

UNIVERSITY OF MANITOBA

AN ECONOMIC ANALYSIS OF THE STRUCTURAL  
CASE FOR THE DEREGULATION OF FREIGHT  
TRANSPORTATION BY HIGHWAY CARRIER

by

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I remain responsible for any errors that remain.

## ABSTRACT

There has been in recent years a re-appraisal of the role that economic regulation plays in particular industries. In the case of motor freight transport, which has developed and matured under economic regulation, the desirability and efficacy of regulation has long been questioned.

Many economists have argued that the motor freight transport industry, if free of regulation, would conform closely to the competitive model and establish a satisfactory position of stable equilibrium. Two interrelated methodologies have been employed to arrive at this conclusion. First, some authors have attempted to identify those structured conditions which, based on a priori theory and empirical evidence, would lead to acceptable conduct and performance. Second, other authors have assessed the conduct and performance of carriers not subject to regulation with the conduct and performance of regulated carriers in order to estimate the effects of regulation on price.

Both of these methodologies, primarily the first, make certain assumptions about the economic characteristics of motor freight transport. These are that motor carrier output is homogeneous, that threshold cost requirements to entry are low, that there exists high factor mobility and high cost variability with respect to output, and that there are no significant economies of scale. In essence, the conventional argument stresses that given ease of entry and exit and the lack of economies of scale, deregulation will result in a motor carrier industry which will not



exhibit significant tendencies toward undue concentration or destructive competition. Implicit in this view is that regulation causes an industry to diverge from its competitive structure and results in non-competitive performance which may be measured readily.

The objective of this study is to challenge these assumptions. It will be argued that the conventional arguments may be inadequate as an analytical and public policy reference point.

The general methodology employed in this study is as follows. First, it is argued that the assumption of output homogeneity is inappropriate. Motor carrier output has a number of dimensions, the most important of which are size of shipment, length of haul, and geographic coverage. Combinations of these three dimensions define a set of sub-industries for which the cross elasticities of demand are assumed to be low. Hence, carriers may be distinguished from one another on the basis of their service. Second, given these sub-industries their structural cost conditions are examined. That is, an attempt is made to ascertain if output heterogeneity on the demand side produces significant differences in the structural cost conditions. Threshold costs, factor mobility, cost variability and indivisibility, and economies of scale are discussed in relation to the output heterogeneity. Differences in these conditions imply differing competitive responses. Hence, the impact of any deregulation measure will not be uniform nor stable across the industry.

The study will focus on the for-hire general freight carrier.

Data indicate that this class of carrier predominates the industry in terms of revenues generated and equipment utilized. Unfortunately, the paucity of Canadian data prevents a detailed analysis of their operations. Therefore, recent U.S. research and a priori reasoning are used to develop the arguments concerning sub-industry structures within the class of carrier.

The analysis up to this point may be considered to assess the impact of structure on behavior. That is, the central question is one of determining if a stable equilibrium would obtain in the absence of regulation. A second line of inquiry relates to the comparison of conduct and performance of regulated carriers to non-regulated carriers. Two studies are reviewed which are representative of attempts to measure the effect of regulation on prices. In essence, these studies attempt to measure the effects of structure on performance based on certain unstated structural assumptions. It is argued that these studies do not employ adequate data nor appropriate model specifications.

The general conclusions of the study may be summarized as follows. The output of motor carriers is not homogeneous but rather has a number of dimensions. The size of shipment, the length of haul, and the extent of geographic coverage are three dimensions of output or service which distinguish one carrier from another. A separate sub-industry can be defined for unique combinations of these characteristics. It is assumed that the cross elasticity of demand for these sub-industries is low.

Threshold costs, factor mobility, cost variability and indivisibility, and economies of scale vary in importance across the

spectrum of output characteristics. In general, carriers which specialize in truckload shipments conform to the competitive model. However, carriers which specialize in less-than-truckload shipments do not. Less-than-truckload carriers require terminal facilities. As the length of haul and geographic coverage increases, the greater the terminal requirements. These terminals represent long-lived, fixed assets which affect the threshold costs, factor mobility, cost variability and indivisibility and economies of scale.

It is argued that for the less-than-truckload carriers threshold costs are increased, factor mobility reduced, and economies of scale are present. The significance of these structural features is a function of the length of haul and extent of geographic coverage. In the absence of economic regulation it is assumed that there exists a real possibility of destructive competition for certain carriers.

A review of studies which compare performance of regulated carriers to non-regulated carriers suggests that no firm conclusions may be drawn from them. The structure of motor transport is too diverse and complex to be incorporated in such models. It follows that it would be inappropriate to frame policy on the basis of this type of research.

In conclusion, it is argued that the arguments for de-regulation tend to over-simplify the benefits to be gained from de-regulation. This is not to say that the present situation is optimal in any sense of the word, but rather to argue that any move towards the de-regulation of motor carriers must be preceded by thoughtful and precise research.

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## CHAPTER I

### Introduction

Though the motor transport industry has been regulated for over 40 years in the U.S. and Canada, many economists have argued that the trucking industry, if free of regulation, would conform closely to the competitive model and establish a satisfactory position of stable equilibrium. As Wilson has remarked "so firmly engrained is this vision of the motor carrier industry that it has achieved the status of a piece of conventional wisdom. The implication of this view is that economic regulation is therefore entirely superfluous at best and a cause of serious economic waste at worst".<sup>1</sup>

One may identify two, though interrelated, methodologies employed by various economists to arrive at the general conclusion. First, some authors have attempted to identify those structural conditions which, based on a priori theory and empirical evidence, would lead to acceptable conduct and performance. Second, other authors have assessed the conduct and performance of carriers not subject to regulation with the conduct and performance of regulated carriers.<sup>2</sup>

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<sup>1</sup>George W. Wilson, "The Nature of Competition in the Motor Transport Industry" Land Economics, 36 (November 1960), pp. 387-391.

<sup>2</sup>For general reviews of the case for de-regulation incorporating both of these approaches see John W. Snow, "The Problem of Motor Carrier Regulation and the Ford Administration's Proposal for Reform" in Paul W. MacAvoy and



This study will concentrate on the first approach with a view to critical analysis of the prevailing views on the structural conditions of the major transport industry. However, in a later section of this study two of the more important studies using the second approach will be examined.

### The Structural Case For De-regulation

The literature of the economics of motor transport is rife with comments as to competitive structure of the motor transport industry. For example, Pegrum stated . . . "the economic structure of the motor transport industry is that of a highly competitive industry."<sup>1</sup> Keyes stated that for (the) "motor trucking . . . industry the competitive analysis is valid."<sup>2</sup> Olson has stated that "without the existence of regulation the motor carrier industry would appear to be one of the best examples of a perfectly competitive industry".<sup>3</sup>

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John W. Snow, eds., Regulation of Entry and Pricing in Truck Transportation (Washington, D.C.: American Enterprise Institute, 1977) pp. 3-43; and James C. Johnston, "De-regulation of Transportation: Its Probable Ramifications" Proceedings: Fifteenth Annual Meeting of the Transportation Research Forum (Oxford, Indiana: Richard B. Cross Co., 1974), pp. 133-137, see also Norman C. Bonsor, "The Development of Regulation in the Highway Trucking Industry in Ontario", Ontario Economic Council, Government Regulation: Issues and Alternatives 1978 (Toronto: Ontario Economic Council, 1978), pp. 103-135.

<sup>1</sup> D. F. Pegrum, Public Regulation of Industry (Homewood, Illinois: Richard D. Irwin, 1959), p. 582.

<sup>2</sup> L. S. Keyes, Federal Control of Entry into Air Transportation (Cambridge, Massachusetts: Harvard University Press, 1951), p. 413.

<sup>3</sup> Josephine Olson, "Price Discrimination by Regulated Motor Carriers", American Economic Review, 62 (June 1972), p. 935.

