801	73942	741--	74301	74401	74501	74601	74701	74801	74953
Out of State	539	2,655	523	1,623	83	350	405	103	4,812	908	1,078	365	103	132	1,903	616
731--	31,936	1,030	1,153	247	68	113	10	8	386	132	168	151	16	59	350	96
73401	282	3	*	*	6	*	*	*	*	*	*	2	*	*	*	*
73501	168	44	*	*	1	*	2	*	55	2	*	*	*	3	*	*
73601	13	12	*	*	*	*	*	*	*	*	*	*	*	*	*	*
73701	102	25	*	19	*	*	*	*	12	6	*	*	*	*	4	*
73801	16	*	1	*	*	*	*	*	14	*	*	*	*	*	*	*
73942	2	*	*	*	*	*	*	*	*	1	*	*	*	*	*	*
741--	3,051	480	10	*	13	28	33	17	310	233	32	58	24	43	157	12
74301	825	14	*	*	*	*	*	*	39	*	2	*	*	*	7	*
74401	859	21	1	*	3	*	*	*	16	94	92	*	*	*	11	*
74501	13	9	*	*	*	*	*	*	*	*	*	*	*	8	23	*
74601	65	33	*	*	*	*	9	*	*	*	*	*	*	*	4	*
74701	311	2	*	*	*	*	*	*	*	*	*	1	*	*	14	*
74801	373	21	1	*	*	*	*	*	5	*	1	13	*	*	2	*
74953	32	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

* No shipments between these areas were found in the random sample of waybills.

TABLE 5-9

PERCENT OF ALL SHIPMENTS MOVING
IN VARIOUS WEIGHT BRACKETS

Weight	1958[a]	1969[b]
0 - 49 lbs.	7.2%	8.7%
50 - 99	16.3	13.2
100 - 149	16.5	12.9
150 - 199	10.8	10.1
200 - 299	13.8	14.7
300 - 399	8.8	9.2
400 - 499	5.0	5.9
500 - 749	7.4	8.6
750 - 999	3.6	3.8
1,000 - 2,499	6.6	8.3
2,500 - 4,999	2.1	2.3
5,000 - 9,999	0.8	1.3
10,000 - 19,999	0.3	0.3
20,000 and Over	0.8	0.7
Total	100.0%	100.0%

Sources:

[a] J. A. Constantin, The Characteristics of Motor Freight Movements by General Commodity Carriers in Oklahoma (Norman, Oklahoma: Bureau of Business Research, University of Oklahoma, 1963), p. 102.

[b] Waybill Study.

TABLE 5-10

PERCENT OF ALL SHIPMENTS MOVING IN VARIOUS WEIGHT BRACKETS BY CARRIER SIZE

Weight	Carrier Size		
	Under $100,000	$100,000 to $2,500,000	Over $2,500,000
0 - 49 lbs.	8.4%	8.3%	9.9%
50 - 99	12.9	12.5	14.8
100 - 149	14.5	12.8	11.5
150 - 199	9.3	10.9	8.9
200 - 299	15.3	15.3	12.6
300 - 399	9.3	9.5	8.4
400 - 499	6.5	5.9	5.3
500 - 749	7.5	8.7	9.4
750 - 999	3.8	4.1	3.6
1,000 - 2,499	8.4	8.2	8.4
2,500 - 4,999	1.8	2.1	3.4
5,000 - 9,000	1.1	1.1	1.9
10,000 - 19,999	0.3	0.3	0.6
20,000 and Over	1.5	0.3	0.7
Total	100.0%	100.0%	100.0%

Source: Waybill Study.

TABLE 5-11

PERCENT OF TOTAL WEIGHT MOVING
IN VARIOUS WEIGHT BRACKETS

Weight	1958[a]	1969[b]
0 - 49 lbs.	0.3%	0.3%
50 - 99	1.9	1.2
100 - 149	2.6	1.9
150 - 199	2.6	2.1
200 - 299	4.5	4.4
300 - 399	4.0	3.9
400 - 499	3.1	3.3
500 - 749	6.0	6.6
750 - 999	4.1	4.2
1,000 - 2,499	13.5	15.5
2,500 - 4.888	9.9	10.0
5,000 - 9,999	7.4	10.7
10,000 - 19,999	6.1	5.4
20,000 and Over	33.7	30.5
Total	100.0%	100.0%

Sources:

[a] J. A. Constantin, The Characteristics of Motor Freight Movements by General Commodity Carriers in Oklahoma (Norman, Oklahoma: Bureau of Business Research, University of Oklahoma, 1963), p. 104.

[b] Waybill Study.

TABLE 5-12

PERCENT OF TOTAL WEIGHT MOVING IN VARIOUS WEIGHT BRACKETS BY CARRIER SIZE

Weight	Carrier Size		
	Under $100,000	$100,000 to $2,500,000	Over $2,500,000
0 - 49 lbs.	0.3%	0.4%	0.2%
50 - 99	1.2	1.4	0.9
100 - 149	2.2	2.4	1.1
150 - 199	2.0	2.9	1.3
200 - 299	4.7	5.7	2.5
300 - 399	4.0	5.0	2.4
400 - 499	3.6	4.1	2.0
500 - 749	6.7	8.2	4.7
750 - 999	3.6	5.4	2.5
1,000 - 2,499	15.2	19.3	10.7
2,500 - 4,999	7.5	11.3	10.2
5,000 - 9,999	9.2	11.6	10.7
10,000 - 19,999	7.3	5.6	3.9
20,000 and Over	32.5	16.7	46.9
Total	100.0%	100.0%	100.0%

Source: Waybill Study.

are certificated to serve small towns in Oklahoma, but normally interline small shipments with smaller carriers. Because of the economics of large volume movements, they deliver volume shipments themselves.

Table 5-13 gives the average revenue obtained from each of the weight brackets and average shipment weight within that bracket. Since the total cost of pickup and delivery and documentation averages $4.41 (ignoring the minor effect of line haul costs), some of the extreme importance placed on weight in present pricing is evident. Since all charges are quoted per hundred weight the average shipment weighing below 300 pounds does not cover the cost of pickup and delivery and documentation at present. It is interesting to note the shift in importance of commodities as shown in Table 5-14. These shifts could come from two sources: (1) more private carriage taking place in such commodity groups as foods and paint, or (2) substantive increases in many of the other categories resulting from a change in the complexion of the Oklahoma business community. Table 5-15 simply re-emphasizes the relationships shown in Table 5-12.

Claims

The heavy cost in claims in certain categories cited in Chapter III leads to an examination of data concerning claims. Table 3-3 shows that the percentages

TABLE 5-13

CHARACTERISTICS OF SHIPMENTS MOVING IN VARIOUS WEIGHT BRACKETS

Weight	Average Weight	Average Revenue
0 - 49 lbs.	27 lbs.	$ 3.17
50 - 99	73	3.21
100 - 149	119	3.29
150 - 199	171	3.58
200 - 299	243	4.09
300 - 399	341	5.17
400 - 499	442	6.53
500 - 749	623	9.26
750 - 999	853	12.07
1,000 - 2,499	1509	20.42
2,500 - 4,999	3494	49.37
5,000 - 9,999	6655	91.43
10,000 - 19,999	12,751	137.04
20,000 - Over	30,503	241.77

Source: Waybill Study.

TABLE 5-14

PERCENT OF TOTAL WEIGHT OF ALL SHIPMENTS ACCOUNTED FOR BY TEN MOST IMPORTANT* COMMODITIES

Commodity	1958[a]		1969[b]	
	Rank	Percent	Rank	Percent
Food Products, Not Frozen	1	9.4	4	5.7
Manufactured Iron and Steel	2	6.3	1	6.9
Manufactures and Miscellaneous	3	4.6	5	5.6
Paint, etc.	4	4.2	---	--
Tires and Tubes, Rubber	5	4.0	7	3.2
Candy and Confectionery	6	3.5	10	2.9
Fresh Meats	7	3.1	--	--
Vehicle Parts	8	2.9	8	3.0
Machinery and Machines	9	2.8	6	3.8
Electric Equipment and Parts	10	2.8	2	6.5
Paper and Allied Products	--	--	3	6.1
Rubber and Plastic Products	--	--	9	3.0
Total		43.6		46.7

* As measured by weight of shipments.

Sources:

[a] J. A. Constantin, The Characteristics of Motor Freight Movements by General Commodity Carriers in Oklahoma (Norman, Oklahoma: The Bureau of Business Research, University of Oklahoma, 1963), p. 109.

[b] Waybill Study.

