TRANSPORTATION OF LIVESTOCK AND LIVESTOCK PRODUCTS IN CANADA: A DESCRIPTIVE ANALYSIS

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by

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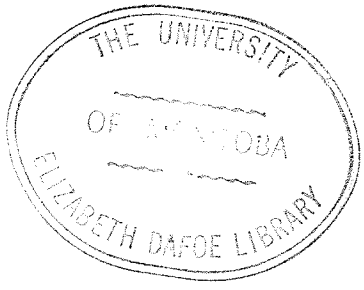

ABSTRACT

TRANSPORTATION OF LIVESTOCK AND LIVESTOCK PRODUCTS IN CANADA: A DESCRIPTIVE ANALYSIS

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Transportation is one of the essential marketing functions performed in the overall marketing of livestock and livestock products. The Canadian transportation environment, particularly since World War II, has undergone substantial changes which have affected the movement of commodity freight. The principal goal of this thesis was to examine what some of these changes have been and how the transportation of livestock and livestock products has been affected. Railway and motor trucks are the main carriers of this commodity group; although, aviation has steadily been increasing in importance.

The nature of the study is primarily descriptive and qualitative, and the treatment is extensive rather than intensive due to the broadness in scope of the subject matter.

Six main objectives guided the development of the study. They are as follows:

(1) to review some literature on the theory of transportation economics relevant to the transportation of

livestock and livestock products;

(2) to investigate in a descriptive way the distribution of volumes of livestock and livestock products marketed, between railway and truck and note what changes have taken place over time;

(3) to examine some aspects of rate making for the transportation of livestock and livestock products;

(4) to describe the institutional factors affecting the movement of livestock and livestock products;

(5) to identify recent technological advances for railway and truck affecting transportation of livestock and livestock products; and

(6) to attempt to identify likely future changes in the transportation of livestock and livestock products.

The major finding of the study was that by far the majority of livestock and livestock products transported in Canada were shipped by motor truck. For-hire and private intercity class trucks hauled 90.6 per cent of the total tons of this commodity group carried by rail and truck in 1965. Also the proportion of livestock delivered by truck to public stockyards and packing plants has increased substantially in the last two decades. On the average for all Canada during 1947-51 about 50 per cent of public stockyard deliveries and about 60 per cent of packing plant deliveries arrived by truck; during 1952-56 approximately 75 per cent of stockyard

deliveries and 70 per cent of packing plant deliveries arrived by truck; and by 1967 about 90 per cent of all deliveries to public stockyards and packing plants were made by truck.

As livestock and livestock truckers made heavy inroads into traffic of this commodity group, railroads were forced to issue truck competitive rates in an effort to retain their share of the traffic. In effect, they were forced to place more emphasis on cost pricing of their services instead of setting rates by the traditional value of service criterion. Trucking freight rates more nearly approximated cost of service pricing although railway rates were often used as a guide for setting maximum truck rates. Truckers also relied heavily on the quality of service they were able to provide through greater flexibility, convenience and speed.

From time to time it has been deemed necessary to extend financial aid to ease the plight of railways and/or particular groups of shippers. With the advent of the competitive era in Canadian transportation, such subsidies took on implications for inter-modal competition and the railways could no longer be thought of as the more or less "neutral" link between shipper and receiver.

Clearly, the relative rates of technological advances among modes have a direct bearing on the cost and quality of service advantages one carrier has over another. Some evidence in this regard is also included in the study.

ACKNOWLEDGEMENTS

I wish to acknowledge and thank all those persons who have contributed to the educational experience of writing this thesis.

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The financial support made available by the Center for Transportation Studies, while I was a student in the Department of Agricultural Economics, is gratefully acknowledged. I wish to thank Mr. T.O. Riecken of the Canada Department of Agriculture for allowing me to complete the final stages of this study while already on the job.

I am also grateful to those individuals in the livestock and transportation business world who took some time to talk with me. They are not mentioned by name here but their specific comments, where used in the text, are duly accredited.

A special thank you to my wife for the many little ways she assisted me in completing this study, and whose many sacrifices I hope I shall not soon forget.

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CHAPTER I

INTRODUCTION

A. HISTORICAL BACKGROUND OF TRANSPORTATION IN CANADA

Transportation activity in Canada dates back to a time even before Confederation and it has continued to be a vital activity to this very day. The geographic expanse of the Dominion has made transportation and communication a very important, if not at times problematic, element of national growth and unity. In its preface the MacPherson Royal Commission on Transportation referred to transportation as being ". . . of the very fibre of the Canadian experience. . . ." [72].

Except for the competition of a few inland waterways, the transportation environment from 1850 till the 1930's was characterized by the railways enjoying a unique monopolistic position in land transportation [72, pp. 2-6]. Already in the 1930's truckers forced railways to reduce many of their rates and, as time went on, the railroads had to compete with motor cars, buses, aviation and pipelines [2, p. 477]. Naturally, the growth of these other modes reduced the railways' share of the total amount of traffic in Canada.

An indication of this trend is shown in Table 1.1 where the railways' share of intercity ton-miles dropped from a peak of 72 per cent in 1946 to 42 per cent in 1965. In absolute magnitudes, a few calculations made from the data in Table 1.1 will show that total intercity ton-miles performed in Canada increased nearly fourfold between 1938 to 1965, whereas rail intercity ton-miles only increased about threefold during the same period (i.e. from 27.0 billion ton-miles in 1938 to 84.4 billion in 1965). The motor truck share during this time tripled from 3 per cent to 9 per cent which, when coupled with the almost fourfold increase in total intercity ton-miles, resulted in an absolute increase in truck intercity ton-miles of nearly 12 times (i.e. from 1.6 billion ton-miles in 1938 to 18.1 billion in 1965).

The reasons for this phenomenal growth in the trucking industry, particularly in connection with livestock and livestock products transportation, will become more apparent throughout the course of the thesis but, basically, the reasons include more and better roads, technologically improved trucks, and speed and flexibility of trucking services. To be sure, the railways have also made great technological progress, which has enabled them to provide better services but truckers still possessed certain advantages over rail. Truck operators are not confined to a set

TABLE 1.1

Intercity Ton-Miles Performed in Canada by Type of Carrier*

Year	Total (billions)	Rail %	Road %	Water %	Air %	Oil Pipeline %	Gas Pipeline %
1938	53	51	3	46	--[a]	--	--
1946	77	72	5	24	--	--	--
1951	105	61	8	30	--	1	--
1956	145	54	7	27	--	11	--
1961	152	43	11	26	--	14	6
1965	201	42	9	27	--	14	8

[a]-- Less than one-tenth of 1 per cent or non-existent.

*Source: A.W. Currie, Canadian Transportation Economics. Toronto: University of Toronto Press, 1967. p. 478.

of steel tracks or rigid time schedules. Motor vehicles do not have the longevity of working life that railway rolling stock and equipment does and so obsolete highway equipment can be replaced sooner with new equipment.

The competition between rail and truck has been, and is, a struggle for traffic, which has had three main effects. It has deprived the railroads of traffic, it has forced the railroads to lower rates, and it has brought about a greater emphasis on the quality of transportation services [2, pp. 477-78].

Livestock and livestock products are among the many commodities transported by rail and truck and, as such, have

been affected by these developments in inter-modal competition. It is the purpose of this thesis to examine the role of transportation in the overall marketing of livestock and livestock products from producer to consumer, and to examine how changes in the transportation environment may have affected this role.

B. TRANSPORTATION OF LIVESTOCK AND LIVESTOCK PRODUCTS

Importance Within the Livestock Marketing System

In the overall marketing process of moving live animals from the producer's premises to the final sale of meat to the consumer, a number of marketing functions are performed, including buying and selling, transporting, assembly and storage, standardization and grading, processing, financing, risk taking and disseminating market information [56, p. 53]. Since place utility is created when commodities are transported from points where their economic value is less to points where their economic value is greater, this study is primarily concerned with the transporting activity and so it will be singled out for purposes of analysis.

A diagramatic outline of the livestock marketing channels and a detailed examination of the transportation involved at each step will be presented in a later section.

Importance to the Carriers of Livestock and Livestock Products

The two principal modes of transportation engaged in hauling livestock and livestock products are the railways and motor trucks. Air transport of this commodity group is small, though not to be overlooked, particularly when viewing future developments.

An indication of the distribution in Canada of the total livestock and livestock products hauled by rail and truck is given in Table 1.2.[1] Nearly 90 per cent of the livestock and livestock products, in terms of weight, was carried by trucks. To the extent that private urban and farm class trucks also carry this commodity group, the truck share is understated.

Of the total revenue tons carried by Canadian railways, livestock and livestock products make up less than 1 per cent and this proportion has decreased considerably in the past twenty years as shown in Table 1.3.

Even though secondary industry and, therefore the volume of manufactured products, has increased greatly over these years, this class of commodities has remained virtually constant at about 30 per cent of total revenue freight carried. Manufactured products are generally high-valued, whereas mine products, which are low-valued, have increased from 33 per cent to nearly 45 per cent. In other words, the railways have been unsuccessful in retaining the high-valued, high revenue earning goods and are still carrying approximately the same proportion of bulk, low-valued goods (i.e. agricultural products, mine products, and forest products

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[1]The data in Tables 1.1, 1.2 and 1.4 could not be brought up to date at the time of writing because of the apparent delay in publishing the source, Motor Transport Traffic by Commodities, Dominion Bureau of Statistics No. 53-004.

TABLE 1.2

Total Livestock and Livestock Products Hauled by Rail and Trucks in Canada* ('000 Tons)

Year	Rail[a]	Truck[b]	Total	% by Rail	% by Truck
1960	1,612	11,529	13,141	12.3	87.7
1961	1,619	13,145	14,764	11.0	89.0
1962	1,505	11,972	13,477	11.2	88.8
1963	1,526	12,401[c]	13,927	11.2	88.8
		11,856[d]	13,382	11.4	88.6
1964	1,659	12,392[d]	14,051	11.8	88.2
1965	1,459	14,064[d]	15,523	9.4	90.6

[a]Fish, wool and hides are also included.

[b]Weight of live animals, meat and meat preparations, dairy produce, eggs and honey carried by for-hire and private intercity class trucks including their urban operations but excluding operations of private urban and farm class trucks.

[c]Including urban operations.

[d]Excluding urban operations.

*Source: Railway Freight Traffic. Dominion Bureau of Statistics No. 52-205. Ottawa: Queen's Printer.

Motor Transport Traffic by Commodities. Dominion Bureau of Statistics No. 53-004. Ottawa: Queen's Printer.

still make up nearly 70 per cent of the total). If the railways hoped to maintain the same level of total revenue, despite the decline in high revenue earning traffic, freight rates on other commodities would have to be raised. The historical development of rail rates, particularly of animal and animal product freight rates, is discussed in Chapter IV.

TABLE 1.3

Per cent Distribution of Revenue Tons of Canadian Railways for Selected Years*

Year	Plant Products of Agriculture	Animals & Animal Products	Mine Products	Forest Products	Mfg. & Misc.	All L.C.L. Freight[a]
1946	22.27	2.34	32.93	11.95	30.51	-
1950	16.88	1.60	38.68	10.97	31.88	-
1955	16.28	1.23	41.60	10.53	29.05	1.32
1960	16.95	1.02	41.18	9.45	30.56	0.83
1965	14.79	0.71	44.58	8.91	30.41	0.60
1967	14.05	0.66	43.76	9.90	31.31	0.32

[a]L.C.L.--Less than carload lot. For 1946 and 1950 this item is included in "Mfg. & Misc."

*Source: Railway Freight Traffic. Dominion Bureau of Statistics No. 52-205. Ottawa: Queen's Printer.

For-hire and private intercity motor trucks in 1965 carried over 238 million tons of which 5.9 per cent consisted of animals and animal products (Table 1.4). The span of years for which data were available is probably too

TABLE 1.4

Distribution of Revenue Tons Carried by For-Hire and Private Intercity Class Trucks[a] in Canada, 1961-65*

Year	Plant Products of Agriculture	Animals & Animal Products	Crude Materials, Inedible	Fabricated Materials, Inedible	End Products, Inedible	General Freight	Grand Total
			(Thousand Tons)				
1961	20,832	13,145	139,004	62,073	16,718	29,933	281,705
1962	23,303	11,972	143,745	66,271	15,660	35,573	296,524
1963	18,936	11,856	99,182	51,206	12,827	17,808	211,815
1964	18,541	12,392	73,523	47,818	13,120	17,796	183,190
1965	22,776	14,064	104,168	62,071	15,936	19,148	238,163
			(Per Cent)				
1961	7.4	4.7	49.4	22.0	5.9	10.6	100.0
1962	7.9	4.0	48.5	22.3	5.3	12.0	100.0
1963	8.9	5.6	46.8	24.2	6.1	8.4	100.0
1964	10.1	6.8	40.1	26.1	7.2	9.7	100.0
1965	9.6	5.9	43.7	26.1	6.7	8.0	100.0

[a]1961-62 include urban operations but 1963-65 exclude urban operations.

*Source: Motor Transport Traffic by Commodities. Dominion Bureau of Statistics No. 53-004. Ottawa: Queen's Printer.

short to establish any long-run trends; however, in the five year period, 1961-65, animals and animal products have increased slightly (railways showed a decline), fabricated materials have increased somewhat and crude materials have shown a definite drop (railways showed a definite increase).

If the same kind of data for farm trucks were added into the totals of Table 1.4 the shares for plant products of agriculture and animals and animal products would no doubt be higher.

It can be concluded that the commodity group, livestock and livestock products, is of greater importance for the motor truck industry than for the railroads, both in actual tonnage hauled (Table 1.2) and in relative terms of per cent of total tonnage.

Total air cargo[2] carried by Canadian airlines has been increasing very rapidly in recent years with an annual increase of ton-miles in the neighborhood of 25-30 per cent [57]. An Air Canada official stated that they expected total cargo handled to double every four years and, along with this growth one would expect that livestock and livestock product shipments would almost certainly increase as well. Roughly 35-40 per cent of total Air Canada cargo during the first ten months of 1968 consisted of

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[2]Air cargo equals air freight plus air express.

agricultural commodities of which 5-10 per cent were animals and animal products.[3] Canadian Pacific airlines reported that they carried only "occasional" shipments of livestock and livestock products and none on a regular basis.[4]

C. SCOPE AND OBJECTIVES OF THE STUDY

This thesis has a very broad scope since it studies the transportation of all livestock and livestock products in Canada. The two main modes of transportation that were considered to be most relevant were railway and motor truck. As pointed out earlier, movement of goods by air is rapidly increasing; however, the volume of livestock and livestock products is small, involving only limited quantities of specialty processed meat products rather than any market livestock, i.e., livestock intended for slaughter or feeding.

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[3]These estimates were obtained in a telephone conversation with S.T. Howe, Cargo Sales Manager, Air Canada, Winnipeg. Air shipments of animals and animal products include, for example, sausage, smoked horse meat, kosher meats, fresh fish, live lobster, day-old chicks, breeding stock (hogs, lambs, horses) and zoo specimens.

[4]Telephone conversation with George T. Wells, District Cargo Sales Manager, Canadian Pacific Air Lines, Winnipeg.

The nature of the study is primarily descriptive and qualitative. No attempt is made to describe and analyze interregional movements;[5] instead the movements of livestock and its products through the marketing channels are discussed, while recognizing the fact that these channels may frequently cross regional and provincial boundaries.

The main objectives of this thesis are:

(1) to review some literature on the theory of transportation economics relevant to the transportation of livestock and livestock products;

(2) to investigate in a descriptive way the distribution of volumes of livestock and livestock products marketed, between railway and truck and note what changes have taken place over time;

(3) to examine some aspects of rate making for the transportation of livestock and livestock products;

(4) to describe the institutional factors affecting the movement of livestock and livestock products;

(5) to identify recent technological advances for railway and truck affecting transportation of livestock and livestock products; and

(6) to attempt to identify likely future changes in the transportation of livestock and livestock products.

D. ORGANIZATION OF THE STUDY

Following this introductory chapter, the first task is to introduce the economic theory relevant to the study of

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[5] T.C. Kerr studied trends in regional production and trade of livestock and poultry products in Canada [19, pp. 83-128].

livestock and livestock products transportation. Accordingly, some literature on the theory of rate making and the theory of inter-modal competition is critically reviewed.

The various livestock marketing channels are described in Chapter III, with special attention paid to the physical movements of the live animals and animal products by railway and motor truck.

Transportation involves transportation charges; thus, some aspects of freight rate making for the two modes in question, both historical and current, are examined in Chapter IV. The analysis first deals with considerations of demand for animals and animal products transportation and, secondly, with some supply characteristics of providing animals and animal products transportation services.

Chapter V contains more descriptive and historical material about the institutional and technological factors affecting the transportation of livestock and livestock products.

Finally, Chapter VI summarizes the major conclusions of the study, points to likely future developments, and suggests further areas of research that might profitably be pursued.

E. DEFINITIONS

It is useful at this stage to define some of the terminology that will be used throughout the thesis.

Livestock and livestock products: This phrase is used interchangeably with 'animals and animal products'. In the main, it includes cattle, calves, hogs, sheep and lambs, fresh or frozen meats and by-products (e.g. hides, tallow) except where specifically indicated otherwise.

For-hire carriers: Include two types:

(a) Common Carriers--those firms who hold themselves out to the general public to engage in the transport of property over regular or irregular routes; and

(b) Contract Carriers--those firms under continuing contracts, with one or a limited number of persons or firms, either for the furnishing of transportation service for the exclusive use of each person served or distinct services designed to meet the needs of various customers [62, p. 6].

Private intercity vehicles: "Privately owned trucks (both intercity and rural) which were operated beyond urban areas and were not used directly in connection with farm operations" [63].

Private urban trucks: Privately owned trucks operated within urban areas [64, p. 24].

Farm Trucks: Trucks owned and operated by a farmer [64, p. 24].

CHAPTER II

THEORY OF TRANSPORTATION ECONOMICS: A REVIEW

This chapter reviews some literature on the theory of transportation economics relevant to the transportation of livestock and livestock products. Essentially, concepts from micro-economic theory are applied to problems in transportation. The discussion is divided into two main parts, of which the first reviews two alternative approaches to rate making and the second reviews some theoretical aspects of inter-modal competition.

A. THEORY OF RATE MAKING

Value of Service

In terms of economic theory, value of service or, synonymously, charging what the traffic will bear, ". . . means charging the rate on each commodity . . . which, when the volume of traffic is considered, will make the largest total contribution to fixed or overhead expenses" [7, p. 148].[1] This must be at the point where marginal cost and marginal revenue are equal (MC = MR) and is illustrated in Figure 2.1 [7, p. 149].

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[1]Locklin also defines value of service as, "the highest charge that can be levied without preventing a shipment from moving" [7, p. 146], but George Wilson points out

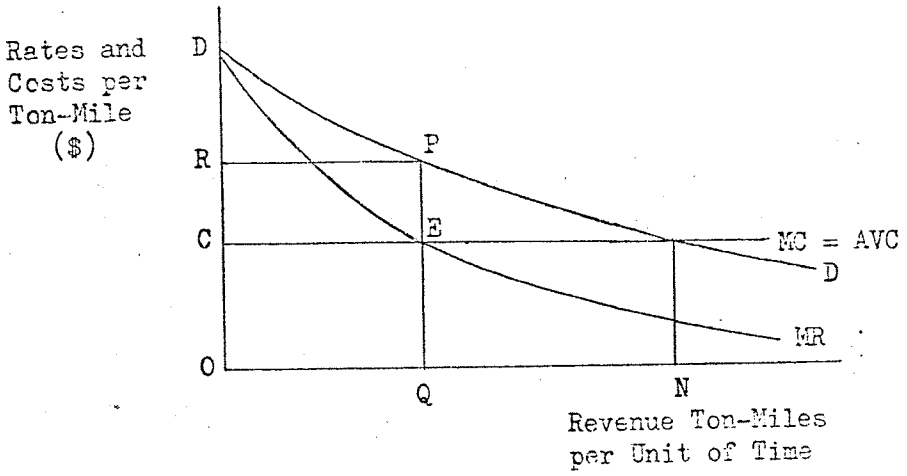

FIGURE 2.1

Illustration of Charging What the Traffic Will Bear

Suppose that DD represents the demand curve for transporting a particular commodity, MR the marginal revenue curve derived from DD, and MC the marginal cost, which is drawn horizontally on the assumption that we are concerned only with a small segment of the transport firm's business (i.e. one of many commodities) and that variable costs per unit of output do not vary over the relevant output

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[11, pp. 151-52] that this is inconsistent with Locklin's other definition on p. 148 and quoted in the text above. The latter definition implies maximizing net revenues (i.e. MC = MR), whereas charging the highest rate possible without preventing a shipment from moving is ambiguous and seems to say that transport firms charge the highest rate possible regardless of net revenues and contribution to overhead.

range.[2] Since MC is constant, average variable cost (AVC) must also be constant and equal to MC.

At point E, MC = MR and quantity OQ ton-miles will be performed at a charge of OR. The area ORPQ will be the gross revenue, OCEQ will be the variable costs, and CRPE the contribution to overhead. Of course, at OQ the contribution to overhead (net revenue) is at a maximum between the one extreme of ON output at a rate of OC just equal to cost, yielding zero net revenue, and the other extreme of OD where no ton-miles are performed and both gross and net revenues will be nil. Economically, one cannot justify a rate less than OC since in that situation not even the variable expenses (out-of-pocket costs) are covered.

Hence, the freight rate charged for a particular commodity depends primarily on the shipper's demand for transporting the commodity and if, as seems likely to be the case, the elasticities of demand for transporting various commodities are different, value of service pricing may simply be regarded as third-degree price discrimination. The necessary conditions required to enable a seller to engage in price discrimination are well known in economic theory [6, pp. 197-200]. In addition to different demand

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[2]The simplifying assumption that MC is constant is not essential to the concept of charging what the traffic will bear. MC could also be increasing while intersecting MR at point E.

elasticities, the seller must possess monopoly power so that buyers cannot avoid a price increase by turning to an alternative seller, and he must be able to separate buyers into two or more markets in such a way that there is no trading among them.

Cost of Service

Cost of service rate making is the situation where the price for performing transportation services is based directly on the cost of providing the services. If a transport firm is a pure monopolist the firm's cost curves may be depicted as in Figure 2.2 [based on reference 6, p. 191]. Assume the transport services are to be priced according to the cost of service principle. (The decision to price solely on the basis of marginal cost while ignoring market demand may either have been imposed by a regulatory agency or it may have been the firm's own decision.) Assume also that market demand is not a limiting factor on the firm's pricing decisions, i.e., the demand function is located to the northeast of points q, q^{1} and q^{11}. The firm may then choose any number of points along its short or long-run marginal cost curves and, for illustration purposes, three possible rate levels are discussed.