These views are based on assumed structural characteristics of motor transport in relation to the theoretical model of a competitive industry. For example, Scherer has stated that "homogeneity of the product and insignificant size of individual sellers relative to their market are sufficient conditions for the existence of pure competition - the only basic structure type under which sellers possess no market power".<sup>1</sup>

Once again, the literature abounds with references to the homogeneity of the output of motor transport. For example, Farmer has stated ". . . all freight transportation firms sell the same product, ton-miles, and while this output can be differentiated somewhat in quality terms, such as in quality of service rendered . . . it is quite difficult to maintain product differentials over long periods of time".<sup>2</sup> Olson states, "its products is movement of goods between two points within a given time period . . . some differences in quality may be possible, . . . but they are relatively difficult to maintain".<sup>3</sup> As may be noted, where authors recognize any heterogeneity of the output it is deemed to be inconsequential in the longer run. Implied in this view is that all motor transport firms have the potential to produce the identical product of competitors because all carriers are assumed to be using the identical technology.

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<sup>1</sup>Frederick M. Scherer, Industrial Market Structure and Economic Performance (Chicago: Rand McNally and Co., 1970), p. 10.

<sup>2</sup>Richard N. Farmer, "The Case for Unregulated Truck Transportation", Journal of Farm Economics, 34 (May 1964), p. 400.

<sup>3</sup>Josephine Olson, op. cit., p. 395.

Wilson has argued extensively as to the heterogeneity of output on the demand side, however, this analysis has only been used to examine output differences between modes.<sup>1</sup> Recently, some authors have argued that the analysis should be extended to determine if non-transport savings do not create demand heterogeneity within a particular mode. For example, Spychalski has argued that "efforts to ascertain competitive conditions in trucking should begin with recognition of the fact that motor freight carriage, taken en toto, is not homogeneous in terms of either (1) types of service produced, and plant and equipment with which such services are produced, or (2) shippers' requirements or demands for motor freight service".<sup>2</sup> This issue will be discussed in more detail in the following chapters.

In reference to Scherer's second condition for pure competition - insignificant size of individual sellers relative to their market - many economists simply point out the thousands of regulated and unregulated carriers in existence as evidence that motor transport is inherently competitive.<sup>3</sup> While there may be some recognition that for certain geographic markets the number of carriers may be quite small (perhaps only one) any perceived con-

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<sup>1</sup>George W. Wilson, "On the Unit of Output in Transportation", Land Economics 35 (August 1959), pp. 267-276.

<sup>2</sup>John C. Spychalski, "Criticisms of Regulated Freight Transport: Do Economists' Perceptions Conform with Institutional Realities?" Transportation Journal, 14 (Spring 1975), p. 7.

<sup>3</sup>C. John W. Snow, op. cit., p. 3.

centration is related to the effects of entry control of new firms.<sup>1</sup> However, output heterogeneity on the demand side and differences in demand between geographic markets (as well as operating cost differences) may confer monopolistic power on certain carriers in the short run.

Recognizing that some monopolistic power may be gained in certain markets economists have argued that, in the absence of regulation, the relative ease of entry and exit (based on low initial capital requirements and highly divisible, relatively short-lived physical units of operation) and the absence of any significant economies of scale where only one or a few firms could supply all the output demanded in a particular market, would limit this power.<sup>2</sup>

The arguments concerning ease of entry and exit are related to the economies of scale argument. For example, the presence of significant economies of scale may indicate the need to raise substantial amounts of capital to enter the industry at an efficient scale (this is sometimes referred to as the threshold cost). If, on the other hand, no significant economies of scale are present and the units of capacity are highly divisible, the entry size of the firm may be small and the threshold cost will be relatively low.

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<sup>1</sup> John W. Snow. op. cit., pp. 3-5.

<sup>2</sup> John Meyer et al., The Economics of Competition in the Transportation Industries, (Cambridge, Mass.: Harvard University Press, 1959), p. 213; and John Sychalski, op. cit., p. 6.

As Pegrum has stated of motor transport ". . . the technical operating units are relatively small and may be very small. Operations may be started with a very small investment and expansion may be undertaken with very small increments in investment in direct and almost immediate response to growth in traffic. Most of the facilities are not highly specialized or unalterably committed to a particular geographic area, and they can be readily shifted to any other markets if the law permits this. Physically, the highways or routes are available to all who wish to use them".<sup>1</sup>

The implication of Pegrum's argument is that not only are there no significant barriers to entry but, due to the divisibility of inputs and high factor mobility, there are no restrictions to exit. Therefore, the conduct and performance of the industry should conform to the competitive model. Furthermore, the arguments concerning the probability of destructive competition are rejected on the basis of the ease of exit.<sup>2</sup>

Given these assumed structural characteristics of motor transport, that is, that motor transport is inherently competitive, the structural case is extended to performance analysis. The

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<sup>1</sup>D. F. Pegrum, Transportation Economics and Public Policy, 3rd ed., (Homewood, Illinois: Richard D. Irwin, Inc., 1973), p. 122.

<sup>2</sup>Cf. Joe Bain, Industrial Organization, 2nd ed., (New York: John Wiley and Sons, 1968), pp. 469-496 and Frederick M. Scherer, Industrial Market Structure and Economic Performance, (New York: Rand McNally and Co., 1970), pp. 198-200. The subject of destructive or cut-throat competition will be discussed at length in Chapter VI.

implicit assumptions of studies which attempt to assess the effects of regulation on price are that in the absence of regulation the industry would conform to the competitive model and that regulation produces measurable differences in performance. This will be discussed in greater detail in Chapter VII.

The structural arguments for the de-regulation of motor transport will be reviewed in detail in the following sections of the study. To rephrase Spychalski, an attempt will be made to determine if "economists' perceptions conform to institutional reality".

#### Industrial Organization Theory and the Case for De-regulation

Industrial organization as a discipline of applied economics was largely created and developed by Edward Mason and his students in the 1930's. As with most applied disciplines industrial organization has followed many lines of development. To some economists industrial organization consists of the testing of theoretical market models. To others it is a means of synthesizing theory and empirical fact.<sup>1</sup>

Most industrial organization studies are framed by the relationships between industrial structure, the behavior or conduct of firms, and economic performance judged in terms of the norms of economic

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<sup>1</sup>See James W. McKie, "Market Structure and Function: Performance versus Behavior" Jesse Markham and G. Papenek, eds., Industrial Organization and Economic Development - Essays in Honour of Edward S. Mason, (New York: Houghton Mifflin Co., 1970), pp. 3-25.

welfare. Unfortunately, this analytical scheme is not a completely connected system. That is, most studies do not, and cannot, examine structure, predict conduct uniquely and completely, and infer performance from behavior and how well this performance related to the norms of economic theory.

Therefore, "Bain's paradigm", as this analytical schema is sometimes referred to, has not been fully connected in a linear or other type of sequence. This is not to say that industrial organization lacks research direction but rather that research which is aimed at a higher level of generalization has not fully connected the elements of the scheme.

As McKie points out, most studies of industrial organization tend to focus on either an analysis linking structure and performance directly, or an analysis linking structure and behavior.

"Investigations of economic performance have usually behavioral problems. In this they resemble the abstract theoretical models of the firm and the market under conditions of pure competition and pure monopoly, for which profit maximization is the only behavioral principle necessary: price policy is what produces maximum profits. Questions of behavior become interesting in equilibrium analysis only when there is some uncertainty about the theoretical results. Performance, on the other hand, is more directly dependent upon the properties of the predicted equilibrium."<sup>1</sup>

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<sup>1</sup>Ibid., p. 4.

The industrial organization schema has been applied to regulated industries such as motor transport though the methodology is rarely, if at all, discussed. Once this is done certain analytical deficiencies become more apparent.

If one examines the structural case for the de-regulation of motor carriers the case may be considered to consist of two parts.