TABLE 5-15

AVERAGE SHIPMENT WEIGHT BY CARRIER SIZE

Study Carrier Size	1958[a]	1969[b]
Over $2,500,000	N.A. lbs.	1,207 lbs.
$100,000 to $2,500,000	N.A.	644
Under $100,000	N.A.	788
All Carriers	746	804

Sources:

[a] J. A. Constantin, The Characteristics of Motor Freight Movements by General Commodity Carriers in Oklahoma (Norman, Oklahoma: The Bureau of Business Research, University of Oklahoma, 1963), pp. 102, 104.

[b] Waybill Study.

of claims by commodity are almost identical for 1958 and 1969. In Table 5-16 (although the comments relating to Table 5-14 apply to a large extent), the relation of the percentage of all claims to the percentage of all shipments is shown to be important. For example, the Tires and Tubes, Rubber category of Table 3-3 is included in the commodity group Rubber and Plastic Products of Table 5-16 which totaled 6.1 percent of all shipments. Tires and Tubes, Rubber comprised 2.6 percent of all shipments but 10.9 percent of all claims and costs. Furniture, which dropped out of the top ten commodities in shipment importance, was third in percentage of all claims.

Table 3-4, studied in a similar context, indicates that this proportion in sizes of claims to their numbers with commodities shows a range in claims of 0 to more than $200 and an average cost of $53.13. Table 3-1 shows that the medium carriers had a low claim size as well as a low frequency of claims. Small carriers had an extremely high frequency of claims, while large carriers had an extremely high cost per claim compared to the frequency. Due to the small amount and low frequency of claims, Table 3-2 gives an extremely low cost for the medium carrier of all claims to all shipments. The small carrier has an extremely high cost per shipment of all claims.

TABLE 5-16

PERCENT OF ALL SHIPMENTS ACCOUNTED FOR BY TEN MOST IMPORTANT* COMMODITIES

Commodity	1958[a]		1969[b]	
	Rank	Per-cent	Rank	Per-cent
Manufactures and Miscellaneous	1	9.6	2	8.2
Vehicle Parts	2	6.9	7	4.7
Cotton Factory Products	3	4.8	--	--
Electrical Equipment and Parts	4	4.7	1	8.7
Machinery Parts	5	4.1	10	3.7
Machinery and Machines	6	3.7	--	--
Drugs, Medicines and Toilet Preparations	7	3.5	4	5.8
Candy and Confectioneries	8	3.3	--	--
Furniture	9	3.3	9	4.0
Paint, etc.	10	3.2	--	--
Paper and Allied Products	--	--	8	4.6
Rubber and Plastic Products	--	--	3	6.1
Apparel and Other Textile Products	--	--	5	5.5
Textile Mill Products	--	--	6	5.5
Total		47.1		56.8

* *As measured by number of shipments.*

[a] J. A. Constantin, The Characteristics of Motor Freight Movements by General Commodity Carriers in Oklahoma (Norman, Oklahoma: The Bureau of Business Research, University of Oklahoma, 1963), p. 108.

[b] Waybill Study.

General Characteristics

Table 5-17 shows that no significant changes in seasonality of shipments have occurred from 1958 to 1969. Table 5-18 shows that the shipments handled by the large carriers contain 70 percent more pieces than those of the smallest carriers. A part of the explanation may be in the frequently heard charge that the large carriers are more selective in the shipments they handle. The major explanation is probably that the smaller carriers are more truly distribution carriers. We discussed earlier the effect on cost of dock handling of the number of pieces in a shipment.

The number of rated items per waybill is shown in Table 5-19. Since this subject was discussed in Chapter III, no further comment is necessary.

Tables 5-20 and 5-21 show data on shipments sent collect. There was a considerable decline in the proportion sent collect. While it is costly to handle COD and freight collect shipments, the costing of them presented certain problems. We made the decision to leave the direct costing for some later study and "allow" the costs of performing this service to remain "hidden" in other cost centers, mainly pickup and delivery. Also some of these costs are buried in the administrative cost center. The collection of freight charges on delivery is a special service provided by the carriers to shippers of about

TABLE 5-17

PERCENT OF ALL SHIPMENTS BY MONTHS

Month	1958[a]	1969[b]
January	7.0%	6.2%
February	7.8	8.0
March	8.3	7.7
April	8.5	9.0
May	8.3	8.3
June	8.9	9.1
July	8.7	8.4
August	8.7	9.0
September	9.3	8.9
October	9.3	10.3
November	7.9	7.3
December	7.3	7.8
Total	100.0%	100.0%

Sources:

[a] J. A. Constantin, The Characteristics of Motor Freight Movements by General Commodity Carriers in Oklahoma (Norman, Oklahoma: The Bureau of Business Research, University of Oklahoma, 1963), p. 101.

[b] Waybill Study.

TABLE 5-18

AVERAGE NUMBER OF PIECES PER SHIPMENT BY CARRIER SIZE

Study Carrier Size	Average Number of Pieces per Shipment
Over $2,500,000	17
$100,000 to $2,500,000	12
Under $100,000	10
All Carriers	13

Source: Waybill Study.

TABLE 5-19

PERCENT OF NUMBER OF RATED ITEMS PER WAYBILL BY CARRIER SIZE

Rated Items per Waybill	Carrier Size: Over \$2,500,000	Carrier Size: \$100,000 to \$2,500,000	Carrier Size: Under \$100,000	All Carriers
1	93.8%	92.9%	89.9%	92.3%
2	4.3	3.9	4.9	4.3
3	0.7	1.6	2.6	1.6
4	0.6	0.8	1.2	0.8
5	0.2	0.5	0.6	0.5
6	0.3	0.1	0.2	0.2
7 and Over	0.1	0.2	0.6	0.3
	100.0%	100.0%	100.0%	100.0%

Source: Waybill Study.

TABLE 5-20

PERCENTAGE OF ALL SHIPMENTS SENT COLLECT AND PREPAID

Type of Payment	1958[a]	1969[b]
Collect	51.3%	32.4%
Prepaid	48.7	67.6
Total	100.0%	100.0%

Sources:

[a] J. A. Constantin, The Characteristics of Motor Freight Movements by General Commodity Carriers in Oklahoma (Norman, Oklahoma: Bureau of Business Research, University of Oklahoma, 1963), p. 100.

[b] Waybill Study.

TABLE 5-21

PERCENTAGE OF ALL SHIPMENTS SENT COLLECT AND PREPAID BY CARRIER SIZE

Study Carrier Size	Type of Payment	
	Collect	Prepaid
Over $2,500,000	41.0%	59.0%
$100,000 to $2,500,000	26.4	73.6
Under $100,000	38.8	61.2
All Carriers	32.4	67.6

Source: Waybill Study.

32 percent of the shipments. Charges for this special service should cover the costs of providing it, and they should be paid by the users, not by all shipments. Further, even though carriers do charge a fee for handling shipments for which an invoice price must be collected, they should be fully compensated for that service. A study should be made to determine those costs, and compensatory fees set for the service.

We did not trace the number of interstate shipments which were sent either freight or invoice collect, but several factors make it reasonable for us to draw inferences concerning which group of carriers is disproportionately burdened by these COD charges. One factor is the sheer magnitude of interstate shipments. A second factor is that the large carriers have the largest proportion of shipments sent COD. Third, a very small proportion of large carrier shipments are intrastate. Fourth, very large proportions of the shipments handled by the medium and small carriers are those which they merely terminate, 54 percent and 64 percent respectively.

From these facts it is possible to infer that a large share of the burden of making COD collections falls on the carriers in these two size groups. The share of the burden may be disproportionately large, and it probably is. Elsewhere we have briefly commented on the need to examine rate divisions and the bases upon which they are made. The delivering carrier of an interlined shipment sent COD has an additional burden placed on it to collect for a shipment for which it receives a share of the freight revenue in proportion to the number of miles it moved the shipment.

Minimum shipments increased considerably in 1969 over 1958 as shown in Table 5-22. These are shipments priced under the minimum charge rules. It is interesting to note that they have become of greater importance in all three categories: number, weight, and revenue. Breaking down these figures by carrier size in 1969, Table 5-23 shows that minimum shipments were slightly more important to the medium carriers. The effect of minimum shipments on total carrier profits is probably negative because of the cost of handling them.

Thus, the percentage of total revenue realized from these shipments points up the extent of the small shipments problem.

Table 5-24 gives the total revenue received by all carriers for an average minimum shipment. Table 5-25 shows just that portion of the revenue that the study carriers received for handling an average minimum shipment. The large carrier was able to retain 75 percent of the total revenue paid for handling the shipment, the medium carrier retained 49 percent of the revenue, and the small carrier received only 46 percent of the revenue. All carriers

TABLE 5-22

PERCENT OF SHIPMENTS, WEIGHT, AND REVENUE ACCOUNTED FOR BY MINIMUM SHIPMENTS

Characteristics of Shipments	Minimum		Other	
	1958[a]	1969[b]	1958[a]	1969[b]
Shipments	39.0	46.4	61.0	53.6
Pounds	5.2	7.7	94.8	92.3
Revenue	8.6	15.2	91.4	84.8

Sources:

[a] J. A. Constantin, The Characteristics of Motor Freight Movements by General Commodity Carriers in Oklahoma (Norman, Oklahoma: Bureau of Business Research, University of Oklahoma, 1963), p. 25.