If the rate was set at OR, at the intersection of SMC and LMC, the quality produced would be OQ; however, in this situation total revenue would not be sufficient to cover total costs. That is, to move OQ ton-miles it costs the

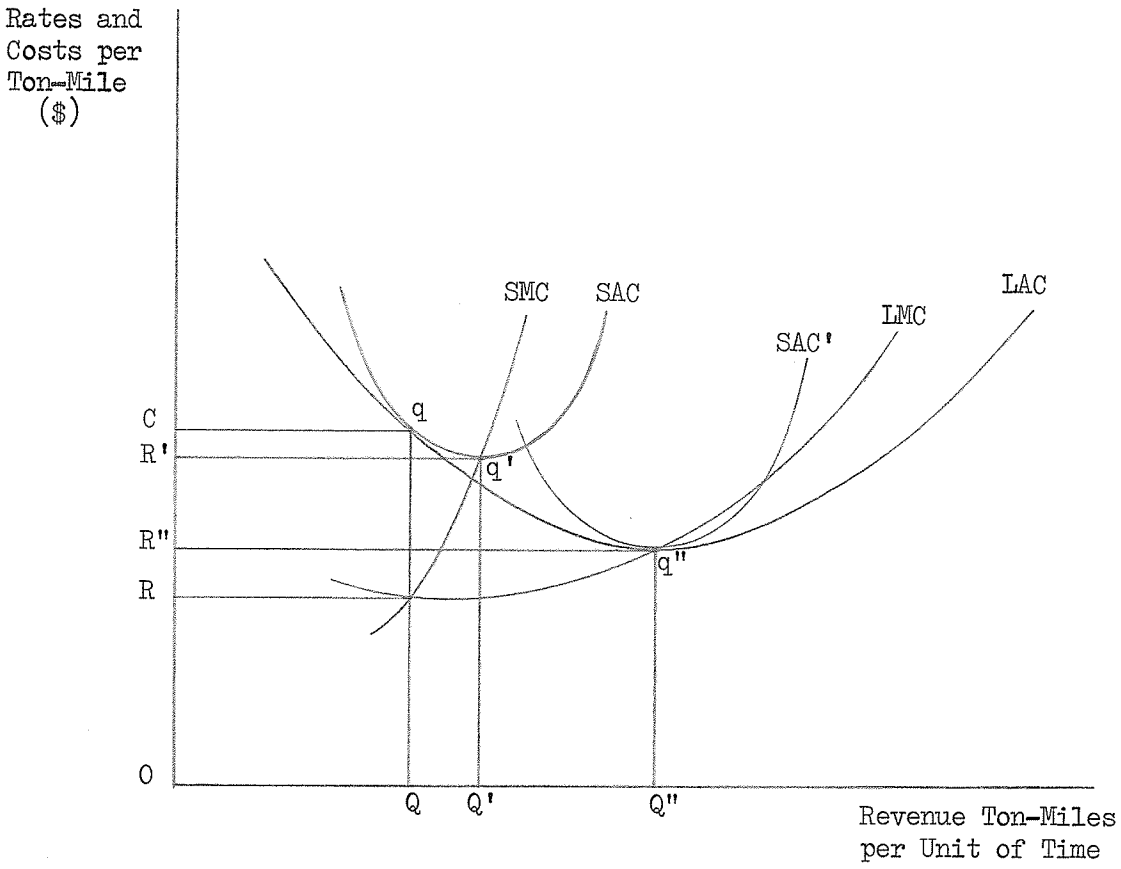

FIGURE 2.2

Cost of Service Pricing

transport firm OC for every ton-mile moved but it only receives an income of OR per ton-mile. Certainly in the long-run, therefore, the firm could not stay in business unless it received some form of subsidy. The amount of the subsidy would be RC per unit of output.

If the rate charged was set at OR^1, output would be OQ^1 ton-miles and no subsidy would be required since both short and long-run total costs would be recovered. In this case shippers would be required to pay OR^1 per ton-mile instead of the lower rate of OR as in the previous example. However, society as a whole would be better off because it now receives more output ($OQ^1 > OQ$) at a lower cost per unit ($OR^1 < OC$). Given output OQ^1, society is still not as well off in the long-run as it could be if the firm built a slightly longer plant so that the new SAC curve would be tangent to LAC at output OQ^1. Essentially, this would involve a movement along LAC in the direction of increasing returns to scale.

Finally, suppose the firm expanded its plant such that the minimum point of the new SAC^1 curve was tangent to the minimum point of the LAC curve, and then set the freight rate at OR^{11} with output OQ^{11}. Again, there would be no subsidy involved. Users of the transport services would be paying RR^{11} per unit more than in the first example but society as a whole would be better off, ceteris paribus, than it was in both previous cases. The firm has taken full advantage of

available economies of scale and is producing at minimum short and long-run average costs.

On this basis one could argue that if a regulatory agency wanted a firm to produce at the long-run optimum scale, then the rate should be set at OR^{11} and the firm should be encouraged to expand to the point where SAC is tangent to the minimum LAC. It should be noted that at this point not only in the firm operating with maximum economic efficiency but also resource allocation from the society's standpoint as a whole is more efficient insofar as no subsidy would be needed (because the entrepreneur is recovering both the long-run average and marginal cost).

Of course, such a policy may give rise to other problems related to the biggness of size and power of the expanded firm. Answers to questions involving economic and political issues cannot be found strictly within the confines of economics. The policy makers will have to balance the importance of the issues involved.

If the optimum allocation of resources[3] is one of the goals of society, then the rate charged by any carrier for

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[3]By an "optimum allocation of resources" is meant an employment of resources which minimizes the costs to society of providing the various productive services. In other words, the allocation is optimum when the value of marginal product of each resource is equal in each of its possible uses and different geographic areas [6, p. 305].

Applied to transportation an optimum allocation requires that the appropriate amount of resources be devoted to transportation as a whole vis-a-vis the non-transport sectors and that the appropriate amount of resources be devoted to each particular mode of transport [11, p. 8].

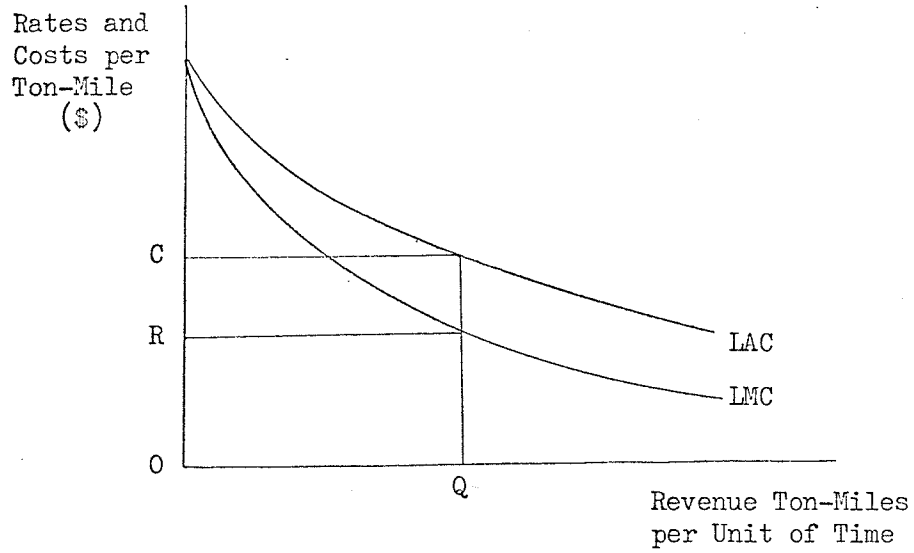

FIGURE 2.3

Cost of Service Pricing Under Increasing Returns to Scale

performing a transport service should or equal the marginal costs to society of providing that service. Under perfectly competitive conditions, this comes about automatically; however, with respect to the transportation industry two conditions exist which violate the requirements for a perfectly competitive solution. Firstly, competition is imperfect, implying that an optimum allocation will not come about automatically and, secondly, the technology of some modes (e.g. railways) may be such that they are subject to declining per unit costs of production in the long-run. Even in the short-run, railways often experience excess capacity (decreasing short-run average

cost) due to the large proportion that fixed costs make up of the total costs.

The long-run situation is illustrated in Figure 2.3, which shows a falling long-run average cost curve (LAC) over the relevant range of output and the long-run marginal cost curve (LMC) necessarily below LAC throughout.

Now, if for any given number of ton-miles, say OQ, a transport firm charged a rate of OR, which was equal to its LMC, total revenue would not be sufficient to cover total costs. Since it is deemed desirable (indeed, necessary for self-sufficiency) that total revenue in the long-run be sufficient to cover total costs, strict adherence to marginal cost pricing must be abandoned. Either some form of subsidy must be paid to the carrier, as was indicated earlier, or some form of price (rate) discrimination must be implemented to make up the gap that exists between LMC and LAC.

Not all transportation economists are agreed as to how the gap should be closed or even what the appropriate cost concepts, upon which the cost curves are based, ought to be, but there is somewhat of a consensus that no rate should be <u>below</u> long-run marginal cost (see for e.g. [8], [11], [9]). Such "non-compensatory" rates would distort the

desired allocation of resources even further.

Meyer, et al. [8, p. 184] point out that, while value of service pricing as used in the long-run and in conjunction with cost of service pricing, distorts resource allocation between the transport sector vis-a-vis the rest of the economy, those undesirable effects must be weighed against the gains of fuller utilization of facilities within the transport industry. That is, rates determined on the basis of value of service will not equal or reflect long-run marginal cost. And inasmuch as transportation is almost a universal input into production processes, its price becomes reflected in the price of almost every commodity. However, when a short-run excess capacity occurs within the transport sector, discriminatory pricing (i.e. value of service) enables the carrier to make fuller use of his investment. There are inefficiencies in both courses of action, which may be very difficult to quantify but whose existence should be recognized nevertheless.

B. THEORY OF INTER-MODAL COMPETITION

The importance of studying inter-modal competition may be found in at least two considerations. The first consideration is the effect inter-modal (or synonymously, "inter-carrier") competition has on the optimum allocation of resources, both among the various modes and among the

transport and non-transport sectors of the economy. The second consideration is the effect inter-modal competition has on the financial viability and stability of transport firms.

With respect to the former, the question of resource allocation as among the different modes is a more immediate concern than the question of allocating resources to the transport sector vis-a-vis the rest of the economy. The latter is important only to the extent that, assuming perfectly competitive conditions, competition among modes results in freight rate structures that more nearly reflect the costs of providing transport services. Rates which bear no relation to costs distort the efficient allocation of resources.

Closely associated to the second consideration is the possible necessity of imposing or relaxing regulatory restrictions in an effort to remove any undesirable consequences of inter-modal competition or lack thereof. Public and private management officers must be clear about what the likely consequences of more or less regulatory restrictions would be and a study of inter-modal competition is useful for this purpose.

The amount of literature that has been written specifically on the theoretical basis of inter-modal competition is indeed very sparse. One reason for this appears

to be the great complexity of transportation economics which renders production theory much less applicable to transportation than earlier writers supposed, and as economists in recent years have focused their attention anew on the transportation field they have discovered that the conventional tools of economic analysis were somehow inadequate for explaining contemporary transport problems. In other words, as economists attempted to solve the ills of modern transport firms they "discovered a veritable gold mine of empty economic boxes" [11, p. 3] which, progress demands, must be filled.

J.R. Meyer, et al.

A major contribution toward fulfilling this task is the work by Meyer, Peck, Stenason and Zwick [8]. The first sentence of the book reads,

> This study assesses the extent of competition in transportation markets and describes what the industry's probable structure would be if these competitive forces were released from regulatory restraints [8, p. 1].

Later, the authors state their objectives in somewhat more detail. They propose to ". . . assemble a sufficient knowledge of transportation costs, market structures, and demand conditions . . ." [8, p. 15], for the dual purpose of obtaining a minimum cost solution to the transportation problem and of determining the need or lack of need for regulation in the transport sector [8, pp. 15-16].

The bulk of the study (including the Appendices) is devoted to determining the cost characteristics of the principal modes of transportation,[4] followed by an analysis of the transport demand characteristics, market structure, and competition. The knowledge gained about the supply and demand components is then synthesized in the concluding chapter whereupon several public policy recommendations are put forth.

No attempt is made in this paper to review and evaluate all the findings of the study and techniques used. The remarks will be limited to a brief summary and evaluation of what the authors say about inter-carrier competition, followed by several critical comments regarding the study as a whole.

In order to allocate traffic among modes on a least-cost basis, the authors employ the following criteria:

Suppose "a" and "b" are two competing modes:

1. If the ATC_a is found to be less than the AVC_b or the MC_b then "a" should carry the traffic.

2, Even though the AVC_a or the MC_a is less than the ATC_b, as long as the ATC_b is less than the ATC_a then "b" should properly carry the traffic [8, p. 146].

With respect to freight traffic (ignoring passenger) it was found on this basis that where water and pipeline

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[4]Railway, highway, water, air and pipelines.

transport were not feasible it was least costly to carry bulk commodities by rail, except possibly for very short distances. In the case of high-valued commodities, both rail carload and rail piggyback were found to be superior in intercity truck transport. And as between rail carload and piggyback movements the latter showed definite advantages by the cost criteria. Apparently, the only role left for intercity trucking was the relatively short-haul movements (less than 100 miles) where its flexibility overshadowed rail service [8, pp. 147-67].

Meyer et al. divide freight traffic into two categories: traffic for which the ceiling on profitable rate increases is set by a competing mode and traffic for which the ceiling on profitable rate increases is set by the demand characteristics of the commodities transported. Presumably, what is meant by the latter category is that the elasticity of demand for transporting a given commodity is greater than or equal to unity, in which case an increase in the freight rate would reduce, or at best, leave total revenue unchanged. The study points out that there is no a priori basis by which commodities can be placed into one or the other of the two categories; however, the authors assume that since high-valued goods are handled by a wider range of transport services these goods can generally be classified as intermodal competitive traffic and low-valued goods as

non-competitive (i.e. corresponding to the second category) [8, pp. 188-89].

At this point Meyer et al. draw on the findings of their cost analysis and bring them to bear on two questions concerning competitive traffic.

> First, to what extent does the present rate structure fail to allocate traffic by relative costs? Second, to what extent would demand characteristics permit competition to achieve a cost-minimizing allocation of traffic between carriers [8, p. 189]?

To best document the extent to which present traffic practices misallocate traffic between competing modes, the study examines the allocation of traffic between truck and rail.

Directing their attention next to the so-called non-competitive, low-valued traffic, Meyer et al. state that the term "market competition", as used in transportation economics, encompasses two distinct types of competition; namely, between different commodities and between differently located suppliers of the same commodity [8, pp. 196-202].

In terms of competition between products, the transport demand depends on the proportion the freight rate is of the delivered price of the product and on the price elasticity of demand for the product itself. The greater the proportion the freight rate is of the delivered selling price of the product and the greater the price elasticity of demand for the product, the greater also will be the transport demand elasticity of the product, ceteris paribus.

In terms of differently located suppliers, their responsiveness to a change in the freight rate depends on their particular elasticity of supply and the latter is in part a function of the distance from the product market. A percentage rate increase will decrease net returns of distant suppliers by a greater proportion than those located close to the market, bringing about a shift in production from more distant to near locations. Such a shift reduces the volume of transport required and with a sufficiently elastic supply the decline in traffic volume will more than offset any gains in revenue the carriers might have had as a result of the rate increase [8, p. 200].

The relevance of this phenomenon for inter-carrier competition (although the study doesn't say so) might be a shift from long-haul carriers to short-haul carriers, as suppliers shift nearer the market. For example, before the supplier-shift, rail, which has an advantage for long-haul movements, may have carried most of the traffic whereas after the shift, motor truck, which is better suited to shorter hauls, may take over much of the traffic from rail.

In regard to the study as a whole, several comments can be made. It was certainly a pioneer achievement to generate the large amount of cost data for the five modes of transport plus ascertaining the main demand and market characteristics. However, the findings of any analysis can

only be as good as the data upon which it was based and Meyer et al. recognize that the data available to them were often fragmentary; hence, they warn that the statistical estimates must be interpreted with caution [8, pp. 43-60].

There is also a great deal of aggregation and averaging throughout the study which renders the findings of little value for assessing any specific operation. While the study purports to break the data down into much finer detail than earlier studies had done [8, p. 34] the degree of aggregation is still sufficient to mask important detail. For example, using "gross ton-miles" as the unit of output without taking account of the ratio of tons to miles masks the effect each has on costs. The cost of hauling one ton fifty miles will not likely be the same as hauling fifty tons one mile and yet the gross ton-miles are the same. This point is argued strongly by Wilson [11, pp. 14ff], [49, p. 109], and [50].

Frequently it was necessary to make some arbitrary assumptions in the course of calculating empirical estimates about such things as the rate of depreciation of equipment, allocating common costs, etc. and this also makes it very difficult to use the results for evaluating anything but the very general, "average" situation. The study primarily seeks to provide some broad, basic guidelines for regulatory policy [8, p. 43] but possibly the guidelines have been

drawn too broadly.

G.W. Wilson

A second study, which appeared about three years after Meyer et al. but which in large part was written at the same time, is a collection of essays by Wilson [11] . This study is primarily theoretical in nature unlike the work by Meyer et al. and is an excellent treatment of several key problem areas in transportation economics. Major literature contributions pertinent to each problem area are critically reviewed. Wilson is more concerned with probing for hidden detail than with being satisfied with broad generalizations.

The gist of his argument, at least in part, is along the following lines. Basic to any meaningful discussion of transportation costs, "inherent advantage", or intra- and inter-modal competition is a clear understanding of the unit of output. What is it that transport firms produce? Earlier writers have grappled with this question and the several units of output measurement suggested as possible candidates include the ton, the carload, the ton-mile, the carload-mile, the passenger-mile and the train-, bus-, or truck-journey. A weighted ton-mile has also been suggested which would essentially be an index of ton-miles in which each ton-mile was weighted by the revenue derived therefrom

[11, pp. 15-16].

No doubt each of these measurements has its merits and demerits but Wilson contends that the output of transportation is ". . . a product that is bound up with weight and distance . . ." [11, p. 19], and so favors the ton-mile as the most appropriate unit of output.[5] Transporting commodities from points where their economic value is less to points where their economic value is greater creates "place utility".

The next question is whether or not the ton-mile unit is homogeneous. Conventionally, the theory of the firm assumes that the units of output are homogeneous. However, does this assumption hold for the ton-mile?

Examining first the demand side, varying levels and slopes of individual demand schedules for any particular transport service (i.e. "physically" homogeneous ton-mile units) is not sufficient to render the units economically heterogeneous. Transporting units of X and units of Y merely represents different uses of transport facilities [11, p. 21]. However, varied shipper demand elasticities is one necessary condition of price discrimination and "quality" differences between particular transport services,

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[5]Presumably the equivalent output unit for passenger traffic is the passenger-mile.

in many instances, are responsible for varied shipper demand elasticities, depending on how important the shipper regards the quality factors (i.e. speed, convenience, and flexibility). For example, if it takes five hours to haul a ton of X a hundred miles but two days to haul a ton of Y the same distance would a shipper regard the ton-miles of X and the ton-miles of Y homogeneous?

In essence this is the case of product differentiation and raises the question of how to define a product or industry. The study asks,

> How much of such differentiation can there be before similar products become dissimilar enough to warrant treating them as distinct and produced by firms in a different industry? Is there such a thing as the transportation industry [11, p. 22]?

A review of the literature reveals divergent views with the one extreme regarding transportation as a single industry (as held by Isard, Pigou and Machlup) and the other extreme regarding transportation as a group of industries composed of different modes such as railroads, water, etc. (as held by Milne and Pegrum). Which of the two views is the more appropriate depends upon the purpose of the investigation at hand. The broader the scope of analysis, generally the broader the working definition of the transportation industry can be and vice versa [11, p. 23].

The accepted definition of industry is based on the relative substitutability among the products produced by

the various firms. That is, an industry is a group of products among which there are high cross-elasticities of demand but which have very low (but not generally zero) cross-elasticities of demand vis-a-vis all other products [1, p. 51].

When Wilson applies this definition to transportation services (taking account of both price and quality factors), he finds that relative substitutability cuts across the several means of transportation. A shipper's choice of one particular mode over another depends on the "net cost" to him (i.e. freight rate minus quality of service savings) of using a particular mode and the value he places on the quality factors will be highly relative (depending on the circumstances) and also highly variable over time. Therefore, the degree of substitutability among modes will also be highly variable depending upon the particular commodity transported, and the shipper circumstances at various times. Identifying each form of transport, then, as an industry is too narrow while treating all forms of transportation as a single industry is too broad for the purposes of analyzing inter-modal differences.

Returning to the question of output homogeneity in terms of demand, the product (i.e. ton-miles) is homogeneous only insofar as substitutability is high which in turn will be reflected by a relatively elastic transport demand curve.

And to the extent that the transport demand curve is inelastic, implying low substitutability, the ton-mile output units must be regarded heterogeneous.

On the supply side Wilson discusses the problems of cost at considerable length. At least three elements in freight transport service constitute independent sources of cost: weight, distance and velocity [11, p. 41]. Unless two of the three variables are held constant, a cost function derived from a composite ton-mile figure for varying speeds would be difficult to interpret. Different proportions of tons and miles, for example, entail different levels of cost. Thus, there exist a whole series of cost functions each relating to a particular combination of weight, distance and speed.

Since cost functions in economic theory relate to homogeneous units of output there is no single cost curve for the total output of any transportation firm. Clearly, from the supply point of view the product is heterogeneous.

The next stage of Wilson's study involves a close examination of the "inherent advantages" of rail and truck transport. These advantages take two forms: cost and quality of service. With respect to cost, the discussion centers upon which cost concept is most appropriate for comparing rail versus truck advantages (i.e. length of run, marginal versus fully allocated costs, etc.).

The quality factors singled out by Wilson include speed, flexibility, dependability, and safety which although in themselves are non-cost concepts they undoubtedly do influence costs as the analysis illustrates [11, pp. 101-13]. All else being equal, the rational shipper will seek to minimize his net cost in selecting one mode over another.

Finally, the problem of inter-carrier competition between truck and rail is discussed on the assumption that the truck and rail cost and demand functions are known. By now the reader of Wilson's essays will have realized that this assumption is of no mean significance since it is apparent that the economics of transportation is fraught with numerous difficulties and complexities. And the more answers one has to the questions raised so far, the better will one be equipped to study inter-modal competition per se.

With the aid of diagrams Wilson shows what the probable competitive outcome would be in the absence of regulation [11, pp. 125-34]. If, for instance, the rail rate on a particular homogeneous commodity declined relative to the truck rate those shippers of the commodity, who valued the truck transport quality factors by less than the newly established truck-rail rate differential, would shift to using rail. In addition, the shippers who do switch to rail will experience a decrease in their net transport cost (i.e. a

decrease in distribution costs) which will serve as an inducement for expanding their output. Therefore, the total rail traffic increase will be a combination of some traffic diverted from the competing carrier (truck) and some new traffic generated through reduced producer costs.

Similarly, if truck rates declined along with rail rates, all producers would experience lower costs inducing them to expand output and the total new traffic generated would be still greater. But in such a case, if the truck and rail rates remained at par, trucks would continue to haul the same amount as before (plus the new traffic generated) since no traffic would be diverted as long as the rate and quality differentials remained constant.

The equilibrium outcome in any given situation will depend on the positions and slopes of the respective demand and cost functions of truck and rail for that situation.

In summary, a general observation about Wilson's essays is that the concern with all the detail leaves one overwhelmed and with the despondent feeling that in practice it would be well nigh impossible to estimate any meaningful supply or demand function. In contrast to Meyer et al., this study is at the opposite end of the generality scale. It would seem that to facilitate "getting on with the job" in a particular situation one would have to strike a balance somewhere in between the two extremes,

incorporating only as much detail as feasible.

Nevertheless, being aware of the unresolved difficulties puts the researcher in a better position to interpret results than if he was ignorant of them. Wilson aptly states that, "This is not a gospel of despair, merely one of caution" [11, p. 78].

CHAPTER III

DESCRIPTION OF LIVESTOCK MARKETING WITH SPECIAL REFERENCE TO TRANSPORTATION

A. LIVESTOCK AND LIVESTOCK PRODUCT MOVEMENTS THROUGH THE MARKETING CHANNELS

The purpose of this chapter is to elaborate in more detail, albeit in national aggregate terms over the last ten years, the volumes and types of livestock that are transported through the marketing system referred to earlier. In addition, wherever possible some comments on the respective roles of railway and trucking will be made.