First, there is an assumed link between structure and behavior. For example, the structure of the motor carrier industry is assumed not to lead to destructive competition. However, the evidence needed to support this argument requires a great deal of information. In fact, a much more complex specification of an industry's structure is required to analyze behavior than to predict performance in terms of the profit rate.

Students of industrial organization have found the following structural dimensions useful in examining the link between structure and behavior.<sup>1</sup>

1. Distribution of sellers by number and size.
2. Relative ease of entry to, and exit from, the industry or market.
3. Conditions of Demand and Nature of the Product:
  - Differential or homogeneous
  - Consumer or producer; durable or perishable
  - Unit value

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<sup>1</sup>Ibid., pp. 9-10.



Methods of distribution

Intermittent or continuous demand

Price elasticity

Short-run income elasticity

Long-run rate of growth

4. Cost conditions and technology:

Shape of marginal and average cost curves;

weight of overhead costs; cost flexibility

Economies of scale

Vertical integration

Joint or Common products

Technolgoical complexity

5. Factor market influences; relative factor costs;

monopoly and competition in factor markets.

6. Locational influences.

7. Government regulation of prices, inputs, outputs,  
and specific taxation.

8. Distribution of buyers by number and size.

These basic elements of structure may be given other names but most would be important in any industrial organization study.

Furthermore, they may exist in a very large number of combinations.

Most of the structural case for de-regulation relates to the cost conditions in virtual isolation with little reference to the other important characteristics - especially conditions of demand.

Grouping of the various structural elements may lead to a range of behaviors depending on the elements grouped and their relative importance. For example, assume there are many small producers

in an industry characterized by easy entry, difficult exit, an undifferentiated product, price-inelastic demand, high overhead costs, and stagnant technology. In periods of excess capacity one may expect depression, unrenumerative prices, and failure of the market to reach equilibrium. However, would this result obtain if one of the elements were altered, say, the introduction of differentiated product. In such an instance firms may be able to protect themselves by differentiating product, however, an equilibrium may not be reached unless there is some tacit agreement on prices or output. In short, it is very difficult to predict behavior when faced with structural combinations, the relative importance of each are not clear.

The second part of the structural case for de-regulation consists of an assumed link between structure and performance. That is, it is assumed that it is appropriate to measure price differences between regulated and unregulated markets as a measure of performance. This assumes that firms operating in the two markets would be identical in every respect save for regulation. In addition, the form of regulation is assumed to be identical.

The link between structure and performance is generally examined by relating concentration in a particular market to profitability. Profitability is usually gauged in reference to some norm as the long-run rate of interest. However, it has become common practise to compare prices between the two markets. The effect of this methodology is not to gauge economic performance per se but rather attempt to evaluate the effects of

regulation. That is, rather than attempting to assess performance as either good or bad the researcher simply looks for differences between the markets. Obviously, the effects of regulation on performance are a subset of performance in general. In essence, regulation has become a proxy for concentration.

In conclusion, the industrial organization schema offers a useful framework for analysis providing its limitations, both theoretical and empirical, are specified as clearly as possible.

### Outline of the Study

Chapter II will review the political economy of regulatory reform. That is, it will briefly discuss the status of the broad regulatory reform movement in the U.S. and Canada, its imperatives, and some possible impediments to regulatory reform. Differences in perspective and policy between the two countries will be highlighted.

Chapter III will profile the Canadian motor freight transport industry. Using highly aggregated Canadian data the size distribution of firms will be presented. In addition, the relative importance of the for-hire general freight carrier is discussed. This chapter will include a brief analysis of motor carrier operations and highlight the importance of terminal functions. A review of the existing regulatory framework within which the industry operates is presented. Finally, the competition to the for-hire general freight carrier, railroads and private motor carriers, is discussed to gauge the competitive impact of these two modes.

Chapter IV will analyze the structure of the industry. It will be argued that output heterogeneity on the demand side defines a set of sub-industries. The dimensions of output discussed are size of shipment, length of haul, and geographic coverage. These continuous variables define a spectrum of sub-industries which have differing structural and competitive characteristics. The structural characteristics discussed are threshold costs, factor mobility, and cost variability and indivisibility. The discussion of economies of scale as a structural characteristic is presented in Chapter V. This will entail a review of the literature.

Chapter VI will discuss destructive competition. That is, given the structural characteristics of motor transport, the analysis will focus on the likelihood of achieving a stable equilibrium. The historical record of destructive competition is reviewed and the modern relevance of the issue is discussed.

Chapter VII reviews two of the more important studies which attempt to measure the impact of regulation on rates. The statistical and methodological shortcomings of this approach are discussed in detail.

Chapter VIII contains the summary and conclusions of the study. It will discuss some of the implications of the results and point out specific areas requiring further research.

## CHAPTER II

### The Political Economy of Regulatory Reform: Recent U.S. and Canadian Experience.

#### Introduction

While the terminology has changed somewhat over the years, the arguments for regulatory reform are not new.<sup>1</sup> What is new on the broad regulatory front is the fact that there is indeed a front. That is, there is a growing constituency of policy makers that are willing to translate arguments for reform into legislation.

For the U.S. and Canada the impetus for reform seems to stem from the inflationary pressure of recent years. That is, regulatory reform is seen as a way of reducing prices without significantly increasing unemployment. While the rapid economic changes over the last few years have spurred an interest in regulatory reform in general, the conventional case is still applied to motor transport.

It will be argued that the perspectives on regulatory reform are quite different in Canada than in the U.S. Canada has not had the same ideological commitment to competition as the U.S. Unlike the recent U.S. experience of de-regulatory success, Canada has

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<sup>1</sup>The terminology has changed in recent years partly, one suspects, due to the efforts of policy makers to remove the negative connotation of "de-regulation" and to the acceptance of the notion that regulation can be made more responsive to changing economic and social circumstances. Hence, the phrase regulatory reform has emerged as a more accurate and less emotive term. One variant of this phrase is "regulatory re-regulation" which tends to leave the reader somewhat bewildered.

experienced de-regulatory failure in terms of its railroads. In addition, Canada seems to be in the unique position of attempting to pass two contradictory pieces of legislation.

It is useful to review the prevailing U.S. and Canadian views on regulatory reform and highlight the imperatives for change. It may be argued that the rigorous structural view taken by U.S. policy makers and the somewhat ambivalent view taken by Canadian policy makers regarding motor transport regulation, reflects an insufficient appreciation of the characteristics of the motor transport industry.

#### Recent U.S. Views

Though earlier examples may be cited, every U.S. president since Harry S. Truman has recognized administrative problems associated with regulation and has appointed some type of commission or board to evaluate regulation.<sup>1</sup> Each has been unsuccessful at affecting fundamental change.

Though it is beyond the scope of this study to inquire into the reasons why regulatory reform did not gain the seeming importance it has at present, the emphasis on economic efficiency in the light of inflationary pressures is clearly important.

It may be argued that contemporary criticism dates to 1961 when an advisor to President Kennedy produced a popular book of

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<sup>1</sup> Canada, Department of Consumer and Corporate Affairs and Treasury Board, Government Evaluation of Regulation: The U.S. Experience (Ottawa: Minister of Supply and Services, 1978), pp. 1-17.

regulatory criticism.<sup>1</sup> From this initial effort, Kennedy delivered a Special Transportation Message to Congress in which he criticized the patchwork of federal transportation policies and recommended specific measures to de-regulate the transportation industries. Nothing came of the proposals.

With the advent of the Kennedy administration, the annual reports of the President's Council of Economic Advisors have called for "regulatory reform". Unlike the earlier period when economists attempted to measure the administrative costs of regulation or to argue that a particular component of the transportation industry had all the structural requirements of a competitive industry, the new research attempted to assess, in dollar terms, the social cost of regulation.<sup>2</sup>

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<sup>1</sup>It should be noted that though the inflationary pressures in 1961 did not approach the levels present today. Kennedy was making a stand on "creeping inflation".