[b] Waybill Study.

TABLE 5-23

PERCENTAGE OF SHIPMENTS, WEIGHT, AND REVENUE ACCOUNTED FOR BY MINIMUM SHIPMENTS BY CARRIER SIZE

Carrier Size	Characteristics of Shipments		
	Shipments	Pounds	Revenue
Over $2,500,000	44.0%	5.1%	12.0%
$100,000 to $2,500,000	46.8	9.7	17.3
Under $100,000	47.6	7.5	15.2
All Carriers	46.4	7.7	15.2

Source: Waybill Study.

TABLE 5-24

TOTAL CHARGES AND WEIGHT OF AVERAGE MINIMUM SHIPMENTS HANDLED BY STUDY CARRIERS BY CARRIER SIZE

Carrier Size	Per Minimum Shipment	
	Total Revenue	Pounds
Over $2,500,000	$7.61	140
$100,000 to $2,500,000	6.21	134
Under $100,000	5.78	124
All Carriers	6.40	133

Source: Waybill Study.

TABLE 5-25

STUDY CARRIERS AVERAGE REVENUE PER MINIMUM SHIPMENT BY CARRIER SIZE

Carrier Size	Revenue per Minimum Shipment
Over $2,500,000	$5.75
$100,000 to $2,500,000	3.09
Under $100,000	2.68
All Carriers	3.55

Source: Waybill Study.

combined held on to only 55 percent of the revenue received for handling small shipments.

Table 5-26 shows the relative importance of various types of commodities to the motor carrier in terms of revenue received and the shifts that took place between 1958 and 1969. It was suggested earlier that a study of claims should be made for a number of reasons including need to determine the degree of correlation of number of claims and number of shipments and weight. With such information better pricing and decisions can be made. Also the carrier could make better decisions concerning action on developing business or attempting to discourage business.

Restating the point that was made in the earlier study, it is only through careful analysis of the characteristics of the traffic that a carrier can make sound business judgments. The regulatory agency has additional responsibilities, for it must have knowledge of characteristics of traffic of different traffic lanes. Probably even more important, the regulators must be able to relate cost characteristics of carriers to the rate structure.[2]

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[2]J. A. Constantin, The Characteristics of Motor Freight Movements by General Commodity Carriers in Oklahoma (Norman, Oklahoma: Bureau of Business Research, University of Oklahoma, 1963), p. 6.

TABLE 5-26

PERCENT OF REVENUE FOR ALL SHIPMENTS RECEIVED FROM TEN MOST IMPORTANT* COMMODITIES

Commodity	1958[a]		1969[b]	
	Rank	Percent	Rank	Percent
Manufacturers and Miscellaneous	1	7.2	2	6.9
Food Products	2	6.9	3	6.1
Electric Equipment and Parts	3	5.2	1	8.2
Vehicle Parts	4	4.3	8	4.0
Tires and Tubes, Rubber	5	4.0	---	---
Paint, etc.	6	3.6	---	---
Machinery Parts	7	3.6	5	5.1
Airplanes and Parts	8	3.4	---	---
Machinery and Machines	9	3.3	6	4.6
Cotton Factory Products	10	2.4	---	---
Paper and Allied Products	---	---	4	5.4
Printing and Publishing	---	---	10	3.7
Apparel and Other Textile Products	---	---	7	4.4
Textile Mill Products	---	---	9	3.9
Total		43.9		52.3

* As measured by revenue produced.

[a] J. A. Constantin, The Characteristics of Motor Freight Movements by General Commodity Carriers in Oklahoma (Norman, Oklahoma: The Bureau of Business Research, University of Oklahoma, 1963), p. 107.

[b] Waybill Study.

Summary

Intrastate shipments have become a smaller proportion of total shipments in the past decade or so, with the large carriers handling a very small share of the total. In addition the decline in the proportion of shipments originated and terminated by the same carrier means that a larger proportion of shipments now are interlined than was the case in 1959. These changes should focus the attention of carrier management and the regulatory agency on at least two things. First, the division of rates between two or more carriers, which is generally done on the basis of the relative distance each carrier moves the shipment, should be re-examined. Second, the facts strongly suggest that the rate structure is not properly related to the economic characteristics of the industry.

There was relatively little change in the number of shipments in the various weight categories above 300 pounds. In the group below 300 pounds, the percent of shipment declined from about 65 percent of the total to about 60 percent. A larger proportion of shipments handled by small and medium size carriers were in the group weighing less than 300 pounds than was the case for the large carriers.

At the other extreme, the volume shipments of large carriers accounted for over 50 percent of the weight moved by those carriers while these more profitable shipments accounted for smaller proportions of the traffic of medium (22 percent) and small (40 percent) carriers.

There was not much change in the importance of certain commodities during the period. Of the ten commodities which accounted for the most weight in 1958, two failed to make the list in 1969 (paint and fresh meat).

The average shipment of the large carriers weighed almost twice as much as that of the medium size carrier and more than 50 percent more than that of the small carrier group.

The number of pieces in shipments of large carriers was much greater (70 percent) than those of the small carrier which averaged 10 pieces per shipment. The medium carriers had 20 percent more pieces than the small ones. Even though the average shipment had a number of pieces in it, there were relatively few shipments which had over two separately rated items (3.4 percent). In fact only 7.7 percent of the shipments had more than one rated item.

There was a decline during the period in the proportion of shipments sent collect. While 32 percent of all shipments were sent collect, 41 percent of the shipments of large carriers were collect. The cost burden for handling COD shipments is apparently disproportionately greater on medium and small carriers.

The percentage of minimum shipments are of the total rose from 39 percent in 1958 to over 46 percent in

1969. The revenue from them rose even more dramatically from nearly nine percent to just over 15 percent. These shipments accounted for only 12 percent of the revenue of the large carriers, but over 17 percent for the medium sized ones. The share of revenue received from these shipments by all carriers was apparently less than the direct cost of handling them.

Our final point of emphasis is one which has run all through this study: the rate structure should be designed to reflect the economic characteristics of carriers and reflect the characteristics of the traffic.

CHAPTER VI

MODEL DEVELOPMENT

One problem facing the researcher in developing a model from his data is determining the degree of sophistication required and/or desired. Although the esoteric methods used by the Kearney Company[1] and the Northwestern University group[2] were well done, we believed that our model should be more simplified so that it could be readily checked and updated by both motor carriers and the regulatory agencies.

The Model

A cost center based rate model is made in a simple building block manner. The costs of each center are aggregated and a price is determined.

The general model can take either of two forms:

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[1]A. T. Kearney Co., Michigan Intra-state Motor Transportation Costs, Report No. 2 (Lansing, Michigan: Michigan Public Service Commission, 1964).

[2]M. L. Burstein, et al., The Cost of Trucking: Econometric Analysis (Dubuque, Iowa: Wm. C. Brown Company, 1965).

TABLE 6-1

PERCENT OF COSTS INCURRED IN COST CENTER ACTIVITY BY STUDY CARRIERS

Activity	Carrier Size			
	Over $2,500,000	$100,000 to $2,500,000	Under $100,000	All Carriers
Pickup and Delivery	16.10%	24.80%	31.8%	22.6%
Documentation	6.7	9.0	11.2	7.2
Administration	5.9	8.2	16.8	6.3
Insurance*	1.8	0.2	7.5	0.2
Dock Handling	16.3	22.5	1.2	13.6
Line Haul	53.2	35.3	31.5	50.1
	100.0%	100.0%	100.0%	100.0%

*Net of salvage.

Source: Waybill Study.

(I) $\text{Price} = A + B + C + D + E + F + G$

(II) $\text{Price} = (F'+G')(A+B+C+D)E'$

where A = cost of pickup and delivery, expressed in dollars

B = cost of documentation, expressed in dollars

C = cost of dock handling, expressed in dollars

D = cost of claims, expressed in dollars

E = cost of claims, expressed in dollars

E' = cost of claims, expressed as percent of revenue

F = cost of administration, expressed in dollars

F' = cost of administration, expressed as percent of cost

G = return on investment, expressed in dollars

G' = return on investment, expressed as percent of cost

For the model to become a working tool, determination must be made of the constants and variables to be used in the components of the general model. Some of the constants can be determined by studies such as this. Others will be determined by exploration of supply and demand considerations, developed by the combined actions of carriers, shippers, and regulatory agencies. The variable will be determined by the particular characteristics of the shipment involved.