The number of possible channels that livestock shipments may follow before the final product reaches the consumer are many; nevertheless, an attempt has been made to examine most of them. For some channels data could be readily obtained from secondary sources; for other channels further investigation of primary sources would be necessary to determine availability.

Figure 3.1 is a basic schema of the physical marketing channels for cattle, hogs and sheep marketed in Canada as they move from primary producer to the consumer. Some of the flows are applicable to feeders as well. The arrowheads show the direction of flow.

It should be pointed out that this diagram is intended to portray the spatial dimensions of the marketing channels irrespective of what the invisible buying and selling mechanisms or agencies operating at any particular point might be. Thus, each arrow indicates the requirement of some transportation activity and a physical movement of the commodity, but the arrangement by which the commodity changes ownership is not revealed.

For example, the livestock moving directly from primary producer to the packing plant may be delivered and sold to the packer by the producer himself; or he may sell them to a trucker or livestock dealer at his farmyard, who delivers and/or resells them to the packer; or the producer may ship his livestock via a public carrier to be delivered and sold to the packing company; or, finally, the shipment might be sold "en route" via a marketing commission, cooperative, teletype, or the like.

The different buying and selling mechanisms are not incorporated into the diagram since it is assumed that the method of sale as such will not determine the mode of transport selected for a particular shipment. Even though it could be demonstrated that one type of selling agency consistently preferred Mode A to Mode B for its shipments, it could be argued that this choice was made largely on the grounds of lower rates, convenience, speed or some other

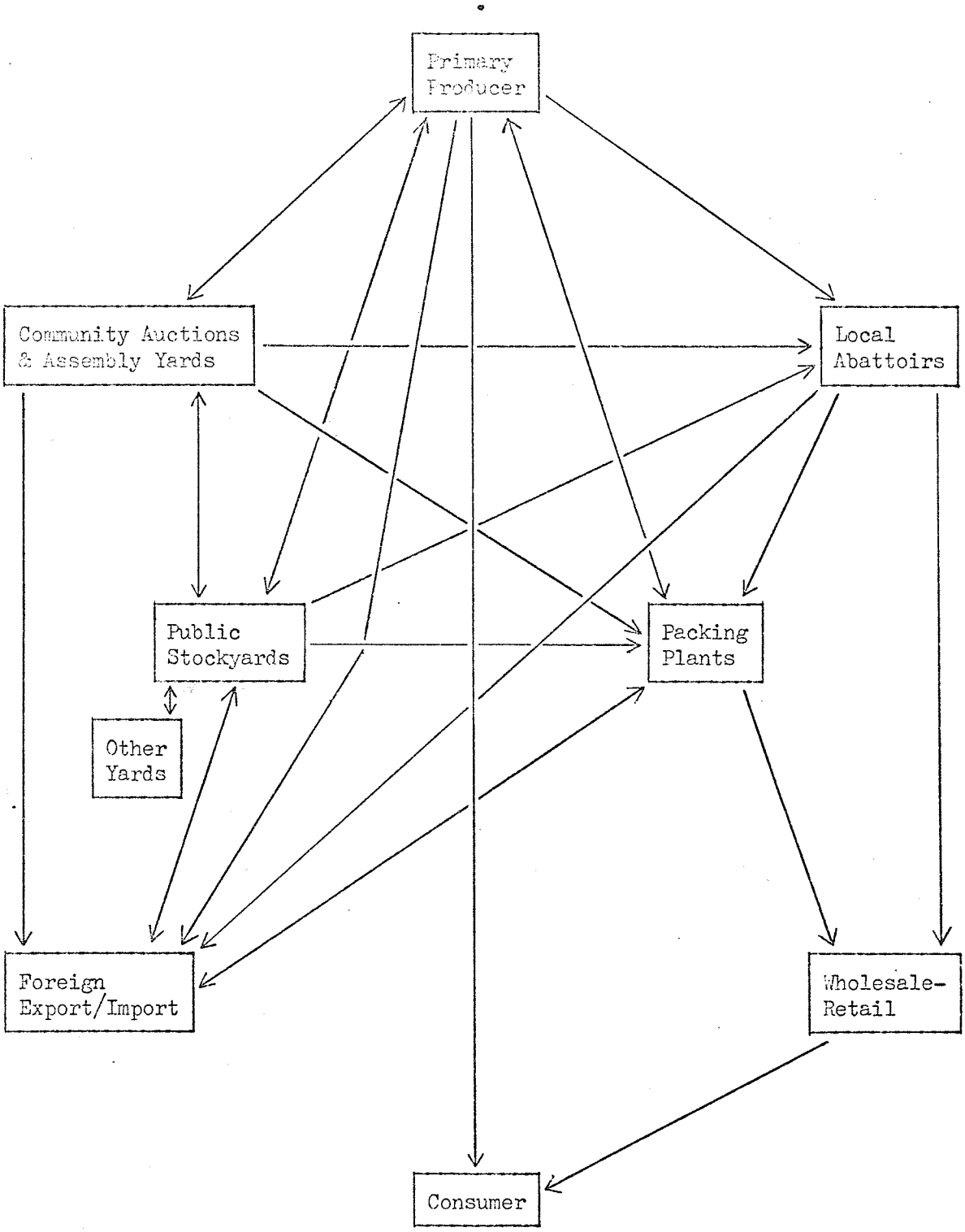

FIGURE 3.1

Diagramatic Outline of Physical Marketing Channels for Livestock in Canada

considerations and that the same mode might well be chosen by another type of selling agency on similar grounds, or by the producer himself in the event that he negotiated the sale on his own.

One exception that comes to mind is the case where the producer sells his animals to a livestock dealer, who happens to be in the trucking business as well. Here the buying agent has a vested interest in trucking and, of course, he will prefer to ship by truck even though rail might offer some advantage.

The arrows do not indicate the volumes of livestock passing through each channel. Quantities may differ as between cattle and hogs, between types of cattle (feeder, slaughter), between provinces, from season to season and from year to year. The volume relative to the capacity of the transportation facilities at a particular channel during a given time period may affect the mode by which the commodity will be shipped. If for instance, railway refrigerator cars are in short supply, the shippers may be forced to turn to refrigerated trucks.

The above diagramatic outline shows the general framework of the way in which Canadian livestock are marketed. A more detailed examination of the transportation involved at each step follows.

From Primary Producer

In general, there are six different channels through which the primary producer may market his livestock and an examination of each follows.

Public Stockyards. In 1966 there were ten public stockyards operating in nine cities across Canada.[1] Columns (2) and (3) in Table 3.1 show the volumes and proportions of total outward movement of four types of livestock shipped to public stockyards since 1957. The data are expressed in two five year averages for the periods 1957-61 and 1962-66. The total outward movement represents the total output of livestock, with resales eliminated to avoid double-counting, shipped to public stockyards, direct to packing plants, direct to foreign export and to out-of-province country points via public stockyards. Animals shipped by producers to local community auctions, to local abattoirs and animals consumed by the producers' own household remain unaccounted for.

To arrive at the total outward movement of livestock that passed through the public stockyards it is necessary to

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[1]Montreal had two yards and there was one yard in each of Calgary, Lethbridge, Edmonton, Regina, Saskatoon, Prince Albert, Winnipeg, and Toronto. Livestock Market Review, 1966 [60, p. 15].

TABLE 3.1

Total Canadian Livestock Marketings and Shipments, Average 1957-61 and 1962-66*

(Thousand Head and Per Cent)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
					Outward Movement:					
Year	To Public Stockyards[a]	% of Total	Direct to Packing Plants	% of Total	Direct on Export[b]	% of Total	To Country Points[c]	% of Total	Total Outward[d]	Total Inward Movement[e]
					— CATTLE —					
1957-61	1,478.2	57.7	900.7	35.2	145.4	5.7	37.5	1.5	2,561.8	357.5
1962-66	1,617.1	52.0	1,315.2	42.3	140.8	4.6	35.0	1.1	3,108.1	462.1
					— CALVES —					
1957-61	487.9	48.5	448.3	44.5	26.3	2.6	44.4	4.4	1,006.9	149.4
1962-66	571.5	47.0	463.1	38.1	71.1	5.8	110.2	9.1	1,216.3	312.8
					— HOGS —					
1957-61	742.9	11.0	5,985.2	88.9	7.8	0.1	-	-	6,735.9	-
1962-66	723.9	10.5	6,142.8	89.4	5.4	0.1	-	-	6,872.1	-
					— SHEEP —					
1957-61	174.3	29.0	398.5	66.5	10.1	1.7	16.6	2.8	599.5	38.7
1962-66	137.3	27.5	330.5	66.3	12.3	2.5	18.4	3.7	498.6	32.6

[a] Stock already sold and shipped to other stockyards and resold has been eliminated.

[b] Does not include stock sold on stockyards and exported.

[c] Total billed through stockyards en route from country points in one province to country points in another province.

[d] Represents total output of stock with all resales eliminated.

[e] Feeder cattle, calves and lambs returned to the country for further feeding from stockyards and packing plants, including through-billings from country points in one province to country points in another.

*Source: Livestock Market Review. Canada Dept. of Agriculture, Ottawa, 1962 and 1967. Livestock and Animal Products Statistics. Dominion Bureau of Statistics No. 23-203. Ottawa: Queen's Printer, 1966, p. 19.

add to Colum (2) those shipments which went directly to export (Column (6)) and those shipments en route from country points in one province to country points in another (Column (8)). When these additions are made, it becomes evident that during 1957-61, 64.9 per cent of the cattle passed through public stockyards but during 1962-66 only 57.7 per cent passed through the stockyards. This is a substantial drop which can be largely explained by the increased proportion of cattle that were shipped directly to packing plants (Column (5)). Total outward shipments of calves to public stockyards, on the other hand, increased from 55.5 per cent in 1957-61 to 61.9 per cent in 1962-66. This was as a result of fewer calves being shipped direct to packing plants for slaughter and more calves, either returned to country points for further feeding, or shipped direct to export. Little change was observed in these respects for sheep and hog shipments.

Regardless of the proportions going to public stockyards and packing plants respectively, the proportion of animals arriving at each by truck as compared to rail has increased phenomenally over the past twenty years. Tables 3.2 and 3.3 are presented as evidence of this trend. Table 3.2 shows that on the average for Canada in 1947-51 about 50 per cent arrived by truck and the rest by rail, while during 1952-56 approximately 75 per cent arrived by

truck.[2] By 1967, Table 3.3 shows that about 90 per cent of the deliveries were made by truck and that in some provinces virtually 100 per cent of some types of livestock were delivered by truck. To be specific, virtually 100 per cent of all types of livestock in Alberta, of all cattle in Saskatchewan, of all hogs in Ontario and Quebec, and of all sheep and lambs in Saskatchewan and the Maritimes were delivered by truck.

An examination of both tables reveals further that the per cent truck deliveries in British Columbia show an irregular pattern and were always less than the Canadian average (except sheep and lambs, second quarter, 1967), and that the per cent truck deliveries in Saskatchewan were always less than the Canadian average during 1947-56 but by 1967 were, in most instances, greater than the Canadian average. Truck deliveries to public stockyards and packing plants combined, in the Maritimes were substantially below 50 per cent prior to 1956 but by 1967 trucks had taken over from 80 to 100 per cent of the traffic. It is abundantly clear that the proportion of truck deliveries in all provinces have increased greatly between 1947 and 1967.

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[2]This series was discontinued in 1958, and already the 1957 report did not separate stockyard and packing plant deliveries.

TABLE 3.2

Railroad and Truck Deliveries of Livestock to Public Stockyards and Packing Plants by Province of Origin, 1947-51 and 1952-56*

		CATTLE					
		To Yards (No. Head)			To Plants (No. Head)		
Province of Origin		By Rail	By Truck	% by Truck	By Rail	By Truck	% by Truck
B.C.	(a)	9,557	3,476	26.7	24,120	10,134	29.6
	(b)	9,413	7,925	45.7	25,775	8,692	25.2
Alta.	(a)	86,834	207,187	70.5	80,711	65,070	44.6
	(b)	52,393	332,128	86.4	49,668	97,354	66.2
Sask.	(a)	191,716	97,676	33.8	51,954	27,407	34.5
	(b)	145,912	125,265	46.2	56,579	34,413	37.8
Man.	(a)	55,955	59,588	51.6	16,006	48,038	75.0
	(b)	35,762	75,636	67.9	13,210	55,620	80.8
Ont.	(a)	142,156	184,762	56.5	48,670	119,736	71.1
	(b)	53,447	327,880	86.0	16,590	217,943	92.9
Que.	(a)	13,970	37,763	73.0	11,820	34,851	74.7
	(b)	4,879	43,339	89.9	2,846	41,381	93.6
N.B.	(a)	2,088	53	2.5	1,534	5,227	77.3
	(b)	381	-	-	3,392	5,372	61.3
N.S.	(a)	909	-	-	3,263	357	9.9
	(b)	102	-	-	5,146	342	6.2
P.E.I.	(a)	1,449	-	-	3,251	2,725	45.6
	(b)	194	-	-	5,805	5,376	48.1
Canada	(a)	504,634	590,506	53.9	243,129	313,544	56.3
	(b)	302,483	906,773	75.0	179,012	466,494	72.3

(a) Five year average 1947-51
(b) Five year average 1952-56

*Source: Calculated from Livestock Market Review. Canada Dept. of Agriculture, Ottawa.

TABLE 3.2 (continued)

Province of Origin		CALVES					
		To Yards (No. Head)			To Plants (No. Head)		
		By Rail	By Truck	% by Truck	By Rail	By Truck	% by Truck
B.C.	(a)	1,206	545	31.1	2,830	1,195	29.7
	(b)	1,355	1,736	56.2	4,830	2,056	29.9
Alta.	(a)	13,695	40,638	74.8	13,570	41,394	75.3
	(b)	7,982	54,655	87.3	5,794	47,044	89.0
Sask.	(a)	49,854	18,638	27.2	14,511	6,120	29.7
	(b)	38,409	23,083	37.5	12,719	6,850	35.0
Man.	(a)	17,201	21,193	55.2	8,105	36,586	81.9
	(b)	13,017	36,286	73.6	8,252	60,439	88.0
Ont.	(a)	55,979	71,932	56.2	29,780	62,791	67.8
	(b)	17,619	97,147	84.7	14,101	123,518	89.8
Que.	(a)	33,340	66,437	66.6	40,389	92,965	69.7
	(b)	14,264	85,592	85.7	23,397	155,779	86.9
N.B.	(a)	10,507	111	1.1	2,670	9,746	78.5
	(b)	6,619	13	0.2	5,550	7,749	58.3
N.S.	(a)	1,555	-	-	1,244	865	41.0
	(b)	724	-	-	2,355	622	20.9
P.E.I.	(a)	1,093	-	-	2,082	566	21.4
	(b)	342	-	-	1,099	365	24.9
Canada	(a)	182,930	218,772	54.5	118,914	262,319	68.8
	(b)	100,397	285,850	74.0	76,633	381,169	83.3

(a) Five year average 1947-51
(b) Five year average 1952-56

TABLE 3.2 (continued)

Province of Origin		HOGS					
		To Yards (No. Head)			To Plants (No. Head)		
		By Rail	By Truck	% by Truck	By Rail	By Truck	% by Truck
B.C.	(a)	697	303	30.3	16,136	15,981	49.8
	(b)	368	692	65.3	18,794	19,748	51.2
Alta.	(a)	77,403	89,318	53.6	482,828	373,206	43.6
	(b)	11,466	219,353	95.0	657,783	614,212	48.3
Sask.	(a)	38,318	24,378	38.9	183,948	89,136	32.6
	(b)	48,997	54,121	52.5	197,470	202,426	50.6
Man.	(a)	14,848	28,704	65.9	53,792	182,413	77.2
	(b)	14,442	53,060	78.6	54,527	264,668	82.9
Ont.	(a)	76,225	126,994	62.5	537,518	1,257,154	70.1
	(b)	25,549	183,671	87.8	271,287	1,601,712	85.5
Que.	(a)	49,556	110,338	69.0	248,692	681,993	73.3
	(b)	25,802	117,647	82.0	120,575	800,885	86.9
N.B.	(a)	2,021	-	-	23,504	31,034	56.9
	(b)	336	1	0.3	20,481	25,072	55.0
N.S.	(a)	27	-	-	16,108	5,595	25.8
	(b)	-	-	-	13,478	9,028	40.1
P.E.I.	(a)	-	1	100.0	48,639	35,063	41.9
	(b)	-	-	-	48,542	35,280	42.1
Canada	(a)	255,577	373,875	59.4	1,553,534	2,541,651	62.1
	(b)	126,960	628,545	83.2	1,402,937	3,572,830	71.8

(a) Five year average 1947-51
(b) Five year average 1952-56

TABLE 3.2 (continued)

SHEEP & LAMBS

Province of Origin		To Yards (No. Head) By Rail	To Yards (No. Head) By Truck	To Yards % by Truck	To Plants (No. Head) By Rail	To Plants (No. Head) By Truck	To Plants % by Truck
B.C.	(a)	2,029	682	25.2	16,578	3,368	16.9
	(b)	1,379	1,536	52.7	18,583	3,414	15.5
Alta.	(a)	15,136	35,383	70.0	78,932	30,657	28.0
	(b)	6,231	34,153	84.6	60,608	28,251	31.8
Sask.	(a)	29,093	10,263	26.1	9,953	6,972	41.2
	(b)	12,082	8,766	42.1	7,178	5,311	42.5
Man.	(a)	7,210	7,085	49.6	6,442	26,160	80.2
	(b)	3,228	6,962	68.3	3,164	20,393	86.6
Ont.	(a)	35,300	45,884	56.5	23,324	69,618	74.9
	(b)	12,400	49,872	80.1	17,141	90,997	84.2
Que.	(a)	44,880	14,479	24.4	45,053	55,893	55.4
	(b)	17,470	15,589	47.2	31,229	73,691	70.2
N.B.	(a)	3,455	43	1.2	6,614	4,477	40.4
	(b)	3,670	43	1.2	7,763	5,629	42.0
N.S.	(a)	543	-	-	513	41	7.4
	(b)	33	-	-	8,685	779	8.2
P.E.I.	(a)	140	-	-	7,157	1,888	20.9
	(b)	39	-	-	9,634	4,298	30.9
Canada	(a)	137,786	113,819	45.2	194,567	199,075	50.6
	(b)	56,530	117,322	67.5	163,983	232,763	58.7

(a) Five year average 1947-51
(b) Five year average 1952-56

TABLE 3.3

Truck Deliveries of Livestock to Public Stockyards and Packing Plants by Province, Quarterly, 1967*

(Per Cent of Total Deliveries[a])

Quarter[b]	1st	2nd	3rd	4th	1st	2nd	3rd	4th
	CATTLE				CALVES			
B.C.	48.0	42.6	33.2	61.3	8.6	19.8	38.3	13.5
Alta.	100.0	100.0	99.8	98.7	100.0	100.0	99.7	100.0
Sask.	98.4	98.3	97.0	99.6	66.6	96.5	90.8	98.1
Man.	86.2	83.0	90.4	89.1	84.3	82.9	91.0	88.2
Ont.	90.2	93.3	85.7	89.9	92.0	92.6	91.6	66.5
Que.	74.5	83.3	73.3	88.5	95.6	99.4	95.4	93.8
Marit.	52.2	97.3	95.7	81.6	80.3	75.9	88.5	86.7
Canada	91.8	93.1	90.4	92.7	87.5	95.2	91.8	89.4
	HOGS				SHEEP & LAMBS			
B.C.	19.8	28.0	22.7	26.1	17.1	100.0	42.4	10.4
Alta.	97.7	97.9	97.5	99.1	100.0	100.0	97.2	100.0
Sask.	87.5	96.6	96.9	97.9	100.0	100.0	100.0	99.5
Man.	91.9	90.6	91.6	91.3	41.6	89.3	75.0	86.9
Ont.	100.0	99.8	99.8	100.0	94.3	92.6	89.1	75.5
Que.	99.8	100.0	100.0	100.0	23.4	67.3	100.0	90.7
Marit.	93.3	96.4	95.4	94.3	100.0	100.0	100.0	100.0
Canada	96.3	96.1	96.3	96.5	81.3	92.5	88.0	84.0

[a]Total deliveries include receipts directly from country points, from other public stockyards, from public stockyards to packing plants, and imports.

[b]One week in each quarter was tabulated and provides the basis for this table.

*Source: Livestock and Meat Trade Report, Canada Dept. of Agriculture, Ottawa, Vol. 48, Nos. 9, 22, 35 and 48. p. 25. 1967.

Packing Plants. The volumes of livestock going directly to packing plants from producer premises is also shown in Table 3.1. Nearly 90 per cent of the hogs took this route as did 66 per cent of sheep and around 40 per cent of cattle and calves.

Reference has already been made to the increasing numbers of animals that are delivered to market by truck as compared to rail. There are a number of reasons that could possibly explain some of the inter-provincial differences in the relative proportions of truck and rail deliveries. The non-availability of all-weather roads in regions like the British Columbia interior might explain the irregular truck-rail delivery pattern in that province [56, p. 64]. The degree to which primary producers are geographically dispersed may partly explain the lower truck deliveries of cattle in Saskatchewan compared to truck deliveries in the provinces of Ontario and Quebec. The more concentrated the producers are geographically, generally the shorter the distances are to market, which makes truck transport more feasible. About 90 per cent of the livestock sold at the Union Stockyards, St. Boniface, Manitoba, in 1967 was delivered by truck and the rest by rail; whereas, just the opposite was true for through-billed livestock en route from points west of Winnipeg to Eastern Canada. In the latter case, the length of haul was much greater and railways carried about

90 per cent of the animals. All St. Boniface stockyard deliveries taken together, therefore, showed that in 1967 exactly one-half were made by trucks and one-half by rail.[3]

A further indication of the effects distance from market outlets may have on the mode of transportation utilized was illustrated by a Saskatchewan study.

An economic survey of the marketing of livestock from farms in the Saskatoon area was conducted in 1955-56, in which transportation was one of the matters studied [42]. From a sample of 143 cattle and hog producers, located at 50, 100 and 150-mile radii it was found that 78 per cent of the cattle and 80 per cent of the hogs marketed during the survey year were transported to market by truck. A smaller proportion of animals was transported by rail from farms at the 50-mile radius from Saskatoon than at the 100 and 150-mile radii. The proportion of cattle transported by rail at the 50, 100 and 150-mile radii was 9, 35 and 37 per cent, respectively, while for hogs the corresponding proportions were 0, 57 and 91 per cent, respectively. Farmers who used rail facilities were usually located close to a direct railway line to a market outlet.

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[3]Telephone conversation with Ken Knowles, Public Markets Ltd., St. Boniface Union Stockyards, Winnipeg, Manitoba.

For hogs, which bruise easily, shrink rapidly and suffer from extreme temperatures, speed of delivery is imperative. It is not surprising, therefore, that 100 per cent of the hogs at the 50-mile radius were shipped by truck, but it is difficult to understand why as few as 9 per cent went by truck at the 150-mile radius. Evidently, speed of rail services at that distance compared favorably with truck deliveries and/or rail freight rates were competitive enough with truck rates to offset any service advantages trucks may have had.