<sup>2</sup>Cf. Thomas Gale More, "The Feasibility of De-regulating Surface Freight Transportation", in Almarin Phillips ed., Promoting Competition in the Regulated Industries (Washington, D.C.: The Brookings Institution).

Ann Friedlaender, The Dilemma of Freight Transport Regulation (Washington, D.C.: The Brookings Institution, 1969).

Larry Darby, "An Evaluation of Federal Regulation of Common Motor Carriage", (Ph.D. dissertation, Indiana University, 1969).

For more recent work see Interstate Commerce Commission, Bureau of Economics, "A Cost and Benefit Evaluation of Surface Transport Regulation" In Paul W. MacAvoy and John W. Snow, eds., Regulation of Entry and Pricing in Truck Transportation (Washington, D.C.: American Enterprise Institute, 1977), pp. 47-91 and "The Costs and Benefits of Surface Transport Regulation: Another View" in Paul W. MacAvoy and John W. Snow, eds., loc. cit., pp. 93-114.

As Wilson has pointed out:

"The studies use widely different and highly suspect techniques, woefully inadequate data, heroic assumptions, and a series of guesses, more or less educated. However, the surprising thing is that despite all of these caveats, there is rather close comparability in the estimates of social costs. In turn, less elaborate estimations arrive at at least roughly similar magnitudes. Without commenting on the acknowledged deficiencies of these estimates, their derivation and the fact that they measure different things even though purporting to be measures of social costs...it is fair to say that (based on these studies) that the social cost of economic regulation of transportation may have been at a minimum between \$3.4 billion in 1969 and higher in subsequent years as freight revenues, ton-miles, and GNP have risen. At least, those who have attempted some quantification appear to agree generally upon the orders of magnitude...." <sup>1</sup>

Studnicki-Gizbert provides a broader view of the regulatory problem:

"The present debate over the usefulness and performance of the regulatory system concentrate on the issue of the costs and benefits of economic regulation from the point of view of economic and administrative efficiency. Given such terms of reference, the results lead to an almost universal condemnation of the regulatory system. The main points are: 1) regulation distorts inter-industry competition; 2) regulation distorts the allocation of resources within the regulated industry; 3) regulation raises prices to transport users; 4) regulation promotes inefficiency and hampers innovation; 5) regulation is inherently associated with administrative delays and high costs to the interests concerned; 6) regulation adversely affects competitive incentives; 7) regulators become over-identified with the regulated firms." <sup>2</sup>

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<sup>1</sup> George W. Wilson, "Economic Consequences of Motor Carrier Regulation" in Allen R. Ferguson and Leonard Lee Lane, eds., Transportation Policy Options: The Political Economy of Regulatory Reform, (Washington, D.C.: Public Interest Economics Foundation, n.d.), pp. 19-36.

<sup>2</sup> K. W. Studnicki-Gizbert, "The Administration of Transport Policy: The Regulatory Problems" Canadian Public Administration (Winter, 1975), pp. 651-652.



While some of the items mentioned above tend to overlap it seems that the prevailing opinion of regulation is that it has "failed". Regulatory failure has a number of dimensions. Perhaps the most obvious is the failure of a regulated firm in spite of, or according to some, because of regulation. The recent collapse of Penn-Central, Reading, Lehigh Valley, Central RR of New Jersey, Boston, and Maine, and Rock Island clearly reflect this view.<sup>1</sup>

The other dimension of regulatory failure stems from the recognition that the regulatory process produces more regulation. For example, Mr. James Miller of the Center of the Study of Governmental Regulation has kept track of the growth of regulation in the Federal Register (which lists new rules daily) and the Code of Federal Regulations (which lists all regulations currently in force). He found that once the period 1970-1977 the number of pages in the Federal Register had increased by 227%, and the pages in the Code of Federal Regulations has increased by 39% in the same period.<sup>2</sup>

It may be argued that a great deal of pressure has been placed on regulatory reform by the recent decisions of what has been labelled "the new antitrust majority" on the Supreme Court.

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<sup>1</sup>Cf. Merton J. Peck, "Regulation and the Railroad Crisis", Allen R. Ferguson and Leonard L. Lane, eds., Transport Policy Options: The Political Economy of Regulatory Reform, op. cit., p. 13-18

<sup>2</sup>"Reforming America's Regulators", The Economist, August 12-18, 1978, p. 61.

The court has shown an increasing deference (since about 1975) to private restraints tolerated by regulators.<sup>1</sup> During the 1960's the Supreme Court (the "Warren Court") generally took the position that the mere fact that an anti-competitive private arrangement had been approved by a regulator did not exempt it from antitrust scrutiny.<sup>2</sup> The court generally decided that unless the anti-competitive conduct was necessary to make the regulatory scheme work the conduct was not exempt from the antitrust law. In some cases the Supreme Court would still allow an antitrust suit against the approved conduct where it was shown that a less anti-competitive alternative was available.

The new Supreme Court seems to be taking a decidedly different approach. Recent decisions seem to reflect the view that the present Supreme Court sees antitrust as "a dogmatic and inconvenient interloper in orderly regulation mandated by Congress".<sup>3</sup> Therefore, the independent antitrust forum of the "Warren Court" which assured scrutiny of anti-competitive practices and mergers where such conduct was approved of by the regulatory agency has gone by the wayside.

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<sup>1</sup>U.S., Senate, Committee on the Judiciary, The Competition Improvements Act of 1975, Hearings, before a Sub-Committee on Antitrust and Monopoly, Senate on S. 2028, 94th Cong., 1st. sess., 1975, p. 319. Prepared Statement of Donald Baker, Visiting Professor of Law, Cornell Law School.

<sup>2</sup>No case has arisen where a regulator has "commanded" change which contradicted antitrust law.

<sup>3</sup>Ibid., p. 322.

Apart from recent numerous bills to allow for greater competition in specific regulated industries the omnibus bill proposed by Senator Edward Kennedy attempts to reaffirm the national dedication to competition at all levels:

"It is the purpose of the Act to reaffirm that the fundamental national economic policy of the United States is free and open competition embodied in the antitrust laws, to establish procedures that strengthen and facilitate the application of antitrust and procompetitive policies by Federal departments and agencies, to minimize anti-competitive behavior in regulated industries, to encourage more vigorous and far-reaching application of the antitrust laws in the policies and practices of Federal departments and agencies, to enable Federal departments and agencies better to restore, maintain, and protect open and vigorous competition in the marketplace... 1

Donald Baker<sup>2</sup> gave virtually unqualified support for Senator Kennedy's bill and proceeded to identify some areas in which he felt the bill would have the greatest input.<sup>3</sup>

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<sup>1</sup> Ibid., p. 6 (This is taken from the draft version of S.2028).

<sup>2</sup> Donald Baker joined the Department of Justice in 1966 and rose to the level of Deputy Assistant Attorney General. When the Carter Administration came to power he was "fired" and took up teaching at Cornell. His support for the bill was quite important since he initiated Department of Justice involvement in cases concerning regulated industries. The most important case was the 1975 "Carterfone" case, also known as the telephone attachments case.

<sup>3</sup> Baker and George Hay also outlined these areas in a speech to the McGill University Institute for the Study of Regulated Industries in March 1978. However, these areas were determined (prior to 2028) on a strategic basis, that is, to which regulated industries should Justice and the FTC allocate antitrust resources.

"...I think we ought to look at four kinds of situations to understand how it is going to work. One is the naturally competitive industry which has been regulated on economic grounds. Trucking and airlines are the cases in point. And here, they probably would be better if almost all the economic entry and pricing regulations were eliminated. What you want out of S. 2028 is the maximum tilt in favour of competition and flexibility. <sup>1</sup>

Baker felt that for other situations such as "ethical regulation" (standards, licensing) or so-called "natural monopoly", the scope of S. 2028 should be limited. However, Baker argued that the government should not allow licensing policies to serve protectionist purposes and should encourage market-oriented practices in the so-called natural monopolies (such as peak-load pricing for example). The fourth case Baker discussed related to the extension of regulation of natural monopolies to other activities. For example, he argued that the fact that a telephone network is a natural monopoly does not justify the extension of regulations to terminal equipment.