To illustrate the process, we will expand the general models into specific models based on data from this study, and certain assumptions which we will make for simplicity's sake.

For the purposes of this chapter volume shipments will not be dealt with. It is a relatively simple matter to adapt a specific "volume" model from either of the general models in the same way that the following specific models are developed.

Cost of Pickup and Delivery

As shown in Chapter III, pickup and delivery is shipment oriented. As was also shown, the number of carriers involved in a shipment have a further bearing on this cost. One consideration not previously mentioned, concerns the possibility of the shipper and/or the consignee placing the shipment, or receiving the shipment directly at the carriers' dock, hence 0.5 m is used to cover all possibilities.

Therefore, using the average cost of pickup and delivery as developed in the study ($2.97 per shipment):

$$A = 0.5m(\$2.97)$$

where m = the number of pickups and/or deliveries involved with the shipment

For an ordinary single line shipment requiring both pickup and delivery, m = 2.

Cost of Documentation

The cost of documentation is shipment oriented. Here too, the number of carriers involved in a shipment have a bearing on this cost.

Using the average cost previously developed ($1.44 per shipment):

$B = n(\$1.44)$

where n = the number of times a shipment must be documented.

For an ordinary single line shipment, $n = 1$; if three carriers are involved in the shipment, $n = 3$.

Cost of Dock Handling

The costs in dock handling have been shown to be oriented to the piece. The number of times a piece will be handled can vary with circumstances. For example, the shipper may load a trailer "to ride." In this case, the shipment would be handled across the dock by the carrier only at his terminating point. Our study showed this cost to be $0.21 per piece.

$C = 0.5p(\$0.21)q$

where p = the number of times the shipment is docked, 0.5 representing ½ of the cost developed for originating and terminating a shipment.

q = the number of pieces in a shipment

Cost of Line Haul

We have shown that the average vehicle cost is $0.47 per mile. Road map miles differ from actual miles necessarily driven from the origin terminal to the terminating terminal. This is taken into account by the use of a circuity factor. In addition, a less than volume shipment does not fill a truck, and should pay a pro rata share determined by the portion of the truck it occupies. Load factors are developed to cover the cost of returning a vehicle to its origin.

In general then:

$D = rstu$

where r = vehicle mileage cost

s = circuity factor

t = portion of the truck capacity occupied by the shipment

u = load factor

In our case, using the assumptions previously made, an average circuity factor of 6 percent, and a 15 pound per cubic foot density (Table 6-2)

$D = (\$0.47)(1.06)(0.00005)t'u$

where t' = weight of the shipment

u = load factor (Table 4-4)

Cost of Claims

As indicated in our previous discussion, the costs of claims can be handled in several ways:

(1) An average cost for all shipments;

(2) An average cost for a particular commodity;

(3) A percent of revenue for insurance.

We have shown the average costs for all shipments ($0.05 per shipment), and some average costs for particular commodities (Chapter III). We have also used liability

TABLE 6-2

PORTION OF TRUCKLOAD REPRESENTED PER POUND AT VARYING DENSITIES

Density	Truckload Factor
3.0 and under	0.00027
4.0 to 5.9	0.00016
6.0 to 7.9	0.00011
8.0 to 9.9	0.00009
10.0 to 11.9	0.00007
12.0 to 13.9	0.00006
14.0 to 17.9	0.00005
18.0 to 21.9	0.00004
22.0 and over	0.00003

Source: Adapted from Tariff 27-D (Dallas, Texas: Southwestern Motor Freight Bureau, Inc., 1964), pp. 40-42.

insurance cost as a percent of revenue (1.5 percent, adjusted, Chapter IV).

Therefore:

$E = vw$

$E' = vw'$

where v = number of carriers involved in a shipment

w = average cost (for either all shipments, or particular commodities

w' = percent of revenue factor

Or: $E = v(\$0.05)$ for average claims of all shipments

$E' = v(1.015)$ for estimated claim cost

Cost of Administration

We have dealt with administrative costs in two ways in this study:

(1) As a definite fixed cost center, where an absolute cost per unit of production could be determined ($1.27 per shipment);

(2) As an indirect cost (20 percent of direct cost) subject to the laws of supply and demand, having the ability to expand and contract as the market, regulatory agencies, and management saw fit.

The true situation is probably an amalgamation of the two extremes, just as the two models given are the poles within which the truth lies.

In view of this

$F = x(\$1.27)$

$F' \quad x(1.0 + 0.2)$

where x – the number of carriers involved in a shipment.

Return on Investment

While we have discussed the need for profit, and recognized that return on investment is a very real cost, because of the scope of this study we have had to treat the fact rather cavalierly, while we admitted that its evaluation was beyond our present competence.

For the purpose of this model exposition we are going to handle the situation as we did in Chapter III, and in effect, beg the question. In the case of Model I we are going to admit that conceptually some specific number could be put in the place of G, but we are going to treat the model as if it were:

$$\text{Price} = G'y(A+B+C+D+E+F)$$

where y = number of carriers involved in the shipment.

We shall then apply the factor as given by the ICC for revenue need to be 17.89 percent.

In the case of Model II we will just as arbitrarily say, as we did in Chapter III, that if we use a factor of 7.5 percent of costs for profit, we will have an operating ratio that hits the magic number of 93.

Specific Models

Having started with the basic model forms, and defining and expanding the constants and variables involved in them, it becomes a simple matter of assembling the building blocks to develop working tools. It is once again emphasized that many of the numbers we have used are really no better than educated guesses, and the final numbers to be filled in will be the result of study and deliberation by those who are so vitally involved (carriers, shippers, regulators).

The models:

(I) $$\text{Price} = [0.5m(2.97)+n(\$1.44)+0.5p(\$0.21)q+(\$0.47)(0.00005)t'u+v(\$0.05)+x(\$1.27)]y(1.1789)$$

If we assume that our shipments are <u>all</u> single line, ordinary pickup and delivery shipments, the model can be simplified to:

$$\text{Price} = (\$2.97+\$1.44+\$0.21q+\$0.0002491t'u+\$0.05+\$1.27)1.1789$$

or:

$$\text{Price} = (\$5.63+\$0.21q+\$0.0002491t'u)1.1789$$

reducing further:

$$\text{Price} = \$6.64+\$0.2476q+\$0.00002937t'u$$

(II) $$\text{Price} = (0.075+1.2)[0.5m(\$2.97)+n(\$1.44)+0.5p(\$0.21)q+(\$0.47)(1.06)(0.00005t'u)]v(1.015)$$

Retaining the above assumptions and simplifying:

$$\text{Price} = (\$4.31+\$0.21q+\$0.0002491t'u)1.2941$$

reducing further:

$$\text{Price} = \$5.58+\$0.2718q+\$0.00003224t'u$$

Tests of the Model

What would be the effect on the shipper if such a new rate schedule using the above formula were used? To get an indication, computations were made using the same five pairs of cities that were used previously. An average size shipment, and a larger shipment of tires and of food were used to try in each of the models. In addition standard Tariff 27-D charges were applied for the same situations. The results are shown in Tables 6-3 through 6-6. Although the rate increases look outrageously high, it should be remembered that it is the final consumer who pays the bill. In the worst possible instance found in this comparison, the consumer retail price for tires would be increased less than 1½ percent. Again, it is emphasized that these comparisons were made for illustration purposes only, they are not intended to be recommended prices.

TABLE 6-3

MODEL CHARGES VERSUS TARIFF 27-D CHARGES BETWEEN SELECTED CITIES FOR TIRES AND TUBES, RUBBER

Cities	Tariff 27-D* Charges	Model (1) Charges	Model (2) Charges
Oklahoma City and Enid	$ 9.28	$20.65	$16.13
Oklahoma City and Ardmore	10.16	22.96	17.30
Oklahoma City and Tulsa	10.48	20.28	15.95
Tulsa and Vinita	8.56	19.80	15.71
Tulsa and Shawnee	9.84	22.68	17.16

Shipment Characteristics: 800 pounds, 32 pieces, density 12.8 pounds/cubic foot, Class 70.

*Source: Adapted from Tariff 27-D (Dallas, Texas: Southwestern Motor Freight Bureau, Inc., 1964) with 1969 supplements.

TABLE 6-4

MODEL CHARGES VERSUS TARIFF 27-D CHARGES BETWEEN SELECTED CITIES FOR TIRES AND TUBES, RUBBER

Cities	Tariff 27-D* Charges	Model (1) Charges	Model (2) Charges
Oklahoma City and Enid	$83.20	$156.73	$111.10
Oklahoma City and Ardmore	88.00	179.82	122.77
Oklahoma City and Tulsa	94.40	153.02	109.22
Tulsa and Vinita	76.00	148.27	106.82
Tulsa and Shawnee	88.80	177.07	121.38

Shipment Characteristics: 8,000 pounds, 320 pieces, density 12.8 pounds/cubic foot, Class 70.