Foreign Export. No official records are kept of animals that are exported directly from the primary producer level and which do not pass through the large central markets (i.e. public stockyards). Some livestock bound for export goes via local community auctions.[4] The number of animals billed through public stockyards en route to export (Table 3.1) represented less than 6 per cent of all types of livestock, hogs being at the bottom with only 0.1 per cent. It would seem that most of these movements from points in Western Canada involved feeder-type animals; whereas export movements from points in Eastern Canada involved slaughter

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[4] Infra, Chapter III, p. 58-60.

livestock, dairy stock and breeding stock.[5]

Community Auctions. Local community auctions, operating on schedules ranging from daily sales to only a few per year, have become important institutions in the marketing of livestock, particularly of feeders. Alberta is an outstanding example of this where in 1956, 22 auctions were operating but by 1964 the number had risen to 52 [20, p. 13]. Also the volumes of livestock handled by the growing number of community auctions has cut sharply into the business done by the three centrally located public stockyards [20, p. 16]. A 1956 study reported four community auctions in British Columbia [21, p. 2], Manitoba reported about ten operating in 1964 [22, pp. 78-79] and Ontario had 64 in 1960 [22, p. 96].

The decentralized community auctions in Alberta were found to have a definite locational advantage over the centralized public stockyards in the marketing of feeders, because buyers and sellers were often located in the same community. The community auction "short circuited" the animals before they were transported to the more distant central market, only to be hauled back again as feeders; thus, reducing the distances which feeders needed to be

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[5]Conversation with A.W. Wood, Dept. of Agricultural Economics, University of Manitoba, Winnipeg.

hauled. Savings in total transport costs followed [20, pp. 17, 24, 33].

While substantiating data were unavailable, it would seem reasonable to suppose that because shorter distances were now involved and because rail services were limited for some of the small auction centers, more feeder livestock would now be handled by trucks than at the time before the growth of community auctions. Reportedly, one-half of the Alberta auctions owned trucks which were used to service both buyers and sellers. At times the proprietors offered reduced truck-hauling rates as an incentive to potential customers of the auction [20, p. 22]. This would appear to be an effective competitive technique against railway transport in those areas where rail services exist.

Local Abattoirs. While some livestock moves from primary producer to abattoirs the volume is probably insignificant. Many small slaughtering establishments situated on the fringes of larger urban centers are operated in conjunction with frozen food locker plants, and in most cases perform both custom slaughtering and processing services [22, p. 81].

Consumer. This channel refers simply to those animals which are slaughtered and consumed domestically by the primary producer and his household. Virtually no

transportation is involved, except possibly for the odd sale of an animal to a neighbor who also buys for home-consumption. This channel and the previous one (to abattoirs) have been included for the sake of completeness.

From Public Stockyards

In general, five channels are open to animals leaving public stockyards; namely, to packing plants, to abattoirs, back to country points, to foreign export and to other yards. The first three mentioned are the major channels.

Packing Plants and Abattoirs. These two channels are discussed jointly because the data combines the movements under one heading. Column (2), Table 3.4 indicates that typically 70 per cent of cattle, 50 per cent of calves and 90 per cent of hogs and sheep leave the public stockyards destined for slaughter. This category consists of those animals going to packing plants and those going to abattoirs.

Data showing the volumes of livestock going to packing plants and abattoirs respectively were obtained from the public stockyard at Winnipeg, Manitoba. This information is summarized in Table 3.5, which reveals that the distribution is approximately half and half for all types of slaughter livestock except sheep, of which 90 per cent go to packing plants.

TABLE 3.4

Disposition of Livestock from Public Stockyards in Canada, Average 1957-61 and 1962-66*

(No. Head) [a]

(1) Year	(2) Slaughter[b]	(3) % of Total	(4) Feeder (Country Points)	(5) % of Total	(6) Export	(7) % of Total	(8) Other Yards	(9) % of Total	(10) Total
				CATTLE					
1957-61	1,054,270	69.9	312,495	20.7	120,811	8.0	20,306	1.4	1,507,882
1962-66	1,138,594	69.2	418,898	25.5	63,419	3.9	23,765	1.4	1,644,677
				CALVES					
1957-61	291,890	58.8	111,752	22.5	84,523	17.0	8,188	1.7	496,353
1962-66	267,234	45.6	200,287	34.2	99,815	17.1	18,249	3.1	585,584
				HOGS					
1957-61	758,944	90.5	77,753	9.3	1,536	0.2	27	-	838,259
1962-66	728,155	89.6	84,864	10.4	229	-	-	-	813,248
				SHEEP					
1957-61	154,751	87.7	20,754	11.7	638	0.4	339	0.2	176,483
1962-66	145,271	91.4	12,809	8.1	30	-	835	0.5	158,944

[a] These totals represent shipments of livestock which actually moved off stockyards and do not necessarily balance with similar totals elsewhere.

[b] Animals shipped to packing plants and abattoirs for slaughter.

*Source: Livestock Market Review. Canada Dept. of Agriculture, Ottawa. Calculated from Table A.1, Appendix II.

Country Points. About one-quarter of the cattle, one-fifth of the calves and one-tenth of the hogs and sheep were returned to the primary producer level for further feeding before finally being slaughtered. Column (4) and (5), Table 3.4 indicate the magnitudes of this movement from public stockyards for the periods 1957-61 and 1962-66.

Empirical evidence was completely lacking that would indicate the distribution between rail and truck of livestock traffic leaving public stockyards. One can only speculate as to the relative importance of the two modes and point to the factors that might influence the method of transportation used. Crucial factors might include the following: the freight rate plus extra charges for miscellaneous services such as handling, feeding, etc.; the quality of service including speed, flexibility and dependability; the availability of alternative carrier services; the locations of origin and destination; the geographic distance involved; the size of shipment; the type of seller and purchaser and tradition or habit.

From Community Auctions and Assembly Yards

The growth and impact that community auctions have had on the marketing of livestock, particularly feeders, was noted earlier. It is thought that the majority of the livestock moving to and from the community auctions goes by

TABLE 3.5

Disposition of Slaughter Livestock from Public Stockyards at Winnipeg, Average 1957-61 and 1962-66*

	To Packers		To Abattoirs	
Year	No. Head	%	No. Head	%
		CATTLE		
1957-61	111,936	63.1	65,336	36.9
1962-66	95,502	53.0	84,656	47.0
		CALVES		
1957-61	32,372	60.3	21,298	39.7
1962-66	24,050	50.4	23,660	49.6
		HOGS		
1957-61	43,450	32.0	92,498	68.0
1962-66	60,287	47.5	66,750	52.5
		SHEEP		
1957-61	20,488	97.2	582	2.8
1962-66	18,438	87.2	2,712	12.8

*Source: Calculated from Table A.2, Appendix II.

truck, especially since some auctions are not located in a rail line. Animals leaving the auction rings may enter one of five market channels with the feeder channel being the most important. Next in importance are probably the slaughter channels leading either to abattoirs or packing

plants.[6] Export buyers siphon off some, most of which are feeders. In Alberta during 1962 United States buyers purchased 10.4 per cent of the cattle, 25.6 per cent of the sheep and zero per cent of the hogs marketed through the community auctions [20, pp. 17-19]. Finally there is the movement to public stockyards which would be one of speculation in which it was thoughtsome profit could be earned by buying in one market and reselling in the other, after deduction of transport costs. Presumably, such speculative movements could occur in the opposite direction as well.

From Packing Plants

Wholesale/Retail. By far the largest proportion of livestock received at packing plants is slaughtered and the meat is then shipped out to wholesale and retail outlets. Table 3.6 summarizes Canadian packing plant slaughterings both in numbers of head and warm dressed weight.

Most or all of the packing companies own trucks which they use mainly for local distribution of meats and by-products and possibly some intercity deliveries; however, for long distances (e.g. West to East), they rely on for-hire

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[6] In Ontario over 90 per cent of the cattle sold for slaughter go direct to packing plants [22, p. 97].

TABLE 3.6

Livestock Slaughtered at Inspected Packing Plants in Canada, Average 1957-61 and 1962-66*

Year	No. Slaughtered	Warm Dressed Weight	No. Slaughtered	Warm Dressed Weight
		('000 lb.)		('000 lb.)
	CATTLE		CALVES	
1957-61	1,920,578	995,664	750,165	98,038
1962-66	2,403,358	1,293,603	758,452	110,078
	HOGS		SHEEP	
1957-61	6,197,672	1,001,686	579,329	25,778
1962-66	6,223,979	1,000,686	466,914	20,852

*Source: Livestock Market Review, Canada Dept. of Agriculture, Ottawa, 1961 and 1966.

truckers and railway services.[7] Again the question of how much meat the packers ship by truck and how much by rail and over what distances remains unanswered.

Foreign Export. Canada is a net exporter of both live animals (except sheep) and some meat products (beef

[7] In an interview with Jack Roman, Traffic Manager, Canada Packers in Winnipeg, he said that some years ago they had tried long-distance trucking with their trucks but that without any back-haul traffic such operations were uneconomical.

and veal) but the principal data source [60] does not indicate the actual amounts originating from packing plants. Practically all packer meat shipments to U.S. export go by truck.[8]

Country Points. Packing companies are also engaged in feeding and finishing livestock either on packer-owned feedlots or by some contract arrangement with livestock producers. Supposedly, packers might dispose of some feeder-type animals through outright sales.

An estimate of the number of feeders that return to country points from packing plants is shown in Table 3.7. The calculation was made by subtracting inter-provincial through-billings and stockyards feeder shipments, from total inward movement (i.e. feeders to all country points). The remainder represents packing plant feeder shipments. However, it should be pointed out that packer purchases of feeder stock at community auctions which is transferred directly to the place of feeding and does not go via packer premises is left unaccounted for by these statistics. Most community auctions do not maintain complete records.[9]

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[8]Personal interview with Alex Eremko, Canadian Pacific Railways, Union Stockyards, St. Boniface, Manitoba.

[9]This interpretation of the data was verified in a telephone conversation with A.M. Johnston, Canada Dept. of Agriculture, Livestock Div. St. Boniface Union Stockyards Office, Winnipeg, Manitoba.

From Local Abattoirs

No secondary data were available which showed the disposition of meat from abattoirs. However, it is assumed that the meat enters wholesale and retail channels as fresh meat or in the form of processed food. Commonly, the abattoirs' business is referred to as "kill and chill", descriptive of the fact that they mainly engage in the fresh meat trade. Most of the offal and by-products are sent to packing companies or other animal product processors.

The export channel is another possibility for government inspected establishments. Uninspected abattoirs would be prevented from exporting their meat products by government food and health regulations.

From Wholesale/Retail

Intercity trucking is utilized in distributing meat and meat products to wholesale and retail stores. Distances of haul are short. By the time the retail cut of meat is picked up by the consumer, this study is no longer concerned with how it is "transported" further. Essentially, this is the last step in the livestock marketing system.

TABLE 3.7

Distribution of Feeder Stock in Canada from Country Points, Public Stockyards and Packing Plants, Average 1957-61 and 1962-66*

(No. Head)

Year	Total Inward Movement[a]	Inter-Prov. Through-Billings[b]	Stockyards Feeder Shipments[c]	Packer Feeder Shipments
		CATTLE		
1957-61	357,507	37,519	312,495	7,493
1962-66	462,142	34,992	418,898	8,252
		CALVES		
1957-61	149,382	44,417	111,752	6,787
1962-66	312,790	110,571	200,287	1,932
		SHEEP		
1957-61	38,678	16,574	20,754	1,350
1962-66	32,648	18,415	12,809	1,424

[a]Feeder cattle, calves and lambs returned to the country for further feeding from public stockyards and packing plants, including through-billings from country points in one province to country points in another.

[b]Total billed through public stockyards en route from country points in one province to country points in another.

[c]Feeder cattle, calves and lambs returned to country points from public stockyards.

*Source: Livestock Market Review. Canada Dept. of Agriculture, Ottawa.

CHAPTER IV

SOME ASPECTS OF RATE MAKING FOR TRANSPORTATION OF LIVESTOCK AND LIVESTOCK PRODUCTS

In this chapter, three broadly related areas of rate making for rail and truck transport are discussed. These are: the historical development of truck and rail rate making, including the rationale upon which rates were based; a qualitative analysis of the price elasticity of demand for animal and animal products transportation (by rail) including some implications for rate making; and a discussion of the economies of plant size for road and rail transport services. The latter involves some of the cost characteristics facing the suppliers of livestock and livestock products transport services. The last section of this chapter briefly presents an overall summary and conclusions.

A. HISTORICAL DEVELOPMENT OF RATE MAKING: RAIL AND TRUCK

Freight tariffs are voluminous and complicated. Many thousands of commodities are shipped daily between thousands of origins and destinations. And the circumstances under which the shipments are made are continually changing, necessitating constant revisions of particular freight rates. This section focuses in particular on the historical developments of livestock and livestock product freight rates for

rail and truck, and on the rationale underlying these developments.

Since railways have played such a major role in Canadian transportation history and since more has been written on rail transport than any other mode, it seems unavoidable that a large part of this section be devoted to a discussion of railway freight rate developments with respect to livestock and related products. And, as is pointed out later, truckers often patterned their own rates after existing rail rates.

Rail Rate Making

Rate Classification. In general, rail freight rates may be grouped into several broad categories.[1] From 1884 until March 1, 1955 commodities were grouped into ten "classes" numbered 1 to 10, each class bearing a different mileage class rate. Articles in classes 1-5 were sometimes referred to as "high rated" goods (e.g. high-valued, bulky, usually less-than-carload lots of clothing, dishes, groceries), and articles in classes 6-10 were referred to as

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[1]The categories include class rates, commodity rates, proportional rates, international rates, transcontinental rates, import and export rates, switching rates, interswitching rates, Maritime Freight Rate Act rates, and miscellaneous rates and charges. See Hugh V. Walker [25, Chap. II and Appendix III] for a breakdown and explanation of each of these categories.

"low rated" goods (e.g. low-valued, usually carload lots of agricultural equipment, livestock, products of mines and forests). In addition, there were nine rate categories above the first class, expressed as multiples of Class 1, ranging from 1¼ to 4½ times Class 1 rates (e.g. imported wine and less-than-carload lots were rated at twice first class) [55] [3, pp. 28-29, 187-88].

The percentage relationships between classes have never remained stable and the effects of numerous percentage increases and decreases in all rates, as well as rounding out the absolute changes to the nearest cent have distorted the original basis even more. The absolute level and the inter-class relationships also differed as between Eastern and Western Canada, prior to equalization. Western rates tended to be higher than Eastern rates.[2]

Livestock was considered to be a relatively low-valued commodity. Therefore, it fell under Class 9. Fresh meats, on the other hand, were higher-valued and perishable so that carload lots of fresh meat were rated at Class 4.

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[2] "The relationship of the classes (omitting ninth, livestock, for which a commodity rate was published) in 1950 for hauls of 400 miles was 100, 88, 75, 63, 50, 46, 39, 39, 34 in Eastern Canada and 100, 85, 67, 50, 45, 38, 27, 27, 22 in the West. For this distance the first class rate in the West was 48 cents per hundred pounds higher than in the East but the tenth class rate was 3 cents per hundred pounds less" [2, p. 655].

Following recommendation of the Turgeon Royal Commission in 1951 [75, p. 125], equalization of class rates took effect on March 1, 1955 at which time the classes were also renumbered such that the rate class numbers designated percentages of Class 100 (formerly Class 1) in terms of cents per hundred pounds, for each mileage block. The relationship of the classes then became 100, 85, 70, 55, 45, 40, 33, 30, 33 (except horses and mules became 40), and 27 [2, p. 28].[3]

In general, class rates represent legal maximum or ceiling rates and are applicable only in the absence of any lower rate. Most livestock and livestock products, in fact, nearly all of the revenue tonnage carried by Canadian railways, move under "commodity" rates[4] which may be sub-divided into normal commodity rates, truck and/or water competitive rates, and agreed charges.[5] In the absence of agreed charges or truck and/or water competitive rates, normal commodity rates apply which are published on a point to point basis

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[3]Multiples of Class 100 were simply designated by appropriate percentages (e.g. 200 means double Class 100).

[4]According to the 1966 Waybill Analysis [53] 55 per cent of total Canadian rail traffic, in terms of tons, was transported under commodity rates while class rate traffic only made up 1 per cent of the total. Furthermore, Class 33 (includes livestock) accounted for only 9 per cent of total class rate tonnage.

[5]Infra, Chapter IV, p. 70.

or on a mileage basis. Truck and/or water competitive rates were introduced by the railways to meet competition arising from highway and water carriers. These rates in turn may be ordinary or incentive. Most of the livestock rates are of the step-ladder incentive type such that the rate per hundredweight decreases with increasing minimum carload weights. For example, the rates might be 210, 190 and 175 cents a hundredweight for carloadings of 21, 28 and 36 thousand pounds respectively. (Truck rates follow a similar pattern.)

In July, 1967 (revised in October, 1967) the railways introduced "per car charges"[6] for livestock. These charges consist merely of a flat rate per car, given origin and destination, regardless of loaded weight or number of head. The shipper is free to specify whether he wants to be billed by hundredweight or by the car. If the shipper's livestock are relatively light (e.g. feeder calves) it would probably be to his advantage to pay the flat rate per car. This is so because most of the per hundredweight rates are of the step-ladder incentive type referred to earlier.

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[6]Information obtained in conversations with Jack Roman, Traffic Manager, Canada Packers, Winnipeg and Alex Eremko, Canadian Pacific Railways, St. Boniface Union Stockyards, Winnipeg, Manitoba.

Another type of incentive rate is the "multiple carload rate."[7] This is a variation of the unit train or train-load concept which reduces handling of individual cars. If a shipper has two or more carloads of produce per day which have a common origin and destination, he is eligible for a multiple carload rate. Large livestock producers, dealers and packing plants no doubt ship sufficient volume to take advantage of multiple carload rates.

As far as could be determined, no livestock or meats were being carried under agreed charges.[8] This type of agreement, therefore, does not appear to be of any great importance for the commodity group in question. In the transporting of a commodity group such as petroleum products, there is little question that agreed charges play a prominent role and have a bearing on truck-rail competition. However, in view of the fact that agreed charges are an effective weapon in inter-modal competition, future years

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[7] Jack Roman, op. cit.

[8] The legal basis and regulations pertaining to agreed charges are laid down in the Statutes of Canada [79]. Walker describes agreed charges as "a technique of establishing rail freight rates to meet competition . . . (and) take the form of a written agreement between the shipper and the railways, whereby the shipper agrees to use the services of the railways in shipping a stipulated major portion of a commodity in return for receiving a reduced rate from the railways. During the lifetime of the agreement, any other shipper usually can obtain this reduced rate by filing a 'notice of intent' to adhere to the conditions stipulated in

may see truck operators, in addition to railways, resort to this type of competitive rate making. Witness for the Province of Quebec to the MacPherson Royal Commission on Transportation testified that there already were two trucking agreed charges between Montreal and Quebec [77, p. 18].

Historically, of course, the trucking associations have opposed the railways' use of agreed charges on the grounds that it gave the railroads an unfair advantage and that it could develop into "a potent monopolistic weapon by which competition by trucking operators can be weakened and eliminated" [77, p. 14]. They have further claimed that agreed charges removed traffic from competition for a long period of time;[9] that some rate agreements were less than compensatory; and that it was only the largest truck operators who had the financial resources to enter into agreed charges, which if they did would create hardships for other smaller truck operators [77, pp. 16-18]. It is not clear why only the largest truckers could engage in agreed charges and the submission does not elaborate.

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the agreement" [25, p. 12]. Typically, agreed charge contracts provide that 75 to 100 per cent of a shippers' traffic must move by rail [74, p. 73].

[9]Actually the life of an agreed charge contract is one year, whereupon it must be re-negotiated but a Canada Packers representative indicated that, in practice, it was often implied or understood that the contract would be good for a much longer term (e.g. five years). Consequently, they were reluctant to enter into such a contract.

Despite the repeated protests of the trucking industry, operators still seem to have been able to meet rail competition rather well, particularly on a service basis. A special study conducted by D.W. Carr and Associates for the MacPherson Commission reported that in some cases meat packers in Western Canada preferred truck services to rail with agreed charges at very much lower rates. The supervised refrigeration offered by truckers was particularly attractive [74, p. 73].

This provides an idea as to the categorization of rail tariffs and how livestock rates fit into the scheme.

Pre-1948. Until the 1930's and to a considerable extent into the 1940's, the railways enjoyed an era of near monopoly conditions in the Canadian transportation environment. From the very first commodity classification published in 1874 it was evident that the underlying principle by which commodities were grouped was a "value of service" concept or a "charging what the traffic will bear" idea [73, p. 44]. This principle discussed earlier in Chapter II, was already well known in water transport.

With value of service pricing, the rate charged for transporting a particular commodity depends mainly on the shipper's demand function for the service and, in essence, involves price discrimination. To reiterate, the three conditions necessary for discriminatory pricing are seller

monopoly power, separation of markets and different price (rate) elasticities of demand between markets.

To a large extent all three conditions were present in railway transportation, especially in the early decades of railroading. While there was more than a single railway firm operating in the entire sphere of Canadian transportation, the alternatives of competing railway, water, highway or air transport facilities were often extremely limited or non-existant. Many geographical regions of the country had access to but one common carrier mode and that was usually rail. Competition between railways was also limited for two reasons. Firstly, they were relatively few in number, with two emerging to carry about 73 per cent of total rail traffic by 1966 [71] and; secondly, they were subject to regulation from an early date and subject also to serve as instruments of public policy.* In effect, the railways as a mode of transportation did possess sufficient monopoly power to practice rate discrimination [72, pp. 2-6] [3, pp. 3-27].

Also lacking the mathematical tools and techniques for determining the actual costs of a particular shipment, the railways resorted to ad hoc, experimental adjustments "to discover what the shippers could afford to pay" [73, p. 46] and value of service pricing was a natural out-growth of this situation. In essence, the experimentation sought to determine the demand for transportation services in the

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*Still a third reason was the fact that they were inherently limited to a fixed right of way.

absence of statistically derived demand functions.

Livestock, along with other agricultural products, were placed among the low-value per pound commodities and, hence, moved for relatively low rates. In addition, it was considered desirable for the development of Western Canada that certain settlers' requirements westbound from Eastern Canada be allowed to move at low rates. In 1899, therefore, livestock rates were reduced by 10 per cent [2, p. 87]. Again in 1921, after two general rate increases in 1918 and 1920, the railways voluntarily lowered several commodity rates including those on livestock when prices fell sharply in late 1920 [2, p. 92]. With the depressed prices it was felt that rates were too high for what the traffic could bear. It was not until April, 1948, about 27 years later, that livestock freight rates jumped once more as a result of a 21 per cent horizontal rate increase. (Table 4.1).