Recent U.S. experience in de-regulating air carriers brought about by the dynamic leadership of Alfred Kahn, has indicated that there is sufficient flexibility in regulatory system to allow for reform without the introduction of new legislation. This type of flexibility is now appearing in other independent regulatory agencies. For example, the chairman of the Interstate Commerce Commission (ICC) has recently proposed short-range de-regulation

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<sup>1</sup>U.S. Senate, Committee on the Judiciary, The Competition Improvements Act of 1975, Hearings, op. cit., p. 314.

of truckers entering new markets. This will be accomplished without changes in legislation though a second stage will require legislative changes.<sup>1</sup> He stated that the trucking industry should be de-regulated where regulation is not useful for freight transportation. In addition, it was felt that the trucking industry was mature and more competition was needed.<sup>2</sup>

In conclusion, it may be stated that due to a variety of factors, including a band-wagon effect, that policy makers accept the need for regulatory reform in general and for the de-regulation of trucking in particular. The notion that trucking in a "naturally competitive" industry is at the heart of the proposed reforms.

#### Recent Canadian Views

Canada has not had the same sort of commitment to competition as the U.S. To state this point in another manner, Canada has traditionally accepted the desirability and indeed assumed need for government intervention. "Government ownership, large firms in banking, finance, transportation and some resource industries, often closely related to or directed by government, substantial foreign ownership behind a protective tariff wall . . . these have persisted as dominant character-

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<sup>1</sup>"Trucking Controls", Toronto Globe and Mail, November 9, 1978.

<sup>2</sup>Ibid., See Appendix 1.

istics of the Canadian economy despite the major changes that have taken place over the last century".<sup>1</sup>

As Skeoch has pointed out, Canada has tended to accept the need for large firms in the business sector and for a substantial degree of government support and direction to the economy. An interesting aspect of this view has been not to reject business as bad per se. This attitude has been revealed by exemptions to competition legislation which has traditionally excluded services, transportation coming within the jurisdiction of parliament, labour unions, certain market schemes, etc. "At the very least it is clear that there is no Canadian public policy commitment to a general rule of competition in Canada. To assume that there is (or has been) is to misread the history of combines legislation and to simplify it out of all relation to reality of the vagaries of government policy and administration..."<sup>2</sup>

It would seem that in recent years the Canadian view on the regulatory system has been affected by the same forces that have been at work in the U.S. To reiterate, "... the regulatory process has been faulted for being insensitive to public needs and opinions while, on the other hand, doubts have been expressed concerning the efficiency and effectiveness of

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<sup>1</sup>L. A. Skeoch, ed., Mergers, Consolidations and Big Business, (Oxfordshire: The Ditchly Foundation, 1970), p. 62.

<sup>2</sup>L. A. Skeoch, Restrictive Trade Practices in Canada (Toronto: McLelland and Stewart, 1966), pp. 148-149.

particular regulations, standards, or guidelines. More specifically, with the onslaught of serious inflationary problems, it has been argued that regulations may be unnecessarily adding to prices and costs".<sup>1</sup>

There is another feature of the Canadian scene which has spurred efforts at examining regulation in Canada and that is the prevalence of overlapping regulatory jurisdictions and the conflicts imposed by such an interface. This problem has been accelerated in recent years by the shift of economic power in Canada, as well as the desire of provinces to assume greater control of their economies.

For example, on July 12, 1978 the Prime Minister asked the Economic Council of Canada to undertake a number of studies of specific areas of regulation. "As you know, there has developed in Canada a strong concern that increasing government regulation might be having serious adverse effects on the efficiency of Canadian firms and industries and on the allocation of resources and the distribution of income. You will recall that First Ministers, in February, 1978, '... agreed that the whole matter of government regulation should be referred to the Economic Council of Canada for recommendations for action in consultation with the provinces and the private sector'. In

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<sup>1</sup>Canada, Department of Consumer and Corporate Affairs and Treasury Board, Government Intervention in the Marketplace and the Case for Social Regulation, (Ottawa: Department of Supply and Services, 1977), p. 1.

addition, First Ministers expressed concern about the overlapping of federal and provincial regulatory jurisdictions".<sup>1</sup>

While it will take some time for the Canadian position on the broad regulatory front to emerge, the conflict between transportation regulation and the competition policy indicates the problems to be faced.

In order to explore the conflict it is useful to begin with the MacPherson Commission Report.<sup>2</sup> The MacPherson Commission was called upon to inquire into and report upon the problems relating to railway transportation in Canada and the possibility of removing or alleviating inequities in the freight rate structure.<sup>3</sup>

It has been pointed out the primary concern of the MacPherson Commission was somewhat more broad than indicated by the title. "This was to free railways from the 'dead hand' restrictive rate regulation that appeared to prevent them from effectively meeting the growing competition of road transportation and abandoning uneconomic services. Keeping the railways running had always required massive support from the public coffers. There had been a valid rationale for this sort of regulation when rail

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<sup>1</sup>Letter from Prime Minister Trudeau to Dr. Sylvia Ostry, Chairman of the Economic Council of Canada, July 12, 1978.

<sup>2</sup>Canada, Royal Commission on Transportation Report (Ottawa: Queen's Printer, 1961). Hereinafter cited as "MacPherson".

<sup>3</sup>Ibid., Vol. 1 and Appendix A.



virtually monopolized the transportation field".<sup>1</sup>

What had started as an investigation of railway rates ended in a broad sweeping recommendation for greater competition.

"In brief, the broad aim of public transportation policy should be to ensure - consistent with other goals of national policy - that all the various modes of transportation are given a fair chance to find their proper place within a competitive system"<sup>2</sup>

. . . national transportation has been a greate deal more pre-occupied with the question of how effectively the transportation system was functioning as an instrument to fulfill national policy objectives, than with the question of how well it was functioning as an economic enterprise. There were, of course, good reasons in the past this was so. In our view, however, that there are now equally good reasons why it should no longer be so".<sup>3</sup>

This new commitment to competition was carried over to the National Transportation Act of 1967. The other main feature of the legislation was the formation of a single trans-modal regulatory authority which emphasized a commitment to competition. It should be pointed out that the new commitment to competition was born out of a continuing railway crisis. The Law Reform

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<sup>1</sup>Law Reform Commission of Canada, The Regulatory Process of the Canadian Transportation Commission (Ottawa: Minister of Supply and Services, 1978), p. 7.

<sup>2</sup>MacPherson, op. cit., Vol. 1 p. 29.

<sup>3</sup>Ibid., p. 30.

Commission noted that railway rates had been frozen since 1959 and this meant that by 1967 taxpayers were paying up to \$100 million per year to cover railway deficits.<sup>1</sup>

Clearly, the Transportation Act of 1967 was based on the notion of regulatory failure and its escalating social costs. Therefore, rather than attempting to regulate the entire system the government would grant the railways pricing freedom and if it was felt that certain regions had to be served in the national interest, it would be "cleaner" to pay a direct subsidy for the service.

As the Law Reform Commission notes, the failure of the National Transportation Act of 1967 was primarily due to certain ambiguities of the legislation in terms of coverage and certain ambivalence to promote competition in transportation.

"This (Act is somewhat schizophrenic: it says we are going to have competition, but at the same time we are going to lay an extremely heavier hand on that competition and see that it does not get out of control. I think we will wind up getting the worst of both worlds. We will not benefit from the advantages possible under a competitive system in those areas where competition will work effectively; neither will we get the benefit of regulated system for which the transportation system seems to call".<sup>2</sup>

It is argued that since 1967 the criticisms of the existing system (as recently demonstrated by an inadequate number of box

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<sup>1</sup>Law Reform Commission, op. cit., p. 8.