*Source: Adapted from Tariff 27-D (Dallas, Texas: Southwestern Motor Freight Bureau, Inc., 1964) with 1969 supplements.

TABLE 6-5

MODEL CHARGES VERSUS TARIFF 27-D CHARGES BETWEEN SELECTED CITIES FOR FOOD PRODUCTS, NOT FROZEN

Cities	Tariff 27-D* Charges	Model (1) Charges	Model (2) Charges
Oklahoma City and Enid	$16.59	$32.38	$23.23
Oklahoma City and Ardmore	18.29	36.73	25.43
Oklahoma City and Tulsa	18.79	31.68	22.87
Tulsa and Vinita	15.38	30.79	22.42
Tulsa and Shawnee	17.59	36.22	25.16

Shipment Characteristics: 1,005 pounds, 50 pieces, density 8.0 pounds/cubic foot, Class 100.

*Source: Adapted from Tariff 27-D (Dallas, Texas: Southwestern Motor Freight Bureau, Inc., 1964) with 1969 supplements.

TABLE 6-6

MODEL CHARGES VERSUS TARIFF 27-D CHARGES BETWEEN SELECTED CITIES FOR FOOD PRODUCTS, NOT FROZEN

Cities	Tariff 27-D* Charges	Model (1) Charges	Model (2) Charges
Oklahoma City and Enid	$118.19	$212.51	$146.72
Oklahoma City and Ardmore	131.05	247.31	164.32
Oklahoma City and Tulsa	134.27	206.91	143.89
Tulsa and Vinita	110.15	199.75	140.27
Tulsa and Shawnee	126.23	243.16	162.22

Shipment Characteristics: 8,040 pounds, 200 pieces, density 8.0 pounds/cubic foot, Class 100.

*Source: Adapted from Tariff 27-D (Dallas, Texas: Southwestern Motor Freight Bureau, Inc., 1964) with 1969 supplements.

APPENDIX A

STATISTICAL METHODOLOGY

STATISTICAL METHODOLOGY

The State of Oklahoma is large and exhibits areas of varied distinctive characteristics. The motor carriers operating within the state also exhibit varied characteristics. Because of these two factors it was decided that a stratified sample would best exemplify the characteristics of the Oklahoma distribution carriers.

The state was divided into four regions (See Appendix B). Region One is the area of the state west of the north-south Interstate Highway 35. Region Two contains the area in the northeastern part of the state north of Highway 66 and east of Interstate Highway 35. Region Three comprises the southeastern part of the state, that area south of Highway 3 and east of Interstate 35. Region Four contains the balance of the state, that is, bounded on the north by Highway 66 on the west by Interstate 35 and on the south by Highway 3; the Arkansas border is its eastern border.

To further satisfy the sample, the latest annual revenue figures as reported to the Oklahoma Corporation Commission were determined. It was found that the revenues broke at two significant points, allowing a break into three categories: (1) over 2,500,000 dollars revenue; (2) between 100,000 dollars and 2,500,000 dollars; (3) under 100,000 dollars revenue. Appendix C shows the result of the stratification of all the carriers registered and certified by the Oklahoma Corporation Commission as of January 1, 1969.

A sample design, using the ICC methodology (i.e., the percentage of carriers was chosen as related to the percentage of category or to its strata), was then made picking the most significant carriers of each category in each region. Appendix D shows the sample design.

The pilot design was then picked from the Region One sample, using one carrier in each category, so as to enable us to use the data collected in the final sampling procedure. The carriers chosen were: Lee Way, Hodges, and Ausley--all located in Oklahoma City.

In order to have a confidence limit of 95 percent with a standard deviation of not more than 0.5 a sample of 1,000 way bills was determined for each of the three carriers.

Random numbers were used to choose which way bills were to be extracted.

For the determination of a final sample size, it was felt that three sets of data were most significant. They were (1) the number of pieces per shipment; (2) the carrier's revenue; (3) the total revenue for all carriers involved in the shipment.

When we examined the results of the sample with regard to the total number of pieces in a shipment, we found the following results:

Ausley:
Range--1 piece minimum, 190 pieces maximum
Mean--9.40 pieces
Standard Deviation--16.60 pieces

Hodges:
Range--1 piece minimum, 540 pieces maximum
Mean--11.62 pieces
Standard Deviation--61.06 pieces

The examination of carrier revenue showed the following characteristics:

Ausley:
Range--$3.15 minimum, $79.79 maximum
Mean--$5.11
Standard Deviation--$6.59

Hodges:
Range--$1.27 minimum, $3,800.46 maximum
Mean--$12.72
Standard Deviation--$141.84

Lee Way:
Range--$1.13 minimum, $893.32 maximum
Mean--$24.78
Standard Deviation--$62.80

The total revenue to all carriers involved in a shipment reflected the following:

Ausley:
Range--$3.15 minimum, $150,75 maximum
Mean--$11.46
Standard Deviation--$17.41

Hodges:
Range--$1.27 minimum, $326.40 maximum
Mean--$14.42
Standard Deviation--$23.68

Lee Way:
Range--$1.13 minimum, $893.32 maximum
Mean--$31.06
Standard Deviation--$68.14

It became apparent that the data was either skewed or multimodal from the above results. Therefore sorts were made on each of the characteristics; when this was done, it was found that ten to fifteen percent of the data, in total, found on either one or both of the extremes was distorting the results. When new descriptions of the data were made omitting the extreme data and coefficients of variation were calculated we came up with the following results:

Number of pieces:
Ausley--0.77
Hodges--0.96
Lee Way--0.99

Carrier revenue:
Ausley--0.47
Hodges--0.59
Lee Way--0.65

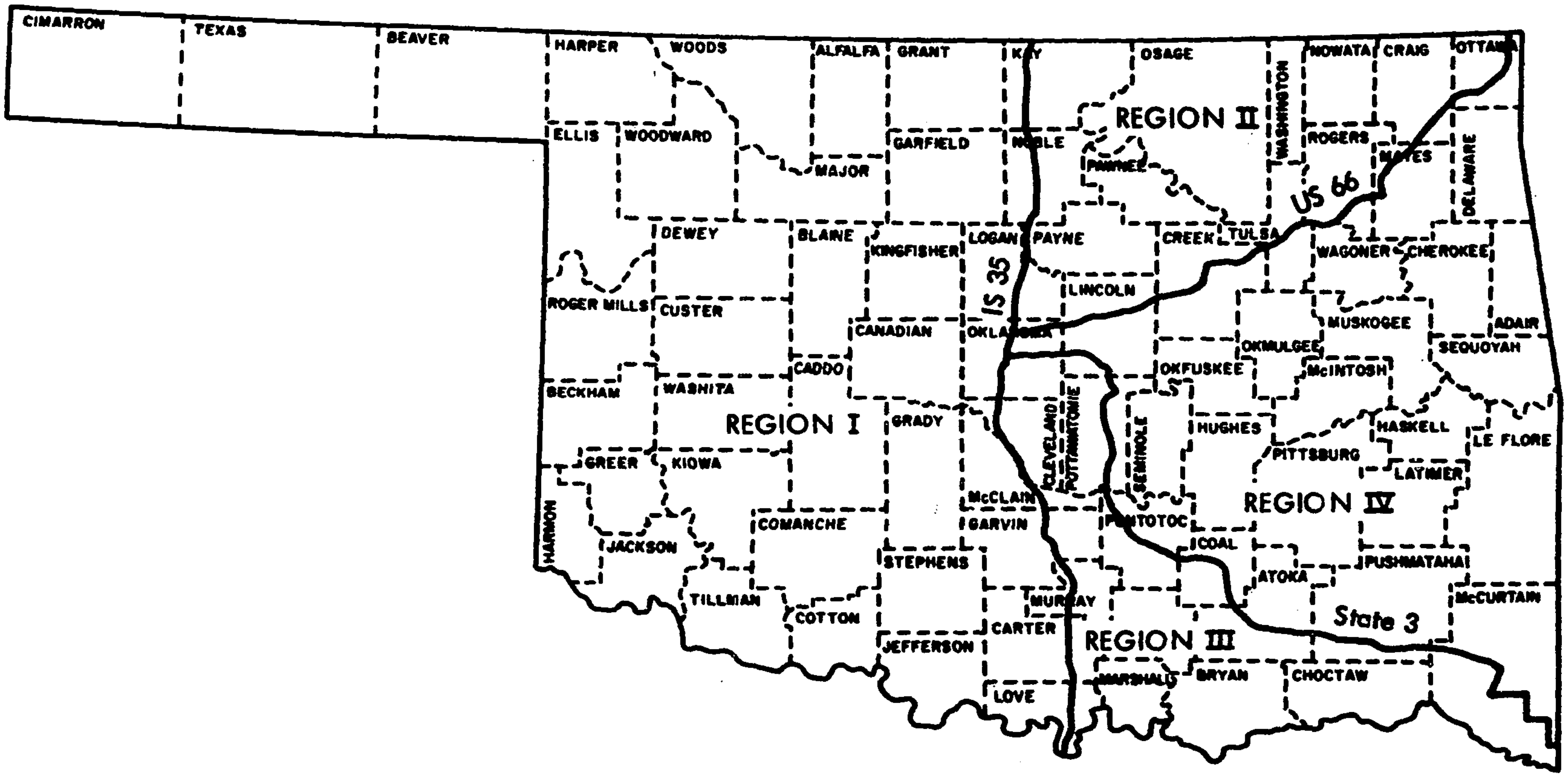
Total revenue:
Ausley--0.38
Hodges--0.53
Lee Way--0.46