Post-1948. Including the 1948 21 per cent case, there have been eleven horizontal rate increases (including interims) which resulted in a peak cumulative increase of 157 per cent by December 1, 1958 (Table 4.1). This does not mean that all rates, or even that rates on the average, have increased by 157 per cent because some rates were unaffected (e.g. statutory rates) and others may have been subject to additional adjustments. Rates on both live cattle, hogs and sheep and on fresh or frozen meats were affected by nearly

TABLE 4.1

Summary of General Increases in Class and Commodity Rail Freight Rates since April, 1948*

Effective Date	Per Cent Increase	Cumulative Increase[a]
8 Apr. 48	21	21
11 Oct. 49	8	31
23 Mar. 50	16 in lieu of 8 above	40
16 June 50	20 in lieu of 16 above	45
26 July 51	12	63
11 Feb. 52	17 in lieu of 12 above	70
1 Jan. 53	9	85
16 Mar. 53	7	98
3 July 56	7	112
1 Jan. 57	11 in lieu of 7 above	120
1 Dec. 58	17	157
1 Aug. 59	10 in lieu of 17 above	142
6 May 60	8 in lieu of 10 above	138

[a]This column is calculated as follows: Suppose the pre-1948 freight rate on any commodity was 100 cents per hundredweight (cents/cwt.). Then a 21 per cent increase would raise the rate to 121 cents/cwt. and the "cumulative" increase would simply be 21 per cent. A further 8 per cent increase added on to the 121 cent rate would raise the latter by approximately 10 cents (9.68 rounded off) bringing it up to 131 cents/cwt., which is 31 per cent greater than the initial rate of 100 cents. In other words, the cumulative effect of, first, a 21 per cent increase and then an 8 per

every general rate case. (At least one exception, for example, is the rate on live cattle, hogs and sheep from Winnipeg to Montreal which decreased one cent per hundredweight on January 1, 1957. See Table A.3, Appendix II.) Following December, 1958 rates were held relatively stable, pending findings of the Royal Commission appointed in May, 1959 to enquire into the railway rate structure and other matters affecting transportation. In the meantime, legislation designed as a relief measure for shippers was passed by Parliament in July, 1959. The Freight Rates Reduction Act and later amendments provided the finances necessary to permit the reduction of freight rates and the payment of compensation to the railways for maintenance of their rates on freight traffic at the reduced levels [58].[10]

In addition to the effects of horizontal changes in rates, livestock rates have been subject to numerous other adjustments. Live cattle rates between Winnipeg and Montreal, for example, have increased on six occasions and

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cent increase, is 31 per cent.

The "16 in lieu of 8" case is calculated by adding 16 per cent on to 121 (not 131), which amounts to 121 + (121 x .16) = 140. Hence the cumulative increase is 40 per cent.

The same procedure is followed for the remainder of the table.

*Source: Hugh V. Walker, The Transportation of Feed Grains in Eastern Canada [25, p. 65].

[10] Infra, Chapter V, p. 117.

decreased on six. Rates on meats between the same two points have jumped only three times and fallen seven. By the end of 1966 the net result has been a cumulative increase of 121 per cent for live animals but only 64 per cent for meats (Table 4.2). It is interesting to note that at the time when rates had reached a peak in December, 1958 the cumulative increase for both commodity groups was slightly more than 140 per cent. One possible explanation of this phenomenon is that since 1958 meats have been subject to more long-haul trucking competition than live animals.

In recent years, however, the railways' monopoly power is being threatened for many different commodities and lengths of haul, including that of animals and animal products, so that unless the shippers of a commodity are "captive" shippers (i.e. their only choice is to ship by rail or not at all) it becomes considerably more difficult to practice discriminatory pricing.

From looking at the historical development of livestock rates or rail rates in total, for that matter, it becomes clear that they have certainly not remained constant or even evolved in some simple, straight-forward pattern. The forces are many that influence rail rates--some economic and some institutional or political.

TABLE 4.2

Index of Rail Freight Rates on Shipments of Livestock and Meats from Winnipeg to Toronto or Montreal, 1921-66*

Effective Date	Cattle, Hogs & Sheep	Meats, Fresh or Frozen
15 Aug. 21	100	
1 Oct. 21		100
8 Apr. 48	121	121
11 Oct. 49	131	131
23 Mar. 50	140	140
16 June 50	146	145
15 Dec. 50	155	
26 July 51	174	162
11 Feb. 52	181	169
1 May. 52	169	160
1 Jan. 53	186	175
16 Mar. 53	200	188
1 May 53	193	183
1 Nov. 55	185	177
1 Mar. 56	193	
1 Nov. 56		183
3 July 56	206	195
1 Jan. 57	205	203
1 Mar. 57	207	205
1 Aug. 58	208	
1 Dec. 58	244	241
1 Mar. 59	240	239
1 Aug. 59	225	
30 Apr. 59		193
7 Sept.59	207	
1 Dec. 59	216	
6 May 60	212	
1 Feb. 62	207	
18 July 62		175
29 Oct. 62		157
1 Mar. 64		164
10 Oct. 66	221	

*Source: Calculated from Tables A.3 and A.4, Appendix II.

Truck Rate Making

From the very outset the rate policies of for-hire truckers have reflected the nature of the trucking industry, which differs considerably from the railway industry. The relative ease of entry and the relatively large number of firms have given rise to a considerable amount of rate and service flexibility as well as competitively determined rates. A special study conducted for the Royal Commission on Transportation [74, pp. 36-37] found that for some standard commodities, which only required standard handling techniques (e.g. canned goods), truckers were content to use railway rates as a basic guide to their pricing. However, the major portion of the goods hauled by trucks consisted of manufactured and processed goods requiring a wide range of specialized services and in this area truckers preferred to leave their rates flexible so as to better meet the needs of particular shippers. Railway rates were not suitable for a rate making standard, particularly on short-haul traffic. For long-distance operators the Commission reported that,

> . . . railway rates provided a clear guide for maximum rates, their line-haul costs appeared to be their guide for minimum rates--the risk of loss by cutting rates below this minimum was correspondingly greater than for shorter haul operators. . . indications that these line-haul costs permitted adequate freedom for competition with the railways were evident in the substantial reductions made in rail rates on dressed meat, livestock, butter and other commodities . . . [74, p. 37].

A comparison of rail and truck rates on hanging beef carried from Winnipeg to Montreal or Toronto revealed that the charges per hundredweight were identical.[11] Intermodal competition, therefore, must rest primarily on quality of service considerations. This appears to be consistent with the above assertion that rail rates provided a clear guide for maximum truck rates over long distances.

Door-to-door pick-up and delivery (including split deliveries of a load to more than one customer at destination), speed and flexibility are probably the three most important quality factors, upon which the truckers place a great deal of emphasis. In long-distance livestock shipments, for example, this means that truckers are able to travel from Alberta to Eastern Canada with only one rest-stop, whereas rail would require two [2, p. 492].[12]

Thus, it would appear that the pricing policies of trucking firms were and are more nearly consistent with cost of service pricing than with value of service. Their ability to practice price discrimination is severely limited by their

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[11]Personal interview with Bill Cole, Executive Secretary of Winnipeg Livestock Exchange, St. Boniface Union Stockyards, Winnipeg, Manitoba.

[12]Canadian Pacific Railways requires two stops; however, Canadian National Railways is now able to run through with only one stop at Winnipeg. [Alex Eremko, Canadian Pacific Railways, St. Boniface Union Stockyards, Winnipeg, Manitoba].

lack of monopoly power because an individual trucking firm must answer to competition of other truckers, to the competition of railways and, in a few instances, to the competition of aviation.

B. PRICE ELASTICITY OF DEMAND FOR LIVESTOCK AND LIVESTOCK PRODUCTS TRANSPORT SERVICES

This section seeks to determine, if only in a qualitative manner, what the price elasticity of the transport demand function for animals and animal products might be. Knowledge in this area is essential when setting and adjusting freight rates on a value of service basis. It also provides carriers with information as to how their total revenue might be affected if rates were altered.

The value of a commodity (i.e. price per unit of weight) provides a good indication of the elasticity of demand for transportation. The elasticity of the transportation demand for any commodity depends on two main factors: (1) what proportion the transportation charge per unit of weight is of the value of the commodity, and (2) the price elasticity of demand for the commodity itself.[13] The

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[13]The transportation demand function discussed here is the demand for transportation services in general which does not isolate the demand for any particular mode, unless rail, for example, happens to be the only mode available, as in a monopoly situation. In the event that two or more modes

greater the proportion the transportation charge is of the selling price of the commodity, and the greater the price elasticity of demand for the commodity, the greater will be the elasticity of transport demand and vice versa.

Generally, the higher the selling price the smaller will be the proportion of transportation charges of selling price and the smaller will be the effects on quantity sold of a change in the transport rate. Hence, a high-valued commodity can "stand" a higher transportation charge than a low-valued commodity, other things being equal.[14] Therefore, maximizing revenues would involve imposing a high freight rate on high-valued goods (which are transport inelastic) and a low freight rate on low-valued goods (which are transport elastic).

First, one must know what proportion the transport charge per unit of weight (T) is of the price per unit of weight of livestock or products (V). This ratio will be denoted as T/V. The numerator, or the per unit of weight

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are available, the transportation charges of alternative modes must be taken into account in determining the elasticity of demand for any particular mode [11, p. 157].

[14]It is possible that the influence of the elasticities of demand for the commodities themselves could be strong enough to offset the transport charge to selling price ratio effect. Such would be the case if the demand for the high-valued good was highly elastic and the demand for the low-valued good highly inelastic.

transport charge, is given by the freight rate plus any miscellaneous charges (e.g. feed for livestock, stopover, handling, etc.) imposed by the railway for a particular shipment. The denominator, or the value of the commodity in question, is given by the per unit of weight price of the commodity. (The relevant price is the market price at destination.)

Consider first the denominator. Whether the value of the commodity, as measured by market price, is considered as being "high" or "low" is largely a relative designation determined on the basis of comparisons with the values of other commodities. It was stated earlier that, other things being equal, a high-valued commodity could "stand" a higher transport charge than a low-valued commodity; consequently, for a given tonnage one would expect a low-valued commodity to contribute proportionately less towards transport revenue than a high-valued commodity. For example, if commodity X made up 10 per cent of total tons hauled by a particular mode and if X was low-valued, its revenue contribution would be less than 10 per cent of total revenue. If X was high-valued, its contribution to total revenue would be more than 10 per cent.

With this in mind, Table 4.3 is presented to show some comparisons of the five broad commodity groups transported by Canadian railways. The group of animals and animal products

was found to have the highest per cent revenue to per cent tonnage contribution ratio in both 1949 and 1966, even higher than manufactures and miscellaneous. Products of mines had the lowest ratio.

It may be inferred from this, ceteris paribus, that on the average, animals and animal products are high-valued goods relative to all other commodity groups.

Within the animals and animal products group, fresh meats were found to make a greater contribution to revenue per ton, as might be expected, than either live cattle and calves or hogs. This is shown in Table 4.4 and also in Table 4.6

Further evidence suggesting that the animals and animal products group constitute the highest valued group is contained in Table 4.5. Again, average revenue per ton earned by animals and animal products was between 1.5 to almost 3.0 times as high as its closest competitor, manufactures and miscellaneous; and up to 15.5 times higher than products of mines, which were at the bottom of the list once more with an average revenue of $2.52 per ton in 1966.

Animals and animal products were also found to have the highest average revenue per ton-mile, despite the largest average length of haul of 1,378 miles as compared to 562 miles for manufactures and miscellaneous. Freight rates generally "taper" with increasing distance [2, pp. 212-15],

therefore, the average revenue per ton-mile for a short-haul will be greater than for a long-haul, ceteris paribus. This means that if the length of haul of animals and animal products was increased sufficiently, while holding manufactures and miscellaneous constant at 562 miles, the average revenue per ton-mile for the former commodity group would eventually drop below the average revenue per ton-mile of the latter (assuming animals and animal products freight rates continued to taper off with increasing distances).

The important point to notice in this regard is that the average length of haul of animals and animal products in 1966 was already more than twice that of manufactures and miscellaneous, yet the average revenue per ton-mile of the former was still above the latter.

If, therefore, animals and animal products are high-valued and if the numerator, T, is relatively low then the ratio T/V should be relatively low also, which would have the effect of making the transport demand function more inelastic, citeris paribus. Can this inference be empirically verified?

A 1954 study in the United States based on Texas choice grade steers sold at retail in New York, found that about 2.0 per cent of the consumer's dollar went to transport services [52]. A second study conducted at the University of Manitoba and based on beef marketed in Winnipeg, over the

TABLE 4.3

Percentage Contribution of Commodity Groups to Total Tonnage and Revenue, 1949 and 1966*

Commodity Group	1949			1966		
	Per Cent of Tonnage	Per Cent of Revenue	Ratio of Tonnage to Revenue[a]	Per Cent of Tonnage	Per Cent of Revenue	Ratio of Tonnage to Revenue[a]
Plant Products of Agriculture	25.9	24.9	1:1.0	23.5	17.3	1:0.7
Animals and Products	1.7	4.8	1:2.8	0.8	4.4	1:5.5
Products of Mines	37.1	17.6	1:0.5	36.4	13.5	1:0.4
Products of Forests	11.3	9.6	1:0.8	9.8	8.2	1:0.8
Manufactures and Misc.	24.0	43.1	1:1.8	29.5	56.6	1:1.9
Total	100.0	100.0		100.0	100.0	

[a]Rounded to the nearest one-tenth.

*Source: Board of Transport Commissioners for Canada, Waybill Analysis.

TABLE 4.4

Percentage Contribution of Cattle, Hogs and Fresh Meats to Total Animals and Products Tonnage and Revenue, 1949 and 1966*

Commodity	1949			1966		
	Per Cent of Tonnage	Per Cent of Revenue	Ratio of Tonnage to Revenue[a]	Per Cent of Tonnage	Per Cent of Revenue	Ratio of Tonnage to Revenue[a]
Cattle & Calves (single-deck)	42.3	29.3	1:0.7	36.3	34.8	1:1.0
Hogs (single-deck)	14.8	6.5	1:0.4	2.1	0.9	1:0.4
Fresh Meats	9.2	19.8	1:2.2	26.8	38.8	1:1.4

[a]Rounded to the nearest one-tenth.

*Source: Board of Transport Commissioners for Canada, Waybill Analysis.

TABLE 4.5

Revenue Analysis of Waybill Sample of Carload Shipments by Commodity Groups, 1949 and 1966*

Commodity Group	Average 1949				Average 1966				
	Length of Haul	Revenue Per Ton	Revenue Per Ton-Mile	Revenue Per Car-Mile	Length of Haul	Load Per Car	Revenue Per Ton	Revenue Per Ton-Mile	Revenue Per Car-Mile
	(Miles)	($)	(¢)	($)	(Miles)	(Tons)	($)	(¢)	($)
Plant Products of Agriculture	751	4.77	0.6	.27	785	51.9	5.00	0.64	.33
Animals and Products	662	13.95	2.1	.28	1,378	14.9	38.98	2.83	.43
Products of Mines	227	2.36	1.0	.45	214	68.6	2.52	1.18	.80
Products of Forests	396	4.24	1.1	.35	389	41.7	5.66	1.46	.56
Manufactures and Misc.	456	8.98	2.0	.46	562	34.3	13.06	2.33	.76
Grand Total	445	4.98	1.1	.37	477	46.9	6.80	1.43	.60

*Source: Board of Transport Commissioners for Canada, Waybill Analysis.

TABLE 4.6

Revenue Analysis of Waybill Sample of Carload Shipments of Selected Animals and Animal Products, 1949 and 1966*

Commodity	Average 1949				Average 1966				
	Length of Haul	Revenue Per Ton	Revenue Per Ton-Mile	Revenue Per Car-Mile	Length of Haul	Load Per Car	Revenue Per Ton	Revenue Per Ton-Mile	Revenue Per Car-Mile
	(Miles)	($)	(¢)	($)	(Miles)	(Tons)	($)	(¢)	($)
Horses and Mules	804	16.26	2.0	.26	992	10.9	36.47	3.68	.40
Cattle & Calves (single-deck)	514	9.63	1.9	.20	1,439	12.4	37.41	2.60	.33
Swine (single-deck)	243	6.08	2.5	.21	457	9.4	17.31	3.79	.35
Meats, fresh	1,311	30.11	2.3	.29	1,539	14.0	56.51	3.62	.51
Meats, cooked or cured	758	16.72	2.2	.58	874	17.4	25.70	2.94	.49
Other Packing House Products, edible	796	22.66	2.8	.30	1,243	19.2	34.01	2.73	.58
Poultry, dressed and frozen[a]					1,140	16.0	37.92	3.33	.56
Butter	1,055	40.36	3.8	.39	900	18.2	36.12	4.02	.83
Fish & Sea Animal Oil					1,785	31.2	23.87	1.34	.41
Total Animals & Products	662	13.95	2.1	.28	1,378	14.9	38.98	2.83	.43

[a] In 1949 poultry is included with "Meats, fresh".

*Source: Board of Transport Commissioners for Canada, Waybill Analysis.

period 1935-1957, found that transportation plus primary marketing costs (these include charges for use of stockyard facilities, feed, insurance, commission, penalties levied on cattle marketed with horns, and other miscellaneous charges) made up a low of 2.1 per cent of the consumer's dollar in 1951 to a high of 6.4 per cent in 1935 [26, pp. 7, 30].

These proportions appear to be quite low, as was anticipated; however, the percentages cited represent the proportion total transport charges are of the retail value of beef, after it has been slaughtered, processed, and cut up for retail trade. To estimate the T/V ratio on this basis, especially for live cattle, may not be too useful since the demand for transporting live cattle is essentially a derived demand, dependent on the consumer demand for the final product. Hence, a more valid estimate of T/V would be one where the value of the commodity was measured by the price of the livestock at destination, before further processing of the animals had taken place. In other words, if a live animal is transported from A to B one should calculate what percentage the total transport charge per pound is of the price per pound of the live animal, if it were sold in the market at B.

With this in mind some simple calculations are tabulated in Table 4.7. The rail freight rates shown in the fourth column may not include all the miscellaneous handling

charges, so to the extent that they are absent the percentage of freight rate over price will understate the T/V ratio, which as stated earlier, should properly include extra charges in the numerator.

The last column of Table 4.7 shows that the ratio is in the range of 3.1 per cent to 9.7 per cent. On the average this is significantly higher than the 2 per cent recorded earlier. Again, since a commodity in a semi-processed state is generally less valuable than the same commodity in a more fully-processed state, the percentages for live and wholesale carcass beef would be expected to be higher than for retail beef. By the same token, it can be seen that the freight rate to price ratio is higher for shipping live cattle from Saskatoon, Winnipeg and Edmonton to Toronto than it is for shipping fresh or frozen meat between the respective points.

From the indications thus far, what can be concluded about the relative magnitude of the T/V ratio? Once again, whether the ratio (e.g. 6 per cent) is considered to be "high" or "low" is somewhat arbitrary and relative. However, if it is true that the value of animals and animal products is relatively high (as was suggested) and given that freight rates on livestock were found to be low-rated (i.e. pre-1955 livestock was in Class 9 and post-1955 in Class 33), then it may be concluded that the T/V ratio must also be relatively low.

TABLE 4.7

Transportation Charge as a Per Cent of the Value of the Commodity: Live Cattle and Meats Shipped Between Selected Points, 1966*

From	To	Commodity Description	Rail Freight Rate	Price of Commodity at Destination	Freight Rate / Price
			($ per cwt.)	($ per cwt.)	(%)
Calgary	Winnipeg	Live Cattle	1.20	22.49[a]	5.3
Moose Jaw	Winnipeg	Live Cattle	0.70	22.49[a]	3.1
Saskatoon	Toronto	Live Cattle	2.04	23.76[a]	8.6
Winnipeg	Toronto	Live Cattle	1.74	23.76[a]	7.3
Edmonton	Toronto	Live Cattle	2.30	23.76[a]	9.7
Edmonton	Toronto	Meats, Fresh or Frozen	3.21	44.00[b]	7.3
Saskatoon	Toronto	Meats, Fresh or Frozen	2.68	44.00[b]	6.1
Winnipeg	Toronto	Meats, Fresh or Frozen	1.98	44.00[b]	4.5

[a]Average price of all steers and heifers marketed at the public stockyards in Winnipeg and Toronto respectively, 1966.

[b]Average wholesale price of beef carcass, commercial steer, at Toronto, 1966.

*Source: Livestock and Animal Products Statistics, Dominion Bureau of Statistics No. 23-203. Ottawa: Queen's Printer. 1966.

This is not to say that transportation charges are insignificant in relation to the value of livestock and livestock products, but it does mean that the effects of transportation charges on the transport demand for livestock and livestock products are of lesser importance than they are for lower-valued but higher-rated commodities.

The second factor affecting the price elasticity of the transportation demand for animals and animal products which must be considered is the price elasticity of demand for the commodity or commodity group itself.[15] Let T_e denote the price elasticity of demand for the transportation of animals and animal products and D_e denote the price elasticity of demand for the commodity group per se. It will be remembered, other things being equal, that the lower D_e is, the lower T_e will be and the higher D_e, the higher T_e will be. Now what can be said about D_e?

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[15] While income elasticity of demand for the commodity may affect the elasticity of transport demand for the commodity, for the purposes at hand only the price elasticity of demand is considered for two reasons; namely, that inter-regional, inter-temporal changes in income are generally relatively small, especially over short time periods, and so can be regarded as nearly constant; and that, since we are attempting to determine the rate (i.e. price) elasticity of transport demand and since transportation constitutes a cost item to be covered by the price of the commodity, it is important to know how consumers respond to changes in the commodity price. The consumer's response, in turn, directly influences the shippers' response to changes in the freight rate.

Table 4.8 indicates some price elasticities for various meats and other selected agricultural commodities at the retail level. Red meats as a group were found to be relatively inelastic (i.e. a 1 per cent rise in the weighted price of red meats resulted in a decrease of only .43 per cent in quantity consumed, ceteris paribus), though not as inelastic as butter and white potatoes, for example. Of the red meats, lamb was highly elastic responding more than proportionately to a given change in price.

Once again the price elasticity at the retail level of demand may not be the appropriate elasticity for determining T_e. The price of the live animal and carcass meat at the stockyards and packing house (wholesale) levels, respectively, is lower than retail by the amount of the packer and retail marketing margins; and the latter typically vary only slightly as prices vary. That being the case, it can be demonstrated that the price elasticity of demand at the farm, or at some other intermediate level, is less than the price elasticity of demand at the retail level [12, pp. 5, 17, 49-50].

Therefore, if an empirical investigation were carried out to determine the price elasticity of demand for live cattle or for carcass beef one would expect it to be lower than the already low retail price elasticity of -.31 (Table 4.8). This would have the directional effect of making T_e

TABLE 4.8

Price Elasticities for Selected Agricultural Commodities and Commodity Groups, Canada, 1926-62*

Commodity	Price Elasticity[a]
Red Meats[b]	$-.43^{+}$
Beef	-.31
Pork	$-.66^{x}$
Lamb	-1.78^{xx}
Poultry Meats[c]	-1.06^{xx}
Eggs	$-.31^{xx}$
Butter	$-.15^{++}$
Cheese	$-.71^{++}$
Margarine	$.25^{++}$
Sugar	$-.27^{x}$
White Potatoes	$.21^{++}$
Wheat Flour	-.24
Cereals[d]	$-.56^{x}$

[a]Levels of significance indicated by: xx = 1 per cent; x = 5 per cent; + = 10 per cent; ++ = 40 per cent.

[b]Includes beef and veal, pork and lamb.

[c]Includes chicken and turkey meat.

[d]Includes wheat flour, oatmeal and rolled oats, rye flour and meal, pot and pearl barley, buckwheat flour.

*Source: M.L. Beckford, "Demand Analysis for Selected Agricultural Commodities, Canada, 1926-62." Ph.D. Thesis, University of Manitoba, October, 1964, Appendix B, Table XX. The analysis omits the World War II period, 1940-46 [80].

less elastic if T_e was, in fact, elastic to begin with, or of making T_e more inelastic if initially T_e was, in fact, inelastic.

On the basis of a relatively low T/V ratio together with with an inelastic demand for animals and animal products it can be concluded that the demand for transporting animals and animal products is rate inelastic. This conclusion is subject to at least the one qualification noted earlier that, strictly speaking, only the transport demand function in general and not for any one mode is being analyzed, unless that mode happens to be in a monopoly position with respect to transporting the commodity group in question. However, to the extent that 1966 rail freight rates were employed earlier in determining T/V and to the extent that some segments of railway livestock and livestock product shipments were immune to truck competition (admittedly, this segment was small) the analysis does isolate the rail transport demand function. In other words, the analysis measures the rate elasticity of rail transport demand for hauling animals and animal products, where cross-elasticity is excluded by definition.