<sup>2</sup>Mr. Max Saltzman, Commons Debates, December 21, 1966, pp. 11482-3 in Law Reform Commission, op. cit., p. 17.

cars to move grain) has led the government to shift away from an emphasis on competition. For example, Mr. Marchand, the former Transport Minister, stated in 1974:

"We said (in 1967) . . . that transportation should work in the same way as other things in other sectors of the economy. We suggested that we should have competition between the railway companies as well as competition between the railways and the trucking industry and between the trucking industry and the shipping industry . . . I can tell you now in all honesty from my experience that this fundamental principle is wrong in Canada . . ." <sup>1</sup>

A long awaited government policy statement in June, 1975 reinforced Mr. Marchand's statements. It argued that due to significant changes in the social and economic environment of the world since 1967 a need for an integrated approach to transportation problems was required. In other words, a fundamental review of the role of competition dictated that competition could now be viable only in some segments of the transportation system and should not be a primary factor in transportation regulation generally. "The objective selected was an accessible, equitable, and efficient system rather than economic, efficient, and adequate".<sup>2</sup>

The content of the policy statement of June, 1975 was incorporated into Bill C-33 which amends the National Transportation

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<sup>1</sup>Mr. Jean Marchand, Commons Debates, March 7, 1974, p. 265 in Law Reform Commission, op. cit., p. 17.

<sup>2</sup>Law Reform Commission, op. cit., p. 18.

Act of 1967. While the word "competition" is still included in the wording of the Act the clear import of the legislation is to reduce the primacy of competition in favour of regional development, adequate service to small communities, etc.

It may be argued that the policy shift since 1967 was based on "de-regulation" failure. That is, it was assumed that by allowing the railways the necessary pricing freedom that competition would, between rail and its major competitor, motor transport, produce an efficient system and significantly improve the financial position of the railways. The railways were essentially given this freedom in 1967, however, the results were not as expected. As Heads has pointed out:

"Canadian experience has shown that freedom from regulation will not necessarily solve the financial problems of the railways. Although the railways have received compensation for services provided as a public duty, particularly in respect of passenger transportation and branch lines, the industry has not been able to generate sufficient funds to produce rates of return which would attract new investment. Theoretically, this can be attributed to a combination of failure to exploit fully the new flexibility in pricing; and possibly the development of new supply and demand conditions that make it impossible for the railways to earn rates of return considere normal in other industries".<sup>1</sup>

As will be discussed later in this study it would seem that the failure to understand the economics of the competition from motor transport is partially responsible for the results of de-regulation.

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<sup>1</sup> John Heads, Some Lessons From Transport De-regulation in Canada, (Ottawa, Canadian Transport Commission, Economic and Social Analysis Branch, 1975), p. 7.

There is, at the same time, a movement in Canadian public policy towards less regulation in the economy generally. This view is embodied in the proposed State II Amendments to the Combines Investigation Act. Given the historical exclusion of transportation sector from the Act one would expect this policy shift merely to reflect historical inconsistencies about what is, and what is not, subject to the Act. However, two policy thrusts of the Act have an immediate impact on transportation. First, it is envisaged that the proposed Competition Act would be laws of "general application". Second, the Act, which had incorporated services in the Stage I Amendments, would now incorporate all regulated industries, which would be exempt from the Act only on very specific grounds.

Perhaps the best way briefly to discuss the Act is to analyze the preamble to the legislation.<sup>1</sup> The preamble is composed of three paragraphs. The first serves to place the Competition Act within the context of certain basic goals of Canadian public policy such as efficient allocation of resources, stimulates innovation, expands trade opportunities, etc. The second paragraph deals with certain factors which are necessary

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<sup>1</sup>Cf. Canada, Department of Consumer and Corporate Affairs, Proposals for a New Competition Policy for Canada, (Ottawa: Minister of Supply and Services, 1977), p. 15-16. While the proposed legislation has gone through a number of alterations the preamble has remained constant. The economic rationale for the legislation may be found in Economic Council of Canada, Interim Report on Competition Policy (Ottawa: Queen's Printer, 1969), and L. A. Skeoch and B. C. McDonald, Dynamic Change and Accountability in a Canadian Market Economy (Ottawa: Minister of Supply and Services, 1976).

to achieve the overall public policy goals. Factors mentioned are the creation of a flexible dynamic, and adjustable economy with emphasis on the removal to mobility, the discouragement of concentration and the predatory exercise of power, thus reducing the need for detailed economic regulation. The third paragraph makes the promotion of competition a matter of national policy by means of the introduction of general laws of general application. The Act clearly has an efficiency orientation which recognizes that competition may be tempered if it conflicts with economies of scale or real savings of resources.

The intent of the regulated conduct section of the Act requires that all regulated industries be subject to the Act. Exemption from the Act would be allowed if:

- (a) Anti-competitive conduct must be expressly required or authorized by a public agency not appointed by regulated persons.
- (b) The regulatory agency must regulate expressly in a manner set out in the regulatory statute.
- (c) The application of the Competition Act would seriously interfere with the attainment of the primary objectives of the regulatory law.<sup>1</sup>

The three exemptions have produced a great deal of controversy on two grounds. First, the import of the exemptions is not clear. For example, are the three exemptions exclusive,

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<sup>1</sup>Canada, Department of Consumer and Corporate Affairs, Proposals for a New Competition Policy for Canada, p. 87.

mutually inclusive? Furthermore, each exemption is not well defined. The first exemption was intended to bring, for example, professional associations with self-regulatory powers from provincial legislation under the Act. However, there are cases where regulatory boards are composed of members of the industry as well as government representatives. The question arises as to how many industry members are required to bring the association under the Act. The second exemption was designed to reinforce the first. That is, many self-regulatory professions do not regulate in a manner spelled out in statute but rather they regulate by regulations to an act or by by-laws. The third exemption may also produce contradictions. For example, if the primary objective of the regulation is orderly marketing of agricultural produce, application of the Act would seriously impair this by prohibiting production quotas.

The second reason for the controversy regarding the regulated conduct section is that federal regulatory agencies would be required to pursue their objectives in a manner least restrictive of competition. Furthermore, the proposed Competition Policy Advocate (presently the Director of Investigation and Research) would have powers of intervention before regulatory agencies. Therefore, actions of regulatory agencies such as the CTC would be open to competitive impact analysis.

Members of regulated industries have expressed concern because certain types of market conduct which though not subject to detailed regulation, have tacit or implicit approval by

government. Examples of this are rate bureaus in trucking, the involvement of airlines in non-transport operations (travel agencies), etc.

Though neither of the two pieces of legislation listed above have been passed, the interface could introduce some very important adjustments as far as transportation sector is concerned. It should be noted that this interface is not necessarily contradictory. For example, the Competition Act seeks to promote competition in order to achieve "efficiency". However, where competition would prevent the attainment of real savings to the economy competition would be tempered. The National Transportation Act would seek to reduce competition in order to make certain portions of the transportation system more "efficient". It may be argued that the introduction of criteria such as regional development to the National Transportation Act may increase rather than decrease the degree of regulation of transportation.

### Summary

This chapter examined the notion of regulatory reform, its imperatives, and recent U.S. and Canadian views on the topic. It was argued that while the imperative for reform may be similar for the two countries, the views on the nature and extent of reform were different.

It was argued that the U.S. has adopted the conventional argument in pursuing the de-regulation of the motor transport industry. No middle ground opinion was encountered, that is,



the U.S. is pursuing de-regulation of motor carriers and not reform. Canada seems to be somewhat more ambivalent in pursuing regulatory reform. In the case of the transportation industries the import of proposed legislation is reform and re-orientation of regulation as opposed to de-regulation. On the other hand, proposed Competition Policy legislation may introduce de-regulation into the system.