Using the above results we were able to determine that with a sample size of 300 at the 95 percent confidence level we would have a precision ranging between four and eleven percent. This degree of precision we feel is great enough for the total number of carriers involved and the cost that would be incurred if we attempted a higher degree of precision.

On this basis the final sampling procedure was determined with the use of random number tables. Appendix E shows details of this procedure.

APPENDIX B

REGIONAL DIVISIONS OF THE STATE



REGION I
REGION II
REGION III
REGION IV
US 66
IS 35
State 3
CIMARRON
TEXAS
BEAVER
HARPER
WOODS
ALFALFA
GRANT
OSAGE
NOWATA
CRAIG
WASHINGTON
ELLIS
WOODWARD
MAJOR
GARFIELD
PAWNEE
ROGERS
DELAWARE
DEWEY
BLAINE
KINGFISHER
LOGAN
PAYNE
CREEK
TULSA
WAGONER
CHEROKEE
ROGER MILLS
CUSTER
LINCOLN
MUSKOGEE
ADAIR
CANADIAN
OKMULGEE
SEQUOYAH
CADDO
OKFUSKEE
McINTOSH
BECKHAM
WASHITA
GRADY
HUGHES
HASKELL
LE FLORE
CLEVELAND
POTTAWATOMIE
SEMINOLE
PITTSBURG
GREER
KIOWA
LATIMER
HARMON
McCLAIN
COMANCHE
GARVIN
COAL
JACKSON
STEPHENS
ATOKA
PUSHMATAHA
TILLMAN
COTTON
CARTER
McCURTAIN
JEFFERSON
BRYAN
CHOCTAW
LOVE

APPENDIX C

CARRIER STRATIFICATION

NUMBER OF POINTS SERVED BY CARRIERS IN EACH

GEOGRAPHICAL REGION

Region I		Region II		Region III		Region IV	
Ausley	6	ABFS	1	Braswell	2	ABFS	15
Berney	4	B & B	44	COF	13	B & B	15
B & B	1	Braswell	1	Day	13	Campbell	8
Braswell	2	Circle J	1	Gordons	5	Cherokee	8
Coley	4	Cherokee	1	Gulley	2	COF	3
Day	1	COF	1	Jones	2	Con Fwd	1
Edmond	2	Con Fwd	1	Ryan	44	David	12
Enid	16	Hayes	3	SFTT	11	Day	14
Graves	9	LeeWay	4	Texhoma	7	Gordons	9
Grove	1	Jones	1	Triangle	1	LeeWay	12
Gulley	5	NCC	16			Jones	14
Hodges	*	Rocket	12			M & M	8
Hayes	1	SFTT	38			NCC	2
Keystone	36	Texhoma	1			OBX	29
LeeWay	47	Triangle	1			Prentice	4
Jones	1					Roberts	18
McComas	11					SFFT	18
Red Ball	2					Rocket	26
Rocket	2					Texhoma	10
Rock Island	6					Triangle	1
Roscoes	14					Wilson	13
Ryan	15						

(continued--next page)

NUMBER OF POINTS SERVED BY CARRIERS IN EACH

GEOGRAPHICAL REGION (continued)

Region I		Region II	Region III	Region IV
SFTT	28			
Texhoma	6			
Triangle	7			

NUMBER OF POINTS SERVED BY CARRIERS
IN EACH GEOGRAPHICAL REGION

A - Over $2,500,000 Revenue
B - Over $100,000 to $2,500,000
C - Less than $100,000

Region I

A	B	C
Braswell 2	B & B 1	Ausley 9
Graves 9	Day 1	Berney 4
Lee Way 47	Hodges *	Coley 4
Jones 1	Keystone 36	Edmond 2
Rock Island 6	Loc Way 2	Enid 16
SFTT 28	McComas 11	Grove 1
	Rocket 2	Hayes 1
	Ryan 15	Roscoes 14
	Texhoma 6	Gulley 5
	Triangle 7	

Region II

A	B	C
Braswell 1	B & B 44	ABFS 1
Con Fwd 1	COF 1	Circle J 1
Lee Way 4	NCC 16	Cherokee 1
Jones 1	Rocket 12	Hayes 3
SFTT 38	Texhoma 1	
	Triangle 1	

* In excess of 50.

(continued--next page)

Region III

A	B	C
Braswell 2	COF 13	Gulley 2
Gordons 5	Day 13	Pawhuska 5
Jones 2	Ryan 44	
SFTT 11	Texhoma 7	
	Triangle 1	

Region IV

A	B	C
Con Fwd 1	B & B 15	ABFS 15
Gordons 9	COF 3	Campbell 8
Lee Way 12	Day 14	Cherokee 8
Jones 14	OBX 29	Davis 12
SFTT 18	Roberts 18	M & M 8
	Rocket 26	NCC 2
	Texhoma 10	Prentice 4
	Triangle 1	Wilson 13
		M & V 7

APPENDIX D

SAMPLE CARRIERS

SAMPLE CARRIERS

Region I

A (1)	B (4)	C (2)
Lee Way	Hodges	
	Loc Way	Roscoes
	Triangle	Ausley
	McComas	

Region II

A (1)	B (2)	C (1)
Con Fwd	B & B	Circle J
	Day	

Region III

A (1)	B (2)	C (1)
Braswell	Ryan	Pawhuska
	COF	

Region IV

A (1)	B (2)	C (3)
Graves	OBX	Campbell
	Rocket	Prentice
		M & V

SAMPLE CARRIER SIZE GROUPS AS DETERMINED BY ANNUAL REVENUE

ANNUAL REVENUE

Over $2,500,000

Braswell Motor Freight Lines, Incorporated
Consolidated Forwarding Company
Graves Truck Line, Incorporated
Lee Way Motor Freight, Incorporated

$100,000 to $2,500,000

B and B Lines, Incorporated
Central Oklahoma Freight Line, Incorporated
H. A. Day Truck Line
Joe Hodges Transportation Corporation
Locway, Incorporated
McComas Truck Lines, Incorporated
Oklahoma Border Express
Rocket Freight Lines Company
Ryan Freight Lines
Triangle Express, Incorporated

Less than $100,000

Ausley Motor Freight
A. B. Campbell
Circle J Freight Lines, Incorporated
M & V Express, Incorporated
Pawhuska Motor Freight, Incorporated
Prentice Truck Line, Incorporated
Roscoe's Freight Line

ALPHABETICAL LISTING AND HEADQUARTERS OF OKLAHOMA CERTIFIED MOTOR CARRIERS INCLUDED IN THE STUDY

Ausley Motor Freight	El Reno, Oklahoma
B and B Lines, Incorporated	Tulsa, Oklahoma
Braswell Motor Freight Lines, Incorporated	Dallas, Texas
A. B. Campbell	Stigler, Oklahoma
Central Oklahoma Freight Lines, Incorporated	Tulsa, Oklahoma
Circle J Freight Lines, Incorporated	Tulsa, Oklahoma
Consolidated Forwarding Company	St. Louis, Missouri
H. A. Day Truck Line	Oklahoma City, Oklahoma
Graves Truck Line, Incorporated	Salina, Kansas
Joe Hodges Transportation Corporation	Oklahoma City, Oklahoma
Lee Way Motor Freight, Incorporated	Oklahoma City, Oklahoma
Locway, Incorporated	Lawton, Oklahoma
M & V Express, Incorporated	Tulsa, Oklahoma
McComas Truck Lines, Incorporated	Chickasha, Oklahoma
Oklahoma Border Express	Fort Smith, Arkansas
Pawhuska Motor Freight, Incorporated	Tulsa, Oklahoma
Prentice Truck Line, Incorporated	Stigler, Oklahoma
Rocket Freight Lines Company	Tulsa, Oklahoma
Roscoe's Freight Line	Enid, Oklahoma
Ryan Freight Lines	Oklahoma City, Oklahoma
Triangle Express, Incorporated	Oklahoma City, Oklahoma

APPENDIX E

RANDOM NUMBER RESULTS

Leeway

Month	Week	4-5 1	6-7 2	8-9 3	0-1 4	2-3 5	Random Number*
January				X			80895
February					X		07454
March				X			95504
April		X					40864
May		X					54304
June			X				64104
July			X				60280
August					X		08705
September						X	26874
October		X					59307
November				X			88497
December		X					54870

*J. G. Kemeny, A. Schlaifer, J. L. Snell, G. L. Thompson, Finite Mathematics (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1962), p. 468.