Of course, the transport demand for rail can still be inelastic (over some rate-quantity range) even in an environment of inter-modal competition and certainly by 1966 truck-rail competition was vigorous. The effect of truck competition on the rail transport demand function is to make it less rate inelastic.

The question may now be raised whether, historically, railway pricing of livestock and livestock products transportation services was consistent with demand theory and value of service pricing. If livestock and livestock products are high-valued goods why were they generally regarded as low-valued, which is exemplified by the fact that livestock was initially placed into Class 9? Also, if the conclusion that $T_e < 1$ is true, then the implication is that an increase in the freight rate would increase total revenue and, conversely, a decrease in the rate would decrease total revenue. It would appear that the railways could have placed livestock in a higher class (fresh meats were in Class 4, which bore higher rates) and that they have foregone revenues they could have earned on hauling livestock and products simply by raising freight rates for this commodity group. The necessary monopoly power to do so was present.

In an effort to explain why freight rates were not raised, one would need to investigate the possible existence of other variables, both economic and non-economic in nature, which either may have prevented the railways from raising their rates even though they would have wanted to, or may suggest that the demand for transporting animals and animal products was, in fact, not rate inelastic.

The supply conditions of livestock and livestock product shippers, for example, may have been such that a small increase in freight rates would have resulted in a large reduction in volume shipped (i.e. an elastic supply curve). Then total revenue earned by the railways from this commodity group would have declined. Regulatory authorities apparently had the well-being of the nation, generally, and the livestock shippers in particular in mind over that of railway earnings. For example, it was a national goal at the turn of the century to stimulate growth in Western Canada, which was particularly suited to primary production. To accomplish this goal it was felt that settlers in the West required abundant, low-priced transportation. Consequently, freight rates were lowered on various settler effects and agricultural commodities, including animals and animal products. The analysis seems to suggest (assuming the relative magnitudes of T/V and D_e at that point in time were the same as we judged them to be in more recent years, and this may be an heroic assumption) that lowering freight rates on low-valued commodities (e.g. plant products of agriculture) was consistent with charging what the traffic will bear (i.e. maximizing revenues). But lowering rates on high-valued animals and animal products was inconsistent. Given the assumptions, this is a clear case where political forces took precedence over economic forces.

Thinking now in terms of the present and future situation regarding the rate elasticity of demand for transporting livestock and livestock products it was concluded earlier that, based on 1966 data, the rail transport demand for this commodity group was rate inelastic. Ignoring truck competition, it would theoretically be possible for railways to increase total gross revenues by raising animals and animal products freight rates. However, given that truck competition does exist, if truck rates remained constant as railways gradually raised theirs, more and more livestock and livestock products shippers would switch from rail to truck, so that at some rail rate level the demand function for rail transport would become perfectly elastic, above which no shippers would choose rail (assuming also that the quality of service differential between rail and truck remained constant).

What the livestock and livestock shippers' response would be to a rail rate increase cannot be determined from the calculations performed. The outcome would depend, among other things, on whether or not truck operators also increased their rates and whether or not the rail-truck quality of service differential changed as freight rates changed. Other things being equal, though, it is hypothesized that, because of the presence of vigorous truck competition, the demand for rail transport of the commodity

group in question is elastic at rate levels above the 1966 level. And, since there are no indications that truck competition is going to decline by any substantial amount in the foreseeable future, this situation is expected to continue.

It should be recognized that to speak of the rate elasticity of demand for transport services of a particular commodity group may not be too meaningful on account of the numerous circumstances that are overlooked but which may be relevant in studying a particular case. For example, between points A and B the rail transport demand may be highly rate elastic, because of truck competition, whereas between A and C the rail transport demand function might be inelastic, since inter-modal competition is lacking. Thus, the foregoing analysis is highly aggregative and simplified for general discussion purposes.

C. ECONOMIES OF PLANT SIZE: RAIL AND TRUCK

As was indicated in Chapter II, cost of service rate making is based directly on the long-run cost curves of the firm. The shape of the long-run cost curves depends on the economies of scale that can be realized.

It is the purpose of this section to comment on the possible presence or absence of economies of scale in livestock and livestock products transportation by rail and

motor truck.

Rail

The question of whether Canadian railroads face increasing, constant, or decreasing returns to scale in the movement of livestock and livestock products has never been investigated and, as far as could be determined, not even an inquiry of whether Canadian railways, for all commodity movements, face increasing, constant, or decreasing returns to scale. The best that can be done here is to point to several studies made of United States railroads, on the assumption that the situation in Canada is not too different to radically affect our observations. Even on the basis of the investigations that have been made, it appears that there is no general agreement among transportation economists as to what, in fact, the shape of the long-run average cost curve is.

Early writers such as W.Z. Ripley [10] emphasized that a substantial portion of total railway expenses were fixed as traffic increased and, therefore, increasing returns existed. Some, however, expressed reservations about the "Ripley formula" which held that operating expenses only made up two-thirds of the total expenses and still half of the operating expenses could be considered fixed with respect to output changes. In 1940 Herbert Ashton wrote:

> That there are factors, independent of variations in the volume of traffic, which affect railroad costs cannot be denied. But the conclusion seems warranted that the general pronouncements with regard to the 'relative constancy' of the several divisions of operating costs can be accepted as reasonably accurate only within definite limits. When considered over any period longer than a month, the variable element in all operating costs stands out as the dominant characteristics [28, p. 332].

Three years later E.W. Williams reiterated the traditional view:

> Present experience indicates, however, that the assumption that railroad operating expenses increase less rapidly than traffic during periods of sustained traffic growth continues to have substantial validity. . . . This performance results from the substantial fixity of certain elements of expense over varying period of time and in large . . . areas in the industry. The presence of such fixed expenses coincides chiefly with excess capacity [48, p. 365].

Evidently, the two crucial factors which no doubt could help explain and to some extent reconcile these conflicting views are the time periods involved and the traffic densities relative to capacity.[16] The shorter the time period and the greater the excess capacity, the greater the fixity of expenses and the degree of declining unit costs.

Two recent major studies of scale economies in the railroad industry were undertaken by G.H. Borts and K.T. Healy in 1960 and 1961, respectively.

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[16]The term "capacity" means the uniform rate of output which a plant is built to supply. In terms of average cost curves, capacity is that rate of output at which the short-run average cost curve (i.e. the plant-cost curve) is tangent to the long-run average cost curve [29].

Borts [30] stratified a cross section sample of 61 railroads by region (Eastern, Southern and Western) and by size (large, medium and small) and made estimates of average cost, marginal cost and the elasticity of cost (marginal cost divided by average cost) for each size class. The hypotheses tested were, "that the cost-output relation is significantly affected by the size of the firm and that it is significantly affected by the region in which it operates" [30, p. 120].

The empirical evidence showed that:

> The average cost per car-mile . . . shows sharply different behavior in the Eastern region on the one hand and the Southern and Western regions on the other. There is evidence of long-run increasing cost in the Eastern region and long-run constant or decreasing cost in the South and West. In the East, average cost is higher for the largest size firm than for the smallest. . . . In the South and West, on the other hand, either the average cost is highest for the smallest size firm, or else the average cost does not vary by size of firm. In addition . . . the average cost curve is substantially above the marginal cost curve for the South and West [30, pp. 126-27].

Borts concludes that while most writers recognized the higher densities of traffic in the East they still asserted that long-run average costs either decreased, or at best remained constant. If Borts' findings are correct, Eastern railroads faced increasing costs and a rethinking of the old position might be necessary.

K.T. Healy [4] studied the effects of traffic density and of scale on the operations of 37 United States railroads

for the period of 1954-56. J.R. Felton reports on Healy's findings as follows:

> After eliminating the effects of differences in density, Healy . . . found that railroads with more than 10,000 employees experienced increases in wages and transportation expense per unit of output [34, p. 729].

This means that railroads with more than 10,000 employees experience greater diseconomies than economies of scale with a consequent rise in per unit costs.

What can now be said about returns to scale in the rail movements of animals and animal products in Canada? When considering this question, reduced unit costs resulting from increased utilization of existing capacity must not be confused with lower unit costs obtained from operating a plant with greater capacity. The former may be represented by a movement along a given short-run average cost curve while the latter implies movement along the long-run average cost curve.

In order to apply Borts' or Healy's findings to the Canadian situation, one would have to decide into which size class the Canadian railroad firms fit and also satisfy oneself that the operating and capital costs incurred by the Canadian railroads were comparable in magnitude to the costs incurred by the United States railroads that were analyzed in the studies. If the Canadian National and the Canadian Pacific Railways, for example, fit into the large class size

and if the traffic density is comparable to the Southern and Western regions of the United States, then there would be some justification in saying that the CNR and the CPR face long-run constant or decreasing costs.

In terms of rail traffic density per route mile or utilization of existing capacity it is doubtful, purely from a conjectural standpoint, that traffic density in Canada would compare with the U.S. Eastern seaboard, except perhaps the density on lines connecting such points as Toronto and Montreal. Canadian traffic density is more likely to compare with the West and South of the United States.

Excess capacity implies the existence of "a plant larger than necessary to produce a given rate of output at minimum cost" [29, p. 324] and it also implies that if the rate of output were increased to full economic capacity, unit costs would decline to the minimum cost point (i.e. to the point of tangency between the plant and economy of scale curves). In the opinion of R.J. Sampson:

> Whether or not excess capacity exists for providing a multi-input service or product depends on the availability or scarcity of all the necessary inputs. If one essential input is being used to capacity, even though others may not be fully utilized, no usable excess capacity exists [44, p. 68].

He goes on to say that the present-day scarce input in United States railroading is rolling stock so that, in effect, there is no usable excess capacity.

Much has been said and written in Canada regarding boxcar shortages in the movement of grain; but, generally, there do not seem to be any shortages in the supply of cattle cars or refrigerator cars. Evidently, the railways can readily determine in advance where and when rolling stock will be required for animals and animal products so they stockpile the empty cars not being used at appropriate locations.[17]

Table 4.9 shows the changes in numbers of some railway rolling stock between 1955 and 1965. Locomotives and flatcars have increased in number whereas refrigerator and stock cars have declined. The same source indicated that the capacities of the equipment has increased, partially offsetting the decreases in car numbers. Between 1954 and 1965, the average tractive power of locomotives increased from 21.3 tons to 29.4 tons and the average capacity of all freight cars increased from 48.1 tons to 53.8 tons.

In percentage terms, stock cars decreased by 45.5 per cent in number while the average capacity of all freight cars increased by only 11.9 per cent during approximately the same time period. If the increase in capacity of stock cars was anywhere near the average increase for all freight cars,

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[17]Personal interview with Bill Cole, Executive Secretary of Winnipeg Livestock Exchange, St. Boniface Union Stockyards, Winnipeg, Manitoba.

then there has been a real decline in available stock car space. This could be interpreted to mean that the railways had had excess capacity with respect to stock cars and, subsequently, decided to reduce the amount of equipment. The degree of utilization, however, may also have increased in the meantime which would offset the decline in physical space.

TABLE 4.9

Railway Rolling Stock in Operation in Canada as at December 31 of Selected Years*

Type	1955	1960	1965
		(No.)	
Locomotive (diesel electric)	1,455	3,308	3,238
Freight Cars - Flat	12,037	12,645	13,475
- Refrigerator	9,735	10,076	7,936
- Stock	5,776	4,917	3,150

*Source: Canada Yearbook, 1962 and 1967.

Truck

Economies of plant size in the trucking industry appear to be limited and of lesser importance than economies of scale in railroading. Once again it was necessary to draw on the findings of United States studies, in the absence of Canadian research in this area.

Studying the costs of operating livestock trucking firms in North Dakota, K.L. Casavant and D.C. Nelson suggest

that a three tractor-four trailer firm making 450,000 miles annually utilizes the possible economies of scale to a large extent [15, p. 43]. A one tractor-one trailer model firm was definitely found to be less efficient, whereas quadrupling firm size from the three tractor-four trailer to the twelve tractor-sixteen trailer model only reduced per mile operating costs by 0.49 cents. Average operating costs dropped by 3.29 cents when a one tractor-one trailer firm was increased to a three tractor-four trailer size.

An earlier study by M.J. Roberts [43] of 114, Class 1 general commodity carriers showed similar findings. While limited economies of scale existed, it was notable that in the cost distribution of all sizes of firms there was a large concentration within the 40-to 60-cent band (i.e. average cost per vehicle-mile). The most numerous and largest deviations from this range occurred for small sized carriers [43, p. 231].

The two important variables which in large part explained the cost differentials among firms were the vehicle-miles per route mile and the average length of haul. The first variable measured the intensity of vehicle employment in terms of routes operated ("route utilization") and the second was an indicator of the extent to which terminal expenses intruded on per vehicle-mile costs, since the shorter the haul, the heavier the terminal burden on each

performance unit. Roberts employed a technique in which he combined these two variables by calculating their cross products for each of the firms involved.[18] He found that high costs were confined exclusively to firms which had cross products below a certain critical minimum level (300,000). Beyond the critical level, there was little chance of experiencing high costs; yet, there did not appear to be any advantage in striving for a cross product higher than 300,000 [43, p. 232].

The apparent lack of substantial size economies in trucking firms has several implications. The evidence of both studies indicates that firm expansion per se is not necessarily a means of achieving lower costs. Therefore, the merger of two or more trucking firms (who may be in financial difficulty) may not result in greater efficiency; unless, through the merger, a small firm's cross product is raised above the critical minimum level. A more fruitful approach to lowering costs was suggested by the authors of both studies and that is to increase the utilization of existing capacity. This may take several forms: (1) increase the vehicle-miles per route mile (i.e. route utilization); (2) increase vehicle utilization by increasing annual per

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[18]For example, a carrier with an average haul of 100 miles and a vehicle-miles per route mile figure of 2,000 would have a cross product of 200,000.

vehicle mileage and by increasing the load factor (e.g. decrease the number of empty back-hauls); and (3) increase the average length of haul, thereby spreading terminal expenses over more miles.

It is also clear from these studies that trucking rates cannot be set on the basis of the assumption that long-run marginal costs are declining. The expansion of a trucking firm by providing services over new routes may, in fact, occur under conditions of constant or increasing long-run marginal costs; unless, the expansion contributes to increased utilization in one or more of the forms mentioned earlier. Rates set on the assumption that long-run marginal costs are declining, when they are actually constant or increasing, will be maladjusted and non-compensatory.

D. SUMMARY AND CONCLUSIONS

The historical development of transportation pricing policies, particularly of the railroads, is a complex weave of political and economic fibers difficult to unravel. In the early years of railway monopoly all commodities transported were categorized into a commodity classification system based largely on a value of service concept. Livestock was regarded as a low-valued commodity and was classified accordingly. With the advent of motor truck competition, the emphasis in Canadian railway pricing shifted towards a

cost of service approach and, in addition to class rates and normal commodity rates, the railways issued truck competitive rates, agreed charges and various incentive rates in an effort to retain their share of freight traffic.

From the very outset motor truck pricing policies were found to reflect the competitive and flexible nature of the industry, exemplified by both intra- and inter-modal competition. Trucking freight rates more nearly approached cost of service pricing rather than value of service. Emphasis on non-price, quality of service factors tailored to individual shipper's needs was also characteristic of the trucking industry.

Knowledge about the price (rate) elasticity of demand for transporting the commodity group in question is beneficial to value of service pricing. The analysis in this chapter sought to determine (qualitatively) what the price elasticity of the transport demand function for animals and animal products might be. It was suggested that both of the two main factors determining transport demand elasticity (i.e. the proportion the transportation charge per unit of weight is of the value of the commodity, and the price elasticity of demand for the commodity itself) apparently point to a price (rate) inelastic demand for transporting livestock and livestock products. Relative to other commodity groups, livestock and livestock products is often regarded as

low-valued; however, this is contrary to the results obtained in this study. Other things being equal, the implication of a transport demand function whose rate elasticity is less than unity is that an increase in the freight rate would increase total revenue of the carrier and, conversely, a decrease in the rate would decrease total revenue. From this standpoint, it can be argued that the railroads could have earned more total revenue if they had placed livestock and livestock products each in a higher-rated class. Other variable factors were briefly pointed out which could possibly explain why this had not been done.

To the extent the analysis isolated the rail transport demand function on the basis of the 1966 data, it was concluded that the rail transport demand for animals and animal products was rate inelastic. Because of the existence of vigorous truck competition, however, it was hypothesized that at rate levels above the 1966 level the rail transport demand for animals and animal products would be rate elastic, ceteris paribus. If the quality of service differential between rail and truck remained constant, and if truck rates remained constant as railways gradually raised theirs, more and more livestock and livestock product shippers would switch from rail to truck, so that at some rail rate level the demand function for rail transport would become non-existent, above which no shippers

would choose rail. Of course, truckers could respond in any number of different ways which would affect the relative truck-rail, rate and quality of service differentials and, in that sense, the final outcome is indeterminate.

The long-run cost curves of a transport firm provide the basis for cost of service rate making. Hence, the question of economies of scale in livestock and livestock products transportation by rail and truck was examined. While it was not possible to cite conclusive research results with respect to scale economies in Canadian railroading, it was suggested, given certain assumptions about comparability to United States railroads of size and traffic density, that the Canadian National and the Canadian Pacific Railroads most likely face long-run constant or decreasing costs. Evidently, shortages in the supply of cattle cars and refrigerator cars, which would create bottlenecks in the system, have not been a problem either.

If the rail long-run average cost curve is, in fact, declining the implication for rate making is that strict adherence to cost of service pricing must be abandoned. In Chapter II it was pointed out that in order to recover total costs in the long-run, either some form of price (rate) discrimination would have to be implemented (i.e. value of service pricing) or some form of subsidy would have to be paid to the carrier in question.

Economies of plant size in trucking were found to be of lesser importance than in railroading; although, there were definite cost advantages for the smallest sized trucking firms to expand. In order to decrease per unit costs, it was reported that efforts directed towards making fuller use of existing capacity were more successful than relying on firm expansion per se to improve efficiency.

CHAPTER V

INSTITUTIONAL AND TECHNOLOGICAL FACTORS AFFECTING THE TRANSPORTATION OF LIVESTOCK AND LIVESTOCK PRODUCTS

Two main parts make up the contents of this chapter. The first part deals with various institutional factors which have a bearing on the transportation of livestock and livestock products. The second part summarizes the effects of the major technological advances that have occurred in the railroad and truck transport industries.

A. INSTITUTIONAL FACTORS

This section outlines some of the institutional aspects of the livestock and transportation industries as they relate to the transportation of livestock and livestock products. Such facts of life as industry controls and government subsidies, for example, can give one mode a definite advantage over another.

Rail Branch Line Abandonment

A great deal of debate has occurred in recent years over the issue of rail branch line abandonment and particularly as to how abandonment may affect those directly concerned with the movement of grain. To the extent branch

line services were used to carry livestock and livestock products, the discontinuing of such services would lead to a greater reliance on motor truck transport. Indeed, if a rail line in a particular area were abandoned the only alternative mode of transport left may well be truck, so that between the respective points on that line inter-modal competition would have been eliminated. To assess how shippers of livestock and livestock products would be affected, this problem would have to be studied in greater depth.

Government Subsidies

There is evidence to indicate that the Canadian government has generally favored the well-being of the railway industry over that of other modes and probably for good historical reason. From time to time it has been deemed necessary to extend financial aid to ease the plight of railways and/or particular groups of shippers. As long as railways had a virtual monopoly any problems connected with such a subsidy were usually cast in terms of the effects it would have on the industries to which the affected shippers belonged. The railways were often thought of as the more or less "neutral" link between the shipper and the receiver. But with the advent of the competitive era in transportation, such subsidies took on implications for inter-modal competition, as well, and added this new dimension to be considered.

Three government subsidies that have some importance for the movements of animals and animal products are discussed below. No attempt is made to quantify any of the effects since to make an adequate empirical analysis would probably require three relatively large studies. The subsidies are mentioned here merely as relevant institutional factors along with some qualitative comments as to their effects.

Possibly one act conspicuous by its absence is the Maritime Freight Rates Act, 1927 [61], which, while of considerable importance with respect to the development of inter-carrier competition in the Atlantic provinces, was considered to be of small significance to the transportation of livestock and livestock products. Of the total cattle marketed annually in Canada during the last two decades, the Maritimes in total have never reached the 2 per cent level and have never reached 4 per cent of total hogs marketed [19, pp. 88, 94]. Therefore, the volume of livestock and livestock products traffic is quite low.

In any case, much of what is said below regarding the three other subsidies may, in principle, be applied to the Maritime Freight Rates Act as well.

Freight Rates Reduction Act, 1959 [58]. This item of legislation was originally designed as a relief measure for shippers who were subject to non-competitive rates (i.e.

class and some commodity rates). In response to the strong opposition on the part of shippers to the 17 per cent horizontal rate increase of 1958, the Federal government granted the railways a sum of twenty million dollars for a one year period as compensation to permit them to maintain their freight rates at a lower level. Later amendments appropriated additional moneys for this purpose. In the meantime, some months previous to this Act a Royal Commission had already been appointed to inquire into matters affecting transportation, including the railway rate structure.

It is understandable that the trucking industry ". . . was and is violently opposed . . ." [77, p. 48], to such a subsidy. They argued that if left to competition, an increasing amount of the non-competitive traffic would become competitive as was already happening. However, with the railways receiving compensation from the government, truckers could not very well compete.

With respect to livestock rates, the railways issued truck competitive rates early in 1959 both for live animals and meat shipments. Therefore, these particular rates were not directly affected by the Freight Rates Reduction subsidy. But even though the subsidy was not directly applicable to the competitive animal and animal products rates, it did put the railways in a better financial position and as such gave them an advantage over their competitors. This

Act terminated on April 30, 1962 [58].

Feed Grain Assistance Act, 1941.[1] Feed freight assistance was originally instituted by the Federal Government in 1941 as a temporary wartime measure to aid livestock producers during a time of rising production costs and product price controls. The subsidy has been in effect since that time subject to later amendments adjusting the level of payments, adjusting the sphere of application, or introducing additional features such as storage assistance. The subsidy is paid to the feed dealers or feed mills who must pass on the full amount of the subsidy to the livestock feeders purchasing the grain.

Thus, the feed freight subsidy essentially is paid to the shipper, who then is free to choose any mode of transport (except as will be noted shortly). The Canadian Trucking Associations argued that in the event any subsidy was deemed necessary it should be paid in just such a manner, and they held out the feed grain subsidy as an example in line with this criterion [77, p. 50].

However, until very recently the subsidy was in fact limited to rail and water shipments only [73, p. 248,

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[1] For a comprehensive account of the background, inception, and development of the feed freight assistance policy see the study by Kerr [19, pp. 1-24]. A second major reference is A.G. Wilson's Ph.D. thesis [82, pp. 1-41].

Regulation No. 1(a)] and as such adversely affected inter-modal competition. The MacPherson Commission also recommended that the subsidy not be restricted to rail and water [73, p. 246]. Then in September, 1964 certain truck shipments were made eligible to receive assistance but only those in Eastern Canada [19, p. 11] while truck shipments from Western Canada into either Eastern Canada or British Columbia and truck shipments within British Columbia were still exempt [82, p. 298, Regulation No. 4(1)].

A subsidy of this kind may lead to a distortion in resource allocation in that shippers may choose the lowest rate carrier which, however, may not be the least cost carrier. For example, cases were reported where rail transport was chosen instead of water because the existing schedule of assistance to water carriers was sufficiently below that of rail [73, p. 234].