### CHAPTER III

#### A Profile of the For-Hire Motor Transport Industry

##### Introduction

In this chapter the profile of the motor transport industry is presented. Using Canadian data it will be shown that the industry is both large and diverse. The most important segment of the industry is the for-hire general freight carrier in terms of revenues generated and equipment operated. Some analysis of motor carrier operations are presented. However, the paucity of information does not allow for in-depth treatment.

The regulatory framework within which carriers operate is also presented. It will be agreed that in the absence of rather detailed knowledge of de facto and de jure regulation no firm conclusion as to the extent of economic regulation in Canada may be made. Differences in regulatory treatment by federal and provincial authorities are discussed.

Having identified the for-hire general freight carrier as the most important segment of the industry, the nature of competition from railroads and private carriage is discussed. It is argued that while these two modes are competitive with truckload general freight movement, they are not competitive to less-than-truckload movement. In addition, it will be argued that truckload general freight movement is much more competitive with railroads than usually assumed.

The arguments developed in this chapter tend to lend support to the conventional view of the overall composition of

the industry. That is, that general freight truckload movement is subject to competition whereas less-than-truckload is not. Chapter IV will argue that the benefits of de-regulation of this segment may be questioned.

### Industry Profile

The motor industry is both large and complex.<sup>1</sup> Until very recently, published data on the motor transport industry were sparse and if available were considered to be unreliable. In 1974 Statistics Canada undertook a census of fore-hire motor carrier firms<sup>2</sup> with the intention of building a base year of data from which to launch an accurate and comprehensive publication.<sup>3</sup>

In 1974, census forms were mailed to some 26,878 carriers and/or establishments. Of this total 13,186 reports were utilized in the publication, the other 13,692 being considered

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<sup>1</sup>The motor transport industry, in its broadest sense, supplies transportation services for the movement of goods or people in either private or for-hire vehicles. In the carriage of passengers the private motor car is the dominant form. Various estimates suggest that about 85% of all passenger miles stem from the private motor car. On the freight side it is estimated that there are over one million trucks and trailers registered in Canada and about 90% are in the private sector. This study is, of course, directed toward the "for-hire" freight sector.

<sup>2</sup>Any carrier which, for compensation, undertakes the transport of goods.

<sup>3</sup>Statistics Canada, Motor Carriers Freight 1974, 53-222 (Ottawa: Ministry of Industry, Trade and Commerce, 1976). This publication excluded household goods movers.

as out of the scope of the survey or being out of business.

These carriers earned \$2.97 billion and employed about 125,000 persons including working owners.

Though estimates vary, the growth of motor transport has been, in absolute and relative terms, remarkable. Comparisons of ton miles between modes tend to be poor indicators of the relative "importance" of various modes such as rail, water, pipeline. This is due to the fact that ton-mile estimates are biased by the type of commodity each mode is most likely to carry. "Rail, for example, tends to be better suited to carry long haul bulk shipments than are trucks. The latter tend to handle consumer and manufactured and semi-manufactured products".<sup>1</sup> Table III.1 indicates the growth in ton-miles for the various carriers.

Table III.1  
Canadian Transport Market<sup>2</sup>

<u>Mode</u>	<u>1960 Billion Ton-Miles</u>	<u>% of Total</u>	<u>1970 Billion Ton-Miles</u>	<u>% of Total</u>	<u>% Change</u>
Rail	65.4	39.6	111.0	35.3	+ 70
Road	15.6	9.5	35.8	11.5	+ 130
Water	56.9	34.5	78.8	25.3	+ 39
Pipeline	26.8	16.4	86.9	27.9	+ 212
Total	164.7	100.0	313.5	100.0	+ 89

<sup>1</sup>R. K. House and Associates, Manitoba For-Hire Trucking Industry Productivity Study - Report (Winnipeg: Manitoba Department of Industry and Commerce, February 1974), p. 3. This is not to suggest that rail and truck are not competitive for all commodities. This question will be dealt with in greater detail further on.

<sup>2</sup>Ibid., p.2. See also Transportation Development Agency, Highway Systems in Canada, (Preliminary Draft), (Montreal: Transportation Development Agency, October 1973), p. 7.

In 1970, total transport revenues in Canada, for all commodities carried in the motor transport industry came to \$1.50 billion as compared to \$1.45 billion for rail. In 1969, 40 per cent of the total expenditure in freight transportation was related to trucking as compared to 29 per cent for rail and 31 per cent between water and pipeline.<sup>1</sup>

As the above comments indicate motor transport is a leading mode of transport. Table III.1 shows the total ton-mile shipped by motor transport increased 130 per cent between 1960 and 1970. Case estimated that for the period 1970-1980 motor transport would grow at the rate of 6 per cent per year.<sup>2</sup> In addition, he felt that the growth in trucking would, in general, follow the growth of the Gross National Product. Therefore, it would seem safe to say that motor transport is a leading mode of transport in both absolute and relative terms and that its further growth prospects are significant.<sup>3</sup>

Having discussed the industry in aggregate terms it is worthwhile to disaggregate the published industry data. There are several ways of accomplishing this, some not being compatible or capable of being cross-classified; however, the

<sup>1</sup>R. K. House and Associates, op. cit., p. 2.

<sup>2</sup>Allen Case, Transportation 1980, The Outlooks and Issues For Canadian Transportation in the Next Decade. (Ottawa: Department of Finance, May 1970).

<sup>3</sup>It is beyond the scope of this study to chronicle in detail the growth in motor transport. For more detailed discussion see E. T. Steeves Trucking in Canada 1957-1967. Paper presented to the Annual Meeting of the Canadian Trucking Associations, (Ottawa: Statistics Canada, 1969).

most common method is to examine characteristics by revenue class.

In 1974 Statistics Canada added 4,991 firms to its 1972 universe, these being known as Class "0" carriers. These carriers were added to the universe in 1974 if they were not provincially or territorially licensed in 1972. These Class "0" carriers did not represent a revenue class per se but rather spectrum of carriers to be added to the analysis. The 1972 and 1974 groupings are as follows:

TABLE III.2

Class	Gross Operating Revenues	Establishments 1972		Establishments 1974	
		Grouping	% Total	Grouping	% Total
Class 1	\$2,000,000	130	1.0	192	1.5
Class 2	\$500,000-\$1,999,999	380	2.9	607	4.6
Class 3	\$100,000-\$499,999	1,382	10.5	2,394	18.2
Class 4	\$25,000 -\$99,999	2,398	18.2	5,506	41.8
Class 5	\$25,000	3,905	29.6	4,487	34.0
Class "0" add in 1974		4,991	37.9	-	-
		13,186	100.0	13,186	100.0

Per cent may not add to 100 due to rounding.

Source: Statistics Canada, Motor Carriers Freight, op. cit., p. 12-13.

Table III.2 indicates the substantial size disparity in number of firms by revenue class, affirming the notion that motor transport is composed of small firms. However, in terms of operating revenue and equipment utilized (all trucks) the numerical disparity is overshadowed by a productive disparity.

Table III.3

Total Operating Revenues and Total Equipment  
Operated by Revenue Class, 1974

<u>Class</u>	<u>Total Operating Revenue (\$000,000)</u>	<u>% of Total</u>	<u>Total Equipment Operated</u>	<u>% of Total</u>
Class 1	1,545	52.1	72,889	49.0
Class 2	572	19.3	28,048	18.9
Class 3	509	17.2	26,154	17.6
Class 4	272	9.2	15,674	10.5
Class 5	<u>68</u>	<u>2.3</u>	<u>5,911</u>	<u>4.0</u>
	\$2,966	100.00	148,676	100.0

Source: Derived from Statistics Canada, Motor Carriers Freight, 1974, op. cit., p. 16.