Column 3, start with first number, first digit from left. If no fifth week in the month, move to the first week.

Week	Day	8-9 Mon	0-1 Tues	2-3 Wed	4-5 Thurs	6-7 Fri	Random Number*
1		X					78806
2				X			73306
3		X					89939
4			X				41958
5						X	86031

*J. G. Kemeny, A. Schlaifer, J. L. Snell, G. L. Thompson, Finite Mathematics (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1962), p. 470.

Column 4, down from the top 18th number, second digit from left.

If day not available in first or fifth week, move back one at a time until day is available.

Ausley

Month	Week	0-1 1	2-3 2	4-5 3	6-7 4	8-9 5	Random Number*
January				X			58247
February					X		65749
March					X		78316
April					X		77109
May		X					15227
June				X			54801
July					X		73188
August						X	90391
September		X					12118
October						X	86886
November				X			53778
December				X			57833

*J. G. Kemeny, A. Schlaifer, J. L. Snell, and G. L. Thompson, Finite Mathematics (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1962), p. 469.

Column 2, down from top 13th number, first digit. If no 5th week in month, move to first week.

Week	Day	4-5 Mon	6-7 Tues	8-9 Wed	0-1 Thurs	2-3 Fri	Random Number*
1				X			25899
2		X					41443
3				X			97816
4		X					36546
5				X			23994

*J. G. Kemeny, A. Schlaifer, J. L. Snell, and G. L. Thompson, Finite Mathematics (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1962), p. 471.

Column 3, down from top 21st number, third digit.
If day not available in first or fifth week, move back one at a time until day is available.

Date of waybills for the following carriers:

	Leeway	Hodges	Ausley
January	20	3	15
February	25	7	17
March	17	17	24
April	4	14	21
May	5	9	2
June	11	25	18
July	9	3	28
August	19	20	1
September	30	5	1
October	3	27	29
November	17	7	19
December	1	24	17

Reduce waybills so as not to pick more than 84 in any one month.

Divide those of day chosen by 84; determine ratio.

Ratio	Pick waybills ending in number:
0 - 1.24	All
1.25 - 2.49	0,2,4,5,6,9
2.50 - 3.49	0,4,6
3.50 - 7.49	3,5
7.50 - 12.49	0
12.50 - 23.49	every second one ending in 3
23.50 - over	every third one ending in 7

	1.25-	2.50-	3.50-	7.50-	12.50-	23.50-
Random number:	09452[a]	6248 [b]	58329[c]	80307[d]	80307[e]	80307[f]
	49864	09255	37591			
	49930	49979				
	80189					
	37330					
	51902					
	58480					
	35094					
	17236					
	85785					

[a]J. G. Kemeny, A. Schlaifer, J. L. Snell, and G. L. Thompson, Finite Mathematics (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1962), p. 469.
Column 2, 26th number from top, last digit from the left.

[b]J. G. Kemeny, A. Schlaifer, J. L. Snell, and G. L. Thompson, Finite Mathematics (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1962), p. 468.
Column 1, first number, first digit on left.

[c]J. G. Kemeny, A. Schlaifer, J. L. Snell, and G. L. Thompson, Finite Mathematics (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1962), p. 471.
Column 4, start with bottom number, third digit from the left.

[d]J. G. Kemeny, A. Schlaifer, J. L. Snell, and G. L. Thompson, Finite Mathematics (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1962), p. 470.
Column 3, first number, second digit.

[e]J. G. Kemeny, A. Schlaifer, J. L. Snell, and G. L. Thompson, Finite Mathematics (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1962), p. 470.
Column 3, first number, third digit.

[f]J. G. Kemeny, A. Schlaifer, J. L. Snell, and G. L. Thompson, Finite Mathematics (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1962), p. 470.
Column 3, first number, last digit.

DATES FOR WAYBILL SAMPLE

Carrier	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Day	21	11	31	23	21	30	1	27	30	29	19	31
Triangle	27	18	24	28	14	17	15	25	16	2	24	4
Roscoe's	27	28	11	8	5	23	8	25	19	31	3	22
McComas	16	10	4	14	23	3	17	22	9	13	28	31
Locway	15	28	12	30	14	30	16	20	10	2	12	17
B & B	28	19	27	16	30	26	29	5	10	7	27	2
Circle J	8	12	24	28	26	23	28	13	30	1	5	17
Con Fwd	20	11	11	28	1	30	21	18	30	14	6	9
Rocket	14	28	28	29	30	30	18	29	9	24	28	1
Braswell	16	3	14	17	30	25	17	21	17	22	20	18
Ryan	23	18	31	2	30	4	2	19	30	23	12	10
COF	31	21	31	18	27	24	14	15	23	31	28	2
Pawhuska	3	7	17	25	19	13	21	22	26	24	17	12
OBX	22	26	26	30	14	30	1	13	24	8	12	31
M & V	13	6	28	3	12	27	25	11	4	30	10	4
Campbell	17	11	3	7	30	2	8	4	9	14	28	1
Graves	29	6	19	16	23	12	30	29	4	15	6	31
Prentice	27	6	17	28	19	16	3	18	22	20	6	29
Lee Way	20	25	17	4	5	11	9	19	30	3	17	1
Hodges	3	7	17	14	9	25	3	20	5	27	7	24
Ausley	15	17	24	21	2	18	28	1	1	29	19	17

APPENDIX F

COST COMPONENTS

COST COMPONENTS

Cost Center Activity	Weighted Average	Unit
Pickup and Delivery	$2.97	Shipment
Payroll with fringes	2.48	Shipment
Vehicle costs	0.49	Shipment
Depreciation		
Maintenance		
Fuel and Oil		
Tires		
Taxes		
Documentation	$1.44	Shipment
Payroll with fringes	1.29	Shipment
Equipment depreciation	0.05	Shipment
Forms and supplies	0.10	Shipment
Administration	$1.27	Shipment
Payroll with fringes, Sales, Tariff, Advertising, Communications, Supplies, Purchasing, Utilities, Rent, Property insurance, Taxes, other indirect		
Claims	$0.05	Shipment
Dock Handling	$0.21	Piece
Payroll with fringes, Equipment depreciation, Other direct		
Line Haul	$0.47	Mile
Payroll with fringes	0.29	Mile
Vehicle costs	0.18	Mile

APPENDIX G

DISTANCES BETWEEN ZIP CODE CENTERS AND ZIP CODE COMMUNITIES IN MILES

731-- to	Miles	731-- to	Miles	731-- to	Miles
73001	93	73034	15	73066	8
73002	15	73035	55	73067	57
73003	87	73036	30	73068	22
73004	11	73038	80	73069	18
73005	65	73039	60	73073	46
73006	74	73040	52	73074	45
73007	19	73041	106	73075	54
73008	12	73042	73	73076	59
73009	85	73043	49	73077	63
73010	29	73044	32	73078	20
73011	59	73045	13	73079	44
73012	77	73046	67	73080	32
73013	58	73047	61	73081	72
73014	45	73048	67	73082	68
73015	92	73049	17	73083	28
73016	34	73050	41	73084	8
73017	61	73051	33	73086	82
73018	47	73052	51	73087	68
73020	19	73053	89	73088	63
73021	90	73054	20	73089	28
73023	121	73055	77	73090	26
73024	89	73056	59	73091	82
73025	75	73057	40	73092	55
73027	39	73058	40	73093	29
73028	42	73059	36	73094	73
73028	65	73060	14	73095	38
73030	73	73061	76	73096	75
73031	35	73062	99	73097	8
73032	94	73063	39	73098	63
73033	98	73064	16	73099	19
		73065	19		

73401 to	Miles
73401	0
73430	30
73432	43
73434	39
73435	32
73436	16
73437	28
73438	36
73439	31
73440	31
73441	48
73442	46
73443	9
73446	24
73447	15
73448	17
73449	44
73450	34
73451	22
73452	24
73453	8
73454	32
73455	22
73456	38
73457	45
73458	9
73459	27
73460	26
73461	51
73462	57
73463	28
73464	40
73465	18
73466	34