Another way in which the feed freight subsidy might affect inter-modal competition is as follows. Both Kerr [19] and Wilson [82] found that there had been significant shifts in the location of production, particularly of hogs and poultry from the Prairies to Ontario and British Columbia. Associated with these shifts it was observed that interregional movements of feed grains had increased over time, while interregional movements of meats and live animals had declined. Since feed grains are bulkier and of

lower value than processed meat, the railways will likely have gained some traffic, since they have an inherent advantage for hauling bulky commodities. Motor trucks, in the meantime, will have lost the business of hauling the finished product, that they supposedly would have shipped in the absence of the subsidy.

Bridge Subsidy, 1952.[2] The Turgeon Royal Commission in 1951, recognized the non-revenue producing portion of Northern Ontario as an economic "Bridge" between Eastern and Western Canada. Thus, it was recommended that the Federal government pay an annual subsidy to the railway companies to cover the cost of maintaining the 550 mile stretch of track, corresponding to the distance between Sudbury and Fort William. The annual cost of maintaining the bridge amounted to seven million dollars which was to be passed on to the shippers in the form of reduced rates. The reductions, however, were not to be applied to statutory rates, agreed charges and competitive rates.

Those rates affected were to be reduced by the aggregate of 2.53 per cent of the basic rate, plus 5.8 cents per hundredweight [14, p. 4]. May 1, 1952 was the effective date of the Bridge Subsidy which affected West-East meat

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[2]Payment of the "bridge" subsidy is pursuant to Section 468 of the "Railway Act," 1903 [69].

shipments as shown in Table 5.1. For example, the rate for shipping a hundred pounds of meat from Winnipeg to Toronto in 1958 was reduced by 18 cents. Live cattle, hog and sheep rates were similarly affected.

It is difficult to understand why part of the reduction formula was expressed as a percentage of the basic freight rate. The purpose of the subsidy was to contribute towards the maintenance costs of a fixed part of the railline and presumably these costs would not vary with the point of origin of the freight. However, reducing the freight rates by a certain percentage gives the distant, higher rate-paying shippers a greater reduction than that received by shippers nearer the market. Meat shipped from Calgary to Toronto, for example, enjoyed a freight rate that was subsidized by as much as six cents per hundredweight more than meat shipped from Winnipeg. This improved the cost advantage of Calgary shippers relative to Winnipeg shippers.

Therefore, a reduction formula expressed as a flat rate per hundredweight would seem not only to have been adequate to accomplish the intended purpose but would also have been more equitable to Western shippers.

The effects of the bridge subsidy on inter-modal competition of livestock and livestock products transportation was of relatively minor importance and short-lived. Seven years later the railways introduced truck competitive

rates for both livestock and meat shipments, whereupon the subsidy no longer applied. On the other hand, long-distance livestock truckers would no doubt contend that seven years (1952-59) and seven million dollars per year was more than of minor importance. The subsidy favored the railways and prevented truckers from competing to as full an extent as they would have liked.

TABLE 5.1

Effect of "Bridge" Subsidy on Cost of Shipping Meat From Western Plants to Toronto, 1952-1959*

Effective Date	Rate of Subsidy on Shipments From		
	Calgary	Regina	Winnipeg
	(Cents per cwt.)		
1 May 52	14	13	11
1 Jan. 53	15	13	11
1 May 53	20	18	16
3 July 56	21	19	16
1 Jan. 57	22	20	17
1 Dec. 58[a]	24	22	18
6 May 60[a]	36	33	28

[a]Subsidies were not effective after April 29, 1959 from Calgary and Regina or after May 21, 1959 from Winnipeg when rates were reduced to meet truck competition.

*Source: J.C. Gilson, et al., Development of the Livestock Industry in Canada by 1975 and Implications for the Meat Processing Industry in Manitoba, (A study prepared for the Committee on Manitoba's Economic Future) Winnipeg, Manitoba. 1962. p. 8.6.

The MacPherson Commission sided with the trucking industry's viewpoint when stating that ". . . there can be little question that the subsidy has inhibited [the] growth of truck competition" [73, p. 228]. It was also felt that to achieve the objective of assisting shippers through reducing freight rates it could better have been done by allowing inter-modal competition to drive rates down. Consequently, they recommended that the bridge subsidy be abolished [73, p. 232].

Again, the railways received financial assistance while the truckers did not. The subsidy failed to recognize the fact that truckers travelled over the same economic "bridge" which for them was also a non-revenue producing stretch.

Section 74 of the "National Transportation Act" [66] repealed the bridge subsidy with respect to any payments after the year 1966 and in its place enacted Section 468A, which outlined a series of permissible rate increases over a three year period designed to yield the Canadian National and Canadian Pacific Railways, combined, an aggregate of seven million dollars. Thereafter, Section 468A expires.

Carrier Regulation

Legislation governing railroading and trucking in the main includes the Railway Act (1903) [69], the Transport Act

(1938) [79], the National Transportation Act (1967) [66], the Motor Vehicle Transport Act (1954) [65] and the respective provincial motor vehicle statutes. Railways, of course, have had a much longer history of regulation, which has always been a federal mandate.

The 1950's and early sixties were somewhat confusing as to the federal versus provincial responsibilities in regulating motor truck operations. Extra-provincial[3] truckers were regulated by provincial boards, partly under the authority of provincial statutes and partly under authority of the Motor Vehicle Transport Act, 1954, with the result that inter-provincial firms were responsible to ten, sometimes conflicting, provincial bodies applying a federal Act but having as final reference their own provincial laws.[4] The National Transportation Act (Secs. 14, 29-35) brought extra-provincial trucking directly under federal law and a 1954 Privy Council decision ruled that jurisdiction of the intra-provincial portion of an extra-provincial undertaking should also properly be regarded as federal [76, pp. 10.10-10.12].

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[3]The term "extra-provincial" embraces both inter-provincial and international.

[4]For a more detailed historical account of motor truck regulation see [76, Section 10] and [77, pp. 8-12, 53-63].

Intra-provincial trucking continues to be regulated by provincial governments which regulate with respect to admission to the industry, safety, licensing, insurance, freight rates, and routes and time schedules of motor carriers. In all provinces except Newfoundland for-hire carriers are required to obtain certificates of public convenience and necessity before starting business. Such authority in Alberta, however, is exercised for extra-provincial operators only [78, pp. 18-19]. Such a certificate, also called franchise, gives the holder a monopoly of common carriage by highway over certain specified mileage but does not restrict the number of trips or the amount of equipment used. A franchise is issued for a nominal fee only after the applicant has produced sufficient evidence of financial responsibility, that he has had some experience in highway operations, that there is a real demand for his services, and that he is prepared to adhere as far as possible to a definite schedule of services [2, p. 453].

Regulation of admission to the industry, routes of motor carriers and rates typically excludes vehicles owned by farmers and farmers' co-operatives and used solely in transporting agricultural products and supplies; trucks used for carrying goods solely within the corporate limits of an urban center; private and contract carriers; mail trucks; school buses; and so forth. Owners of all these types of

motor carriers are free to enter the industry as they see fit and to charge whatever rates they like [2, p. 453]. This means that all livestock and livestock product truckers, other than for-hire common carriers, are not subject to regulation regarding admission to the industry, routes served and freight rates charged.

Under provincial jurisdictions freight rates of for-hire common carriers are filed and regulated in British Columbia, Saskatchewan, Manitoba, Quebec, New Brunswick, and Prince Edward Island. The regulatory authority in Alberta has the power to have rates filed and regulated but it is not exercised. In Ontario and Nova Scotia rates need only to be filed. In Newfoundland alone freight motor carriers are in no way regulated [78, pp. 18-19].

Provincial regulations governing size and weight restrictions for all motor trucks have become more uniform over time from one province to another. The permissible size and weight dimensions have also increased; for example, the maximum gross vehicle weight in Saskatchewan in 1960 was 64,000 pounds and by 1967 it had been raised to 74,000 pounds [78]. The higher permissible weights enable livestock truckers to operate larger units and to load heavier, and the greater uniformity between provinces facilitates inter-provincial movements.

While the railways are still required to file their rate tariffs with the Canadian Transport Commission, as prescribed under Section 325 of the 1967 Act, it appears that the legislation grants the railways more freedom in rate making than was previously enjoyed. The permissible level of total earnings is no longer controlled. Only captive shippers (i.e. non-competitive rated goods) may make appeal to the Commission regarding unreasonably high rates; and the guiding principle now applicable to complaints of unjust discrimination and undue preference is how the "public interest" is affected. Concern over these changes in regulation are expressed by both Mauro [39] and Stechishin [81, pp. 6-7, 14].

Probably only in exceptional circumstances would a livestock shipper be able to prove to the Canadian Transport Commission that he was captive to rail transport and, in any case, virtually all livestock and livestock products move under competitive rates. Therefore, the primary safeguard livestock shippers have, other than for reasons of unjust discrimination, is the forces of inter-modal competition.

The Criminal Code of Canada (Section 542 on the cruelty to animals) and the Canadian Transport Commission govern the handling of livestock in Canada. The Commission requires that live animals not be confined in transit longer than 36 hours without being unloaded, fed, watered and rested a

minimum of five hours before being reloaded again. Stockyards are maintained along rail lines for this purpose either by the railways themselves or by independent proprietors [2, p. 292].

B. TECHNOLOGICAL ADVANCES

Just as numerous technological advances have occurred in other industrial fields in recent decades, so it has in transportation. The result has been a reduction in unit costs of output and an improvement in the quality of service. When the productivity of factor inputs is enhanced a reduction in unit costs comes about, ceteris paribus.

Evidence based on United States experience indicates that the historical productivity gains of the transportation sector compare favorably with other sectors. Choosing labor as the most appropriate input against which to measure productivity increases, Professor John R. Felton reports that the average annual increase in output per worker in transportation as a whole between 1947-65 was 4.4 per cent [16, p. 111]. This growth rate exceeded substantially the comparable rate of 3.1 per cent for 27 manufacturing industries. The highest average annual rate recorded was 7.2 per cent for three public utility industries.

Similar data for Canadian transportation were unavailable so one can only assume that the Canadian experience has

not been too dissimilar. For purposes of illustration, a further comparison of labor productivity gains for each mode of transport is provided by Felton, which is reproduced below in Table 5.2. The striking picture revealed by these figures is that during the early periods (1929-1948) the motor freight and airline industries, which were then in their formative years, achieved very great productivity increases but then levelled off, especially trucking. On the other hand, the long established railroad industry had always lagged behind motor freight performance until the most recent time period, 1957-1965, when the railroad average annual rate of change in output per employee exceeded significantly that of motor truck.

TABLE 5.2

United States: Annual Average Rate of Change in Output Per Employee in Transportation for Various Periods, 1929-65*

Mode of Transport	1929-37	1937-48	1947-57	1957-65
		(Per Cent)		
Railroad	2.4	4.2	2.1	6.7
Motor freight	25.1	10.0	2.7	3.8[a]
Inland water	0.7	5.6	4.5	6.7
Airline	14.2	9.0	9.0	7.6
Pipeline	5.1	6.0	6.7	7.6

[a] 1957-64

*Source: John R. Felton [16, p. 112]. The interested reader is referred to the article itself for a list of sources from which the author compiled this table.

It is commonly reported that trucking has been more flexible in adopting technological improvements than railways [72, pp. 9-11, 28] [17, p. 9.22] and this was probably true up to the early 1950's or so. More recently, however, it appears that the railways have been much more aggressive and flexible in streamlining their operations and seeking to meet the needs of individual shippers, so much so that they have surpassed the productivity achievements of motor freight.

Technological advances have had an impact on the transportation of livestock and livestock products, among the many other commodity groups. Carrier operators have sought to retain and gain livestock and products traffic through the adoption of innovations that improved their facilities and services over that of competitive carriers. In this manner, inter-modal competition is directly affected.

Innovations may be applied in three broad areas of the transportation plant; namely, terminal facilities, the right of way, and carrier equipment. Even a list of only those technological changes affecting the movement of livestock and livestock products would be very lengthy; therefore, comments below are limited to a few major examples.

The "Place Ville Marie" complex in the Central Station area of Montreal is a prime example of the railways' program

to redevelop their terminal facilities.[5] Trucking firms also have constructed new terminals designed to speed loading and unloading, to facilitate servicing of vehicles and so forth. Railway freight yards utilize radar, television, electronic computers, two-way radio, integrated data processing, microwave switching devices and remote control systems to sort freight cars and group them into trains bound for common destinations. The CPR yard in Toronto incorporates a transistorized centralized traffic control system which allows one man to control the more than one thousand train movements made each day over the rail approaches to the yard. Meanwhile the CNR has constructed four electronic "hump" classification yards at strategic points across Canada.

Another innovation designed by CNR engineers is an electronic scale for weighing moving freight cars. This scale has a high degree of accuracy, meets all government regulations and can calculate within three seconds the weight of a car travelling between ten and twelve miles an hour and weighing up to 250 tons.

These terminal innovations decrease substantially the time required to handle freight cars passing through the yards.

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[5] Information about railway technological advances cited in this section have been gleaned from a special article in the Canada Yearbook, 1965, unless otherwise indicated [67].

Rail innovations in the improvement of the right of way include continuous welded track and track maintenance machinery. Truckers have enjoyed the benefits of improved, all-weather roads and the completion of the Trans-Canada highway in 1962 [54, p. 777].

Technological advances in carrier equipment has resulted in increased capacity and specialization of equipment. The use of light-weight alloys and construction materials have resulted in higher payload-to-tare weight ratios both in railroading and trucking.

Complete "dieselization" in terms of locomotive power was a major forward step and further improvements of the diesel units are being made continually so as to increase power output, reduce maintenance costs, improve fuel consumption efficiency, and lengthen the working life. Large transport trucks also switched from gasoline to diesel motors.

Perishable meat products in transit have benefited greatly from the improvements made in the refrigerated boxcar, whose history goes back some one hundred years ". . . when a lining was added to the inside of each of 30 ordinary boxcars, the space was filled with sawdust, and ice tanks were placed in the doorways" [35, p. 30]. Today the use of mechanical refrigeration is almost universal both in rail cars and highway trucks with some experimentation being

carried out with liquid nitrogen refrigeration.[6] The newer mechanically refrigerated boxcars have a maximum length of 46 feet and maximum capacity of 70 tons [31].

Dressed carcass meat going by rail in Canada moves on railway-owned hooks[7] and in railway-owned cars. Due to rough movement and vertical oscillation of the cars, claims for "down beef" were frequently being received, when the hooks either tore through the meat or jumped the rail. Rather than rigidly fixing the overhead meat rails to the ceiling, a series of springs and shock absorbers were installed to cushion the rails against shocks caused by car movements. In addition, the suspension for the car itself was improved which was so successful that by early 1965 the CPR had 540 soft-ride cars for freight and another 33 for passenger service. Down beef claims were virtually eliminated [41, pp. 61-62].

Finally, several forms of containerization have been developed suitable for hauling animals and animal products. The CNR has in regular use in excess of a thousand eight by

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[6] Imperial Roadways Ltd., a Winnipeg-based interprovincial trucking firm was successfully operating 19 such units by early 1968 [47].

[7] The hooks referred to are the means used to hang carcass meat from rails attached to the ceiling of the boxcar.

eight by twenty-foot containers which are mechanically loaded onto flatcars or highway trailers. All units have propane gas heaters and presumably they could be refrigerated as well [33].

A container designed for hauling live animals was displayed recently which consists of a 40-foot double-decked, slatted container that is placed onto a standard 52-foot flatcar. The upper deck is built in to the container while the flatcar serves as the floor of the lower deck [40]. The original livestock cars were only single-decked; however, later models had a second tier as well. When the livestock container is not being used, it can be removed from the flatcar, thus freeing the latter for alternative usage.

Piggyback transportation,[8] also called trailer-on-flatcar (TOFC) service, may be thought of as a type of containerization. It consists of using a highway tractor and trailer (usually a semi-trailer) to pick up the freight at origin, loading the trailer onto a railway flatcar for line-haul transportation to destination and then delivering the goods from the rail terminal by tractor and trailer.

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[8] An excellent account of the development of piggyback services and related problems in Canada is the special study conducted by D.W. Carr and Associates for the MacPherson Royal Commission, "Piggyback Transportation in Canada" [74, pp. 95-151].

A number of alternative arrangements or "plans" have been developed in which the railway, trucker and shipper involved perform different services. A description based on the five United States piggyback plans is provided in Appendix I, but so far only Plans I and II are operational in Canada.

Although Plan I is designed to service for-hire common carriers not all are eligible to use the service between any two terminals. Generally, the trucker is required to make a prior contract with the railroad company to ship his trailers via piggyback and what is more important is that the trucker must possess the necessary licenses from the provinces concerned to serve the corresponding highway route between the points covered by the TOFC operation [74, p. 115].

Canadian piggyback operations began in large scale in early 1958 and expanded rapidly until the year 1961. The next year experienced a slight decline followed once more by three years of rapid growth until 1965. That year represents a peak both as measured by the total number of TOFC loadings and as measured by the percentage piggyback loadings of the total revenue cars loaded in Canada. Piggyback loadings made up a high of 5.83 per cent. Since 1965 TOFC loadings have been falling steadily. These observations are all shown in Table 5.3 and Figure 5.1.

What the source did not reveal is the breakdown of the commodities contained in the trailers nor what proportion of them were empties. In the absence of any volume data on the amounts of livestock and livestock products shipped by piggyback, it is difficult to know how important this method of transportation is or how important it might become in the future for livestock shippers.[9] The chief advantage of TOFC operations is that it combines the flexibility of motor truck pick-up and delivery (P & D) with the low line-haul costs of rail. In addition, it increases the speed of delivery over boxcar freight by reducing handling, switching and classification times, etc., and it reduces damage claims and losses through pilferage.

While line-haul costs of rail may be lower than truck line-haul costs, there was some evidence to indicate that freight rates charged by the railways for TOFC service did not necessarily reflect the line-haul costs. Consequently, some shippers still found it more profitable to ship via an

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[9]Carr and Associates indicate that, in the main, TOFC serves non-perishable traffic [74, p. 128]. In their submission, the Canadian Trucking Associations indicated that at least till that date (May, 1960) no livestock moved by piggyback while some frozen foods and perishables did [76, p. 8.3]. In an interview (Nov., 1968) with Alex Eremko, Canadian Pacific Railways, Union Stockyards, St. Boniface, Manitoba he indicated that no live animals went by TOFC and that some meats did but he did not know how much or whether such figures were obtainable.

TABLE 5.3

Railway Cars Loaded in Piggyback Service in Canada, 1958-67*

Year	Total Piggyback Loadings[a]	Monthly Average	Total Revenue Cars Loaded	Piggyback as Per Cent of Total Revenue Cars Loaded
1958	77,109	6,426	3,771,008	2.04
1959	133,929	11,161	3,854,893	3.47
1960	154,898	12,908	3,635,413	4.26
1961	171,341	14,278	3,464,123	4,95
1962	169,398	14,116	3,541,543	4.78
1963	199,416	16,618	3,632,580	5.49
1964	223,005	18,584	3,929,121	5.68
1965	232,178	19,348	3,980,793	5.83
1966	187,587	15,632	4,032,983	4.65
1967	176,128	14,677	3,788,133	4.65

[a]Flatcars carrying highway trailers on a revenue basis, loaded or empty.

*Source: Carloadings. Dominion Bureau of Statistics No. 52-001. Ottawa: Queen's Printer.

all-truck route instead of piggyback [74, p. 138].

Secondly, while piggyback service was faster than conventional boxcar freight, it was generally still not quite as fast as direct truck transport. Some time was lost in loading and unloading the trailers. This factor could be a crucial one in the hauling of perishables such as animals and animal products.

Livestock shippers may prefer to ship by truck to reduce transit time and shrinkage. Shippers of meat products

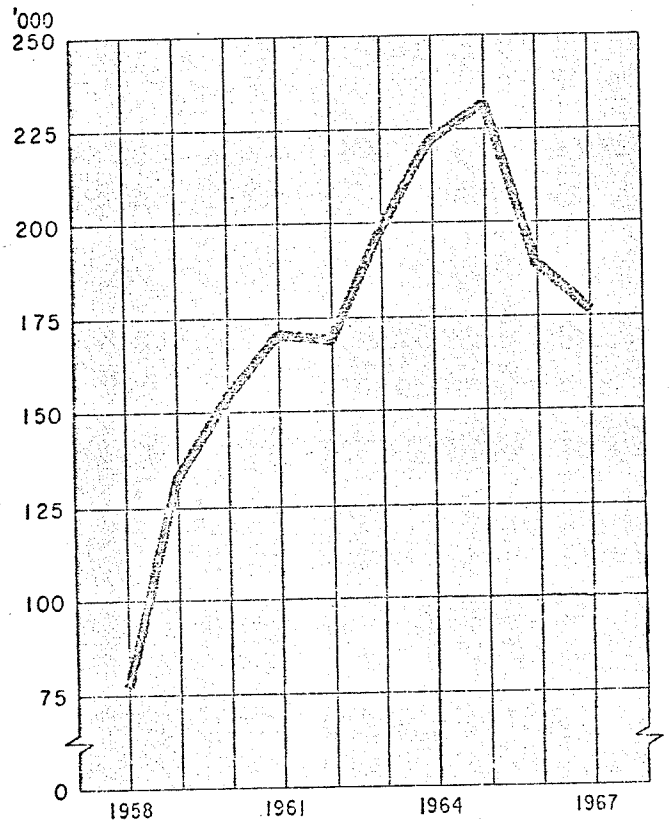

FIGURE 5.1

Railway Cars Loaded in Piggyback Service[a] in Canada, 1958-67*

[a]Flatcars carrying highway trailers on a revenue basis, loaded or empty.

*Source: Carloadings. Dominion Bureau of Statistics, No. 52-001. Ottawa: Queen's Printer, Volume 44, No. 48.

requiring refrigeration may also prefer the supervised refrigeration service of truck transport over piggyback flatcars equipped to generate battery-operated refrigerator vans.

In terms of distance, Carr and Associates argued that TOFC competition was limited to medium and long hauls (i.e. 200 to 250 miles and more) [74, pp. 133, 136]. In a footnote they state:

> It has been estimated that it would cost a trucker, on the average, as much to move a trailer (whether rail- or independently owned) from where it is loaded to the TOFC ramp and from the ramp at destination to the consignee as it would cost to deliver it direct by highway 100 miles [74, p. 133].

Therefore, the short haul of up to 100 and possibly 200 miles is better carried out by direct truck transport. Meyer, et al. also calculated truck transport to be the least cost carrier for distances up to 100 miles [8, p. 190] but, of course, the improvement of highways and motor truck equipment has gradually lengthened the routes over which they can compete.

CHAPTER VI

SUMMARY AND CONCLUSIONS

While some conclusions and implications have already been drawn at various points throughout the study, it is the purpose of this chapter to summarize the major conclusions insofar as conclusions can be made from a descriptive and qualitative study. In addition, likely future developments are pointed out as are further areas of needed research.

A. MAJOR CONCLUSIONS

By far the majority of livestock and livestock products transported in Canada are shipped by motor truck. Of the total tons of livestock and livestock products carried by rail and truck in 1965, for-hire and private intercity class trucks hauled 90.6 per cent. In the same year, this commodity group constituted 5.9 per cent of total truck tonnage (excluding farm and private urban class trucks for which data were not available) but only 0.71 per cent of total railway traffic. Less than one per cent of total air cargo, as well, was made up by animals and animal products.

The proportion of livestock (cattle, calves, hogs, sheep and lambs) arriving from all sources at public stockyards and packing plants by truck, as compared to rail,

increased greatly in the last two decades. On the average for all Canada during 1947-51 about 50 per cent of public stockyard deliveries and about 60 per cent of packing plant deliveries arrived by truck; during 1952-56 approximately 75 per cent of stockyard deliveries and 70 per cent of packing plant deliveries arrived by truck; and by 1967 about 90 per cent of all deliveries to public stockyards and packing plants were made by truck. The 1967 data also showed that virtually 100 per cent of all types of livestock in Alberta, all cattle in Saskatchewan, all hogs in Ontario and Quebec, and all sheep and lambs in Saskatchewan and the Maritimes were delivered by truck.