73501 to	Miles
73501	0
73503	2
73520	53
73521	52
73526	62
73527	13
73528	23
73529	44
73530	57
73531	32
73532	66
73533	28
73537	78
73538	16
73539	62
73540	18
73541	20
73542	46
73543	10
73544	78
73545	81
73546	37
73547	77
73548	44
73549	42

73501 to	Miles
73550	86
73551	41
73552	20
73553	38
73554	82
73555	43
73556	68
73557	8
73558	24
73559	36
73560	64
73561	79
73562	28
73563	95
73564	47
73565	63
73566	32
73567	24
73568	34
73569	72
73570	52
73571	104
73572	24
73573	54

73601 to	Miles
73601	0
73620	4
73622	9
73624	19
73625	22
73626	18
73627	40
73628	66
73632	16
73639	16
73641	26
73642	94
73643	39
73644	26
73645	56
73646	34
73647	12
73650	38
73651	38
73654	57
73655	46
73656	66
73658	32
73659	24
73660	80
73661	27
73662	43
73663	47
73664	32
73665	74
73666	63
73667	37
73668	63
73669	25
73673	52

73701 to	Miles
73701	0
73716	47
73717	72
73718	25
73719	69
73720	13
73721	10
73722	65
73723	65
73724	59
73725	85
73726	40
73727	13
73728	53
73729	33
73730	23
73731	48
73733	17
73734	29
73735	14
73736	12
73737	41
73738	20
73739	24
73741	35
73742	19
73743	24

73701 to	Miles
73744	53
73745	49
73746	66
73748	26
73749	36
73750	39
73753	11
73754	10
73755	67
73756	39
73757	31
73758	61
73759	34
73760	15
73761	28
73762	49
73763	43
73764	54
73765	35
73766	21
73767	41
73768	19
73770	54
73771	47
73772	65
73773	8

73801 to	Miles
73801	0
73832	36
73833	51
73834	35
73835	31
73837	53
73838	40
73840	14
73841	15
73842	34
73843	23
73844	57
73845	37
73847	65
73848	38
73850	41
73851	24
73852	10
73853	19
73855	52
73856	45
73857	15
73858	31
73859	23
73860	40

73942 to	Miles
73901	32
73930	34
73931	45
73932	69
73933	56
73935	55
73936	25
73937	76
73938	60
73939	10
73941	56
73942	0
73944	18
73945	20
73946	96
73947	72
73948	9
73949	20
73950	38
73951	30
73952	84

741-- to	Miles
74001	39
74002	44
74003	49
74008	20
74010	37
74012	18
74015	15
74016	46
74017	28
74020	42
74021	16
74022	60
74023	50
74026	62
74027	47
74028	43
74029	53
74030	40
74031	38
74032	68
74033	13
74034	55
74035	47
74036	30
74037	10
74038	52
74039	22
74040	67
74041	20
74042	52
74043	26
74044	28

741-- to	Miles
74045	58
74046	49
74047	25
74048	41
74051	35
74052	45
74053	26
74054	44
74055	13
74056	53
74058	56
74059	66
74060	29
74061	31
74062	61
74053	14
74066	14
74068	50
74069	66
74070	23
74071	47
74072	62
74073	10
74074	69
74079	55
74080	33
74081	40
74082	31
74083	66
74084	57
74085	55

74301 to	Miles
74301	0
74330	18
74331	15
74332	10
74333	15
74335	40
74336	21
73337	36
74338	53
74339	35
74340	18
74342	37
74343	20
74344	29
74346	38
74347	66
74349	15
74350	16
74351	59
74352	44
74353	42
74354	30
74358	34
74359	65
74360	41
74361	27
74363	40
74364	52
74365	37
74366	27
74367	28
74368	63
74369	17
74370	26

74401 to	Miles
74401	0
74421	41
74422	23
74423	18
74424	35
74425	46
74426	24
74427	47
74428	29
74429	31
74430	48
74431	50
74432	36
74434	7
74435	32
74436	27
74437	51
74438	38
74439	44
74441	20
74442	53
74445	37

74401 to	Miles
74446	8
74447	42
74450	13
74452	46
74454	14
74455	30
74456	51
74457	44
74458	24
74459	20
74460	48
74461	36
74462	43
74463	10
74464	30
74466	9
74467	19
74468	19
74469	20
74470	30
74472	38

74501 to	Miles	74501 to	Miles	74601 to	Miles
74501	0	74549	71	74601	0
74520	10	74552	36	74630	35
74521	59	74553	17	74631	20
74522	6	74554	3	74632	28
74523	75	74555	54	74633	22
74524	27	74556	52	74635	21
74525	44	74557	83	74636	32
74528	25	74558	62	74637	44
74529	17	74559	38	74638	49
74530	71	74560	20	74639	43
74531	30	74561	30	74640	49
74533	63	74562	87	74641	21
74534	50	74563	46	74642	10
74535	55	74565	9	74643	30
74536	49	74566	22	74644	14
74538	41	74567	68	74646	27
74540	57	74569	37	74647	03
74541	12	14570	20	74650	50
74542	62	74571	51	74651	22
74543	75	74572	55	74652	31
74544	44	74573	48	74653	15
74545	23	74574	29	74654	31
74546	14	14576	55		
74547	15	74577	61		
74548	11	74578	32		

74701 to	Miles
74701	0
74720	12
74721	20
74722	142
74723	20
74724	135
74725	8
74726	13
74727	30
74728	107
74729	17
74730	5
74731	16
74733	19
74734	116
74735	67
74736	87
74738	57
74739	110
74740	106
74743	52
74745	95
74747	17
74748	10
74750	82
74751	76
74753	12
74756	61
74759	40
74761	69
74762	115
74763	15
74764	78
74765	25
74766	87
74767	24

74801 to	Miles
74801	0
74820	50
74824	40
74825	68
74826	28
74827	49
74828	41
74829	34
74830	23
74831	42
74832	41
74833	40
74834	26
74836	73
74837	27
74838	10
74839	68
74840	04
74841	32
74842	62
74843	60
74844	47
74845	82
74846	66
74848	38
74849	35
74850	52
74851	8
74852	20

74801 to	Miles
74854	24
74855	10
74856	80
74858	28
74859	41
74860	29
74861	21
74862	51
74863	70
74864	22
74865	64
74866	24
74867	44
74868	18
74869	21
74871	64
74872	42
74873	7
74875	41
74876	51
74877	84
74878	36
74879	28
74880	58
74881	36
74882	51
74883	42
74884	30
74885	41

74953 to	Miles
74901	31
74902	14
74929	37
74930	18
74931	59
74932	9
74933	17
74935	20
74936	43
74937	13
74939	18
74940	8
74941	31
74942	30
74943	38
74944	29
74945	61
74946	55
74947	13
74948	47
74949	43
74950	29
74951	9
74953	0
74954	58
74955	36
74956	5
74957	56
74958	52
74959	18
74960	65
74962	47
74963	62
74964	85
74965	78
74966	9

Source: Adapted from <u>Official State Highway Map/1969</u> (Oklahoma City: State Highway Commission, 1969).

APPENDIX H

"WITH DUE APOLOGIES TO ABE LINCOLN"

"WITH DUE APOLOGIES TO ABE LINCOLN"

"Four score and three years ago our Congress wrought for transportation, a new agency, conceived in the public interest, and dedicated to the proposition that all shippers should be treated equally.

Now we are engaged in a great legal and economic warfare, testing whether that agency or any other so confused and so obfuscated by terrorists before it can long endure.

We are met in a state which has been a pioneer on the battlefield of that war. We have come to debate a portion of that field to find a right rate from those who gave their lifetime that transport might be confused. It is altogether frustrating and absurd that we do so. Because, with this large nonsense, we cannot determine, we cannot compute, we cannot fathom these rates. The rate men, living but dead, who obfuscated tariffs have confused rates far above our poor power to add, subtract or determine them. The world will little note, nor long remember what we say here, but it can never decipher what the rate men did to tariffs. It is for us--the livid researchers to be undeceived by the unintelligible tariffs which they who fought here have so far so nobly obscured. It is research by us to unscramble the freak tariffs stacked high before us--that from these horrendous rates we take increases ex parte determination, which caused that which is impossible to measure or determine--that we here highly resolve that those rates which are dead shall go down the drain, the transportation under ICC shall have new competitive rate structures, and that rate computerization in the public interest, for the public interest will be possible in this country."

Herbert O. Whitten, at the Seminar on "Transportation Costing and Pricing for the Seventies," at the University of Wisconsin, February 18, 1970.

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