Local community auctions have become important institutions in the marketing of livestock, particularly of feeders. Apparently, most of the animals carried to and from these centers are handled by truck.

Associated with the larger number of community auctions, two trends were observed: the trend of marketing a greater proportion of animals via direct sales to packing plants from primary producers and community auction rings, thus by-passing public stockyards; and the trend of returning a greater proportion of calves to country points for further feeding and finishing.

An indication of the former trend was provided in Table 3.1, p. 43, columns (2) to (5) and the latter trend

was illustrated, firstly, by Table 3.1, which showed that the total inward movement of calves had more than doubled during 1957-66 and, secondly, by Table 3.3, p. 50, which showed that the percentage of calves leaving public stockyards destined for country points increased from 22.5 per cent to 34.2 per cent. At the same time, the proportion of calves destined for slaughter dropped from 58.8 to 45.6 per cent.

Practically all livestock and livestock products carried by rail falls under commodity rates as opposed to the higher class rates. Specific freight rates have been revised on numerous occasions including 13 horizontal freight rate changes (11 increases and 2 decreases) in the period 1948-1960. By October 1966, rail freight rates on livestock going from Winnipeg to Toronto, for example, had increased cumulatively 121 per cent since 1921, while rates on fresh meats were up 64 per cent cumulatively in the same period.

As livestock and livestock truckers made heavy inroads into traffic of this commodity group, railroads were forced to issue truck competitive rates in an effort to retain their share of the traffic. In effect, they were forced to place more emphasis on cost pricing of their services instead of setting rates by the traditional value of service criterion.

Trucking freight rates from the outset more nearly approximated cost of service pricing; although, they often times used railway rates as a guide for setting maximum truck rates. Truckers also relied heavily on the quality of service they were able to provide through greater flexibility, convenience and speed. In some instances, truck and rail rates were found to be identical between a pair of shipping points so that inter-carrier competition occurred purely on the basis of service factors.

Since value of service pricing is demand-oriented, it is useful to know the transport elasticity of demand for the commodity group in question. The analysis in Chapter IV suggested that livestock and livestock products, as a commodity group, was high-valued relative to all other commodity groups, including manufactured goods (which are certainly high-valued). A price (rate) inelastic transport demand function is generally associated with high-valued goods and this expectation was borne out by the analysis. Other things being equal, a transport demand function whose rate elasticity is less than unity means that gross revenue of the transport firm would increase with an increase in the freight rate, and decrease with a decrease in the freight rate. Historically, the railroads have regarded livestock as a low-valued good when perhaps they should have treated it as a high-valued commodity. If railway management had as one

of its objectives to prefer more total revenue rather than less (as long as added costs did not exceed added revenue), then livestock and livestock products should each have been put into a higher-rated class, which would have been consistent with charging what the traffic will bear.

No doubt this analysis is oversimplified in that it fails to take into account other variable factors which might explain why rates on livestock and livestock products were not raised. The several factors suggested in Chapter IV included the following: (1) the transport demand for animals and animal products during early years of rail transport was actually elastic; i.e. the relationships that were developed in the analysis largely on the basis of 1966 data do not apply to the situation in 1930, for example; (2) the livestock and livestock product shippers' supply function may have been elastic, such that any small increase in the freight rate (which would have the effect of reducing the net price per unit received by the shipper) would have caused a sharp decrease in volume shipped; and (3) the political goal of developing Western Canada required abundant, low-priced transportation of settler effects and agricultural commodities, including livestock and livestock products.

It is important, for whatever commodity, that freight rates for each mode reflect or equal costs and that freedom of choice be afforded to all shippers. To quote Wilson:

> Only the shippers themselves are in a position to know the non-transport savings that accrue from quality of transport service . . . this implies freedom of shipper choice (that is, no arbitrary allocation of traffic among the various media), and this, if (but only if) coupled with rates based upon relative costs, will ensure an optimum transport system . . . [11, p. 112].

A number of developments have been advantageous to the growth in general of motor truck transport. These are: the streamlining of regulation of extra-provincial truck operations exemplified by the establishment of one federal board instead of separate provincial boards and by the raising of, and greater uniformity in, vehicle size and weight restrictions provincially; more and better roads (e.g. completion of the Trans-Canada highway in 1962); speed and flexibility of trucking services enabling operators to provide pick-up and delivery service from door to door and enabling livestock carriers to meet the 36-hour in transit limit with greater ease than railroads; technological advances enhancing the efficiency of terminal facilities and motor vehicles; and the development of the semi-technological, semi-institutional innovation of piggyback transport, which is a form of containerization that combines the flexibility of trucking with the low line-haul costs of rail.

Clearly, the relative rates of technological advances among modes have a direct bearing on the cost and quality of service advantages one carrier has over another. Evidence

based on United States experience indicated that in the early years (1929-48), the motor freight and airline industries, which were then in their formative years, achieved very great labor productivity gains but then levelled off, especially trucking. The long established railroad industry, on the other hand, always lagged behind motor freight performance until more recent years (1957-65) when the railroad average annual rate of change in output per employee exceeded significantly that of motor truck.

While trucking, as is often stated, has been more flexible and ready to adopt technological innovations than have the railways, it appears that more recently, the latter have become much more aggressive in streamlining their operations and seeking to meet the needs of individual shippers, so much so, that they have surpassed the productivity achievements of motor freight.

B. FUTURE DEVELOPMENTS

On the basis of past and present experience, several observations about future developments in the transportation of livestock and livestock products are presented.

Given the rapid rate of growth in air cargo, it is conceivable that aviation could become a significant mode of transport for an increasing number of livestock products. The regular movement of some specialty meats is already in

evidence and if air freight rates continue to decline as they have in the past, these movements will very likely increase.

While it is doubtful (if even possible) that the transport modes, particularly railways, will totally abandon value of service pricing, continued inter-modal competition will dictate increasing emphasis on cost of service rate making. Railway management has expressed the desire to "rationalize" their industry and, to cite but one course of action they wish to take, they have sought permission to discontinue services on numerous uneconomic branch lines.

To the extent that railway branch lines are used to carry livestock and livestock products, if such services were discontinued a greater reliance on motor truck transport would undoubtedly occur. If truck transport is the only alternative to a rail branch line in a particular area and if the branch line is abandoned, inter-modal competition between the respective points on the line will have been eliminated. Supposedly, truckers would be prevented from earning monopoly profits by competition from other truckers (intra-modal competition).

C. SUGGESTIONS FOR FURTHER RESEARCH

In thinking about further research into the transportation of livestock and livestock products in Canada, three broad areas can be suggested; namely, the demand for, and supply of livestock and livestock products transportation, and spatial equilibrium of the livestock economy.

Much more extensive research into the area of shipper demand for animal and animal products transportation services would be very beneficial. At times railways have petitioned for higher freight rates hoping to increase their revenues while shippers claimed that increased rates would only lead to sharp reductions in volume shipped when, typically, neither party had sufficient knowledge about the facts.

Firstly, what factors affect and underlie the position and slope of the livestock or livestock products transport demand function (if one can speak of the transport demand function) of shippers at various stages in the livestock marketing system (e.g. primary producers, livestock dealers, packers, etc.) and, secondly, what is the slope and price (rate) elasticity of the livestock or livestock products transport demand function? With respect to the latter, several different questions could be considered. One could determine the rate elasticity of demand for hauling animals or animal products by a particular mode (railroad, motor

truck); or one could gain some insight into inter-carrier competition by estimating the cross-elasticity of demand between, say, rail and truck; or, finally, one could disaggregate the problem further by studying the different classes of trucks separately, such as farm trucks versus for-hire and private intercity class trucks. In some instances, farm trucks will be in direct competition with for-hire vehicles while at other times there may be no possible substitution.

An example of an empirical transport demand study is one which attempted to determine the elasticity of demand for railroad transport of certain fruits and vegetables in Florida. This was conducted by Limmer [38].

Equally beneficial would be research into the supply of animal and animal product transportation services by various modes. What are the factors that affect and underlie the position and slope of the livestock or livestock products transport cost function (again, assuming one can speak of the transport cost function) by truck and rail. Account would have to be taken of the length of run, the commodity or commodity group (i.e. it would be meaningless to lump live animals and carcass meat together into one cost figure), the distance, weight, speed and so forth.

A related question to cost is the existence or absence of economies of scale and excess capacity in trucking

and railroading. Reference to cost studies of this nature, carried out in the United States, has already been made; namely, the studies by Casavant and Nelson [15], and Roberts [43] and two articles by Borts [29] [30]. A recent Canadian study by Young [27] analyzes the cost of assembling grain by farm truck.

Finally, the third potential area of research deals with the construction of a spatial equilibrium model of the livestock economy in Canada. A descriptive analysis such as this thesis may be viewed in the broader perspective of location in the space economy and may serve as a preliminary stage to an empirical investigation.

For many years economic theorists abstracted from the effects of space on economic activity and, in effect, the assumption commonly made was that the economic system is space-less and that all transportation costs are, therefore, zero. Location theory explicitly includes as one of its key elements the transfer costs involved in hauling both raw materials and the finished products (i.e. assembly and distribution costs).[1] Another key element is the cost of processing the raw material in one or more plants. In efficiently organizing the operations of a multi-plant firm,

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[1]One example of a major work that developed the general theory of location is W. Isard, Location and Space-Economy [5].

management must decide as to the number, size and location of plants required to process, at minimum cost, any given quantity of raw material produced in varying amounts at scattered production points. In addition, management would wish to simultaneously minimize costs of distributing the finished product to scattered demand points. Thus, determining an overall optimum solution involves the plant cost functions (processing costs) combined with the transportation cost functions (assembly and distribution costs).

Spatial equilibrium models or transportation models have been developed as analytical tools useful for converting descriptive problems in space economy into empirical problems, capable of solution (e.g. minimization of cost). Two of the basic spatial equilibrium models, much utilized by economists, were developed by S. Enke [32] and P. Samuelson [45] in 1951 and 1952, respectively. Without entering into a discussion of the elements of these models, several examples of their application are indicated forthwith.

G.G. Judge and T.D. Wallace [37] [18] analyzed beef movements in the United States with a model where regional supplies, population and disposable income were predetermined variables and the demand for beef was represented by a known linear demand function. The problem was divided into three parts: (1) determination of regional prices, consumption, and surpluses and deficits; (2) deriving minimum cost flows

of beef among regions; and (3) estimating optimum regional price differentials [18, p.9]. Besides working out a solution reflected by the unique set of basic data for a particular year (1955), information was gleaned about what changes in the system could be expected if some of the basic data were changed. For example, one could observe how the solution would be altered if (1) there was an increase or decrease in unit transport costs between regions i and j; (2) there was an increase or decrease in the total supply of beef (inequality of supply and demand); (3) there was a change in the geographical distribution of beef production; (4) there was a change in the level and geographical distribution of population and income; (5) the assumption was made that all beef is slaughtered where it is produced; and (6) the assumption was made that the transport route between regions i and j becomes unavailable due to legal or other restrictions.

The simplifying single commodity assumption may be relaxed by introducing the dimension of form in addition to space. M.M. Snodgrass and C.E. French have formulated a space-form model for fluid and processed milk [23]. Applying this concept to the livestock industry, for example, beef could be transported in one of two forms: live or as carcass beef. Suppose producers are indifferent as to how their animals are disposed of once they have been sold on a

live-weight basis, but that consumers are not indifferent to the form of beef they buy. There may be a variation among surplus regions in costs of slaughtering and in the proportion by which costs of transporting are reduced. Transfer costs of the carcass form consist of the sum of slaughtering and transportation costs. This information can be put in matrix form and solved for an optimum solution.

A third dimension, time, could be added into the above beef model. Then the two forms of beef could each be transported in either one of two time periods and the model would be capable of handling problems of storage, time lags, price adjustments and allocation over time. T. Takayama and G.G. Judge may be cited as recent authors of an intertemporal price equilibrium model [46].

Further modifications and extensions can be embroidered onto the basic spatial equilibrium model by relaxing limiting assumptions and refining techniques. Obviously, the more refinements one has the closer one can come to simulating the real world situation.

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UNITED STATES PIGGYBACK PLANS*

Plan I: Railroads and motor common carriers
Plan I--Railroads carry trailers owned by motor common carriers, on a "division" of the truck rate--actually in practice a flat charge per trailer based on weight and distance, regardless of commodity. The trucker solicits and bills all freight at truck rates; takes trailers to, and picks them up from railroad piggyback terminals; and performs any required road-haul before or after the rail movement. The railroad has no direct contact with the shipper, and simply substitutes for the trucker on part or all of the total road-haul.

Plan II: A railroad operation, door-to-door
Plan II--Railroads carry their own trailers, under their own truck-competitive tariffs. Under this all-rail plan, the railroad deals directly with shippers; furnishes all equipment; and provides pick-up and delivery between shipper plants and rail terminals, either by railroad-owned tractors or by contract with local draymen. P & D is usually confined to established territories contiguous to rail terminals.

Plan III: Shipper trailers, rail cars
Plan III-- Railroads carry trailers owned or leased by shippers, at a flat rate per mile. The shipper delivers trailers to railhead; the railroad puts them aboard flat cars, ties them down, transports them to destination and grounds them; the shipper picks them up at the rail terminal.

Plan IV: Shipper trailers, shipper cars
Plan IV--Railroads carry trailers owned or leased by shippers on flat cars also owned or leased by shippers, at a flat charge per car, whether trailers are loaded or empty. The shipper takes his trailers to and from the rail terminal, and loads and unloads cars. The railroad performs terminal-to-terminal line-haul movement only.

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*Source: D.W. Carr and Associates, "Piggyback Transportation in Canada," Royal Commission on Transportation (MacPherson) Ottawa: Queen's Printer, 1962, Vol. III, p. 151 citing Railway Age, Mar. 28, 1960, p. 74.

Plan V: Joint rates, truck-rail-truck

Plan V--Railroads carry their own trailers, or common-carrier truck trailers, under joint rail-truck rates on an end-to-end basis. Operationally, Plan V is similar to Plan I, but is a true joint operation, which, in effect, extends the territory of each participating carrier into that served by the other; permits each participant to handle shipments originating in or destined to the other's territory; and allows each to sell for the other. Normally, this plan involves a truck road-haul on one or both ends of the rail movement.

APPENDIX II

TABLE A.1

Disposition of Livestock from Public Stockyards, 1957-66 *

(No. Head)[a]

Year	Slaughter	Feeder (Country Points)	Export	Other Yards	Total
		CATTLE			
1957	1,129,840	299,596	128,763	34,473	1,592,672
58	1,092,041	294,456	209,543	12,194	1,608,234
59	961,453	309,731	94,558	18,814	1,384,556
60	1,039,068	307,153	59,355	15,262	1,420,838
61	1,048,949	351,540	111,837	20,786	1,533,112
1957-61	1,054,270	312,495	120,811	20,306	1,507,882
1962	1,054,176	352,966	60,834	21,497	1,489,473
63	1,032,202	368,207	36,396	20,765	1,457,570
64	1,112,243	424,853	27,145	23,518	1,587,759
65	1,263,243	472,394	117,158	27,077	1,879,872
66	1,231,106	476,070	75,563	25,970	1,808,709
1962-66	1,138,594	418,898	63,419	23,765	1,644,677
		CALVES			
1957	345,432	61,764	47,656	2,976	457,828
58	303,776	100,567	133,500	4,478	542,321
59	279,151	128,056	77,737	11,651	496,595
60	275,690	117,934	45,327	7,226	446,177
61	255,400	150,437	118,396	14,610	538,843
1957-61	291,890	111,752	84,523	8,188	496,353
1962	254,984	151,143	133,624	15,162	554,913
63	237,172	184,663	62,842	14,325	499,002
64	262,339	221,514	33,921	23,009	540,777
65	290,360	199,281	144,920	16,723	651,284
66	291,317	244,833	123,767	22,025	681,942
1962-66	267,234	200,287	99,815	18,249	585,584

[a]These totals represent shipments of livestock which actually moved off stockyards and do not necessarily balance with similar totals elsewhere.

*Source: Livestock Market Review. Canada Dept. of Agriculture, Ottawa. 1957-66.

TABLE A.1 (continued)

Year	Slaughter	Feeder (Country Points)	Export	Other Yards	Total
		HOGS			
1957	675,540	54,897	180	115	730,732
58	897,142	85,668	5,186	18	988,014
59	929,567	99,194	34	-	1,028,795
60	694,119	66,433	2,078	-	762,630
61	598,350	82,571	201	-	681,122
1957-61	758,944	77,753	1,536	27	838,259
1962	641,321	82,899	-	-	724,220
63	675,979	84,400	-	-	760,379
64	711,961	98,108	-	-	810,069
65	819,371	85,622	n.a.[b]	n.a.[b]	904,993
66	792,142	73,290	1,149	-	866,581
1962-66	728,155	84,864	229	-	813,248
		SHEEP			
1957	153,907	24,719	951	582	180,159
58	148,804	23,727	1,698	143	174,372
59	160,366	20,666	542	675	182,249
60	146,211	18,631	-	220	165,062
61	164,469	16,025	-	77	180,571
1957-61	154,751	20,754	638	339	176,483
1962	157,799	13,417	-	851	172,067
63	148,313	15,040	146	1,366	164,865
64	153,446	11,710	4	912	166,072
65	141,281	11,887	-	486	153,654
66	125,514	11,991	-	559	138,064
1962-66	145,271	12,809	30	835	158,944

n.a. - Not available.

[b]For purposes of calculation this entry was assumed to be zero.

TABLE A.2

Disposition of Slaughter Livestock from Public Stockyards at Winnipeg, 1957-66*

(No. Head)

Year	To Packers	To Abattoirs	To Packers	To Abattoirs
	— CATTLE —		— CALVES —	
1957	134,323	72,725	48,888	25,521
58	117,698	55,088	35,268	20,946
59	103,680	54,496	26,154	15,280
60	93,454	69,237	25,627	23,330
61	110,524	75,136	25,922	21,411
1957-61	111,936	65,336	32,372	21,298
1962	79,050	65,738	19,725	20,218
63	81,816	72,202	19,444	17,127
64	94,588	82,700	23,128	22,161
65	118,760	99,431	32,418	29,103
66	103,296	103,211	25,537	29,692
1962-66	95,502	84,656	24,050	23,660
	— HOGS —		— SHEEP —	
1957	47,796	83,403	19,838	166
58	50,840	106,463	19,335	635
59	48,234	113,958	18,333	788
60	32,902	82,141	21,049	501
61	37,480	76,523	23,886	821
1957-61	43,450	92,498	20,488	582
1962	22,159	64,942	22,115	1,992
63	15,755	53,792	17,589	5,672
64	24,234	56,799	20,237	3,527
65	119,617	80,295	19,254	450
66	119,670	77,921	12,995	1,917
1962-66	60,287	66,750	18,438	2,712

* Source: Annual records obtained from A.M. Johnston, Canada Dept. of Agriculture, Livestock Div., St. Boniface Union Stockyards Office, Winnipeg, Manitoba.

TABLE A.3

Freight Rates: Cattle, Hogs, and Sheep in Carload Lots from Specified Stations in Western Canada to Points in Eastern Canada, Montreal and West thereof, by Effective Date*

Effective Date	Rates on Shipment From			
	Calgary	Edmonton	Saskatoon	Winnipeg
	(Cents per cwt.)			
15 Aug. 21	114.5	114.5	112.5	85
8 Apr. 48	139	139	136	103
11 Oct. 49	150	150	147	111
23 Mar. 50	161	161	158	119
16 June 50	167	167	163	124
15 Dec. 50	181	181	161	132
26 July 51	203	202	180	148
11 Feb. 52	212	211	188	154
1 May 52[a]	201	200	177	144
1 Jan. 53	219	218	194	158
16 Mar. 53	235	234	208	170
1 May 53	229	228	202	164
1 Nov. 55	222	221	195	157
1 Mar. 56	229	228	202	164
3 July 56	245	244	216	175
1 Jan. 57[b]	255	254	225	174
1 Mar. 57	257	256	227	176
1 Aug. 58	257	256	227	177
1 Dec. 58	302	300	267	207
1 Mar. 59	299	297	264	204
1 Aug. 59	280	279	247	191
7 Sept.59[c]	257	256	227	176
1 Dec. 59[d]	272	271	239	184
6 May 60[d]	267	266	235	180
1 Feb. 62	257 (224)[e]	256 (223)[e]	227 (197)[e]	176 (153)[e]
10 Oct. 66	283 (246)[e]	282 (245)[e]	250 (217)[e]	188 (168)[e]

[a]Effective date of Bridge Subsidy.

[b]From this date to Sept. 6/59 carload minimum weights specified at: cattle - 20,000 lbs., hogs - 16,000 lbs., sheep - 16,000 lbs., except for Winnipeg where sheep - 14,000 lbs.

[c]Carload minimum weights for cattle, hogs, and sheep - 20,000 lbs.

[d]Rates apply to hogs and sheep only, at carload minimum weight - 16,000 lbs., except for Winnipeg where sheep - 14,000 lbs. Cattle rates and minimum loading weights, unchanged from Sept. 7/59.

[e]These rates apply to cattle, hogs, and sheep at carload minimum weight - 30,000 lbs.

*Source: Livestock and Animal Products Statistics. Dominion Bureau of Statistics No. 23-203. Ottawa: Queen's Printer.

TABLE A.4

Freight Rates: Meats from Specified Stations in Western Canada to Toronto or Montreal, by Effective Date *

Effective Date	Rates on Shipment From[a]		
	Edmonton	Saskatoon	Winnipeg
	(Cents per cwt.)		
1 Oct. 21	188[b]	169[c]	121
8 Apr. 48	227	204	146
11 Oct. 49	245	220	158
23 Mar. 50	263	237	169
16 June 50	272	245	175
26 July 51	305	274	196
11 Feb. 52	318	287	205
1 May 52[d]	304	274	194
1 Jan. 53	332	299	212
16 Mar. 53	356	321	227
1 May 53	349	314	221
1 Nov. 55	342	307	214
1 Nov. 56	349	314	221
3 July 56	373	336	236
1 Jan. 57[e]	388	349	246
1 Mar. 57[f]	390	351	248
1 Dec. 58	458	412	292
1 Mar. 59	455	409	289
30 Apr. 59[g]	349	300	233
18 July 62[h]	341	286	212
27 Aug. 62[i]	341 (311)	286 (259)	212 (190)
29 Oct. 62[j]	311	259	190
21 Feb. 63[j]	(292)	(243)	(177)
1 Mar. 64[j]	321 (301)	268 (252)	198 (184)
To date 31 Dec. 66	No change	No change	No change

[a]Fresh or frozen at owner's risk of deterioration.

[b]Effective Aug. 17/23

[c]Effective April 18/32

[d]Effective date of Bridge Subsidy.

[e]Carload minimum weight - 20,000 lbs.

[f]From this date to Aug. 27/62 carload minimum weight - 21,000 lbs.

[g]Meat suspended.

[h]Not specified if suspended.

[i]Meat suspended. Rates in parentheses apply to carload minimum weight - 28,000 lbs.

[j]Not specified if suspended. Carload minimum weight - 28,000 lbs. Rates in parentheses apply to 36,000 lbs.

* Source: Livestock and Animal Products Statistics. Dominion Bureau of Statistics No. 23-203. Ottawa: Queen's Printer.