As Table III.2 and Table III.3 indicate, Class 1 carriers account for about 1.5 per cent of the total number of carriers, but account for over 50 per cent of the operating revenues and almost 50 per cent of the equipment operated. At the other end of the spectrum Class 5 carriers account for about 34 per cent of the total number of carriers but only 2.3 per cent of total operating revenues and only 4.0 per cent of the equipment utilized. If one were to group Class 1 and Class 2 carriers this new category would account for about 6 per cent of total carriers (1974 grouping), but about 70 per cent of total operating revenues and total equipment operated.

Nationally, the industry is not highly concentrated. However, a regional or provincial breakdown would indicate some concentrated markets.

Each of the revenue classifications may be subdivided as follows:

(a) By common and contract carriers. A common carrier transports for compensation the goods of others. A contract carrier undertakes to transport the goods for one or a limited number of shippers.

(b) The common and contract carriers may be further subdivided by the type of commodity. This is generally considered to be an indication of the characteristics of the firm. The general commodity classifications are general freight, household goods, bulk liquid, dump (sand, gravel, snow), forest products (logs, lumber) and "other commodities" (such as cars).

(c) It is possible to subdivide the revenue classes by province of domicile. That is, the province in which the firm or enterprise is registered.

(d) In addition, it is possible to classify revenue classes by range of operation. This usually refers to local (hauls less than 15 miles), inter-city (hauls greater than 15 miles), and off-highway.

A classification by primary revenue source of the carrier by jurisdiction of operation is possible. These jurisdictions are intraprovincial, interprovincial, and international (or extraprovincial).

Ideally, one would like to incorporate size of shipments data with the revenue classifications. As will be discussed later, the size of shipment category is an important dimension of output.



Unfortunately, few of these possible classifications are available in published form.<sup>1</sup> For those available, the types of revenue data and operational characteristics vary by revenue class. Furthermore, there is a substantial degree of aggregation which may mask important operating cost differences. For example, the published data tend to aggregate common and contract carriers. Contract carriers may be specialized commodity carriers which would tend to have different operating characteristics.

The availability of these types of data is crucial to meaningful research on motor transport operating characteristics. It is regrettable that so little data are available for a transport mode as important as motor freight.

Rather than presenting tables of motor transport data it may be more expedient to outline the general view of motor transport operations and comment on the importance of selected characteristics. While many of the overviews of the industry are similar, relatively little effort has been devoted to examining the analytical significance of these characteristics. John Snow provides the following overview of regulated carriers:

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<sup>1</sup> Statistics Canada has recognized the nature of this problem and is proceeding to link computer tapes. That is, Statistics Canada personnel are attempting to combine the financial operating data (Motor Carriers Freight) with Shipment data (For-Hire Survey). While such a linked tape will provide a most interesting data base the number of carriers involved will represent a very small sample. However, the sample will include virtually all Class 1 and Class 2 carriers.



"The specialized commodity carriers are similar firms that specialize in truckload shipments . . . which do not require the use of terminals. These carriers often rely on owner-operators . . . to provide the actual transportation of freight. General freight carriers usually specialize in smaller shipments which require terminal facilities to consolidate shipments into loads large enough to utilize their trucks efficiently. These carriers also carry large shipments, but in many cases such freight is handled by a separate truckload division. General freight carriers account for about two-thirds of the total revenue of the ICC regulated trucking industry. The truckload shipment carriers compete to a significant extent with the railroads. The carriers of smaller shipments do not compete with railroads, since railroads do not carry small shipments to any significant extent . . . (while LTL rates are considered to be non-competitive due to the existence of rate bureaus) private carriage and railroads place a competitive discipline on truckload rates".<sup>1</sup>

Of the 13,186 carriers which reported in 1974, 3,545 were engaged in the transport of general freight. The remaining 9,591 carriers could be classified as specialized freight carriers: 857 in the transportation of bulk liquid, 4,441 in dump trucking, 1,539 in transportation of forest products; and 2,754 in "other commodities" (such as automobiles). In terms of operating revenue general freight

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<sup>1</sup> John W. Snow, "The Problem of Motor Carrier Regulation and the Ford Administration's Proposal for Reform", Paul W. MacAvoy and John W. Snow, eds., Regulation of Entry and Pricing in Truck Transportation, (Washington, D.C.: American Enterprise Institute, 1977), pp. 3-43.

See also Paul O. Roberts, "Some Aspects of Regulatory Reform of the U.S. Trucking Industry" in Proceedings of a Workshop on Motor Carrier Economic Regulation (Washington, D.C.: National Academy of Sciences, 1978), pp. 470-502.

Jerold M. Muskin, "De-regulation-Reassessing the Assumptions" in Proceedings, loc. cit., pp. 350-363.

John C. Spychalski, "Criticisms of Regulated Freight Transport: Do Economists' Perceptions Conform with Institutional Realities?" Transportation Journal (Spring 1975), pp. 5-17.

carriers accounted for 57 per cent of the total and carriers of "other commodities" accounted for 23 per cent of the total. The remaining 20 per cent was divided between bulk liquid carriers (5 per cent), dump truck operations (9 per cent), and forest product carriers (6 per cent).<sup>1</sup>

Though precise data are lacking, it seems clear that general freight carriers tend to be much larger firms than the special commodity carriers. For example, on average, the general freight establishment uses about 25 pieces of equipment (trucks, tractors, semi-trailers, full-trailers, other) whereas bulk liquid carriers use about 8 pieces of equipment, and dump truck operators use about 3 pieces of equipment. Most of the Class 1 carriers are assumed to be general freight carriers. Of the 130 Class 1 carriers, 90 establishments reported the major type of operation to be general freight carriage (about 70 per cent). Within the 130 firms there are 118 which are classified as intercity (hauls of greater than 15 miles) and of these 118 a total of 86 are general freight carriers (about 72 per cent).

In contrast, of the 380 Class 2 carriers only 167 (about 44 per cent) are classified as general freight carriers. Of the 380 firms 342 were classified as intercity carriers and of these 126 were general freight carriers (about 52 per cent).

Therefore, it may be stated that of all commodities general freight is the most important in terms of contribution to total industry operating revenues; that based on all equipment utilized

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<sup>1</sup>Statistics Canada, Motor Carriers Freight 1974, op.cit., p.7.

general freight carriers would seem to be significantly larger than the specialized commodity carriers; that the bulk of general freight revenues are generated within the Class I carriers; and that the bulk of these revenues were generated on intercity transport.<sup>1</sup> Unfortunately, it is impossible to incorporate data on the weight of shipments. However, the figure that 70 per cent of all shipments are "small shipments"<sup>2</sup> will be accepted.

Snow mentions the fact that general freight carriers consolidate freight and make extensive use of terminals. While many economists recognize the importance of terminals to general freight operations, they have not discussed the analytical significance of the terminals.

#### Importance of Terminal Operations

Charles A. Taff has called the terminal the "center of truck operations".<sup>3</sup> Terminals assume greater importance for carriers which specialize in less-than-truckload (LTL) traffic than for carriers which specialize in truckload (TL) traffic.<sup>4</sup> Taff has pointed out that ". . . basically, the terminal serves as a consolidation point for LTL traffic, although the larger carrier may designate certain terminals as consolidation (break-bulk) terminals.

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<sup>1</sup>Statistics Canada does not provide a breakdown of share of operating revenues accounted for by types of carriers. However, this breakdown is provided for the small carriers.

<sup>2</sup>A small shipment is defined as under 10,000 pounds (ICC definition).

<sup>3</sup>See Charles A. Taff, Commercial Motor Transportation, 3rd ed., (Homewood, Illinois: Richard D. Irwin Inc., 1961), p. 327.

<sup>4</sup>It is generally accepted that TL specialized commodity carriers use terminals but to a much lesser degree than general freight carriers.

This is done when there are numerous smaller intermediate points where LTL shipments are picked up and carried to the designated consolidation terminals".<sup>1</sup>

Terminals are an integral part of the motor carrier operating system. The number of terminals any particular carrier operates is a function of the type of traffic, distances, and weights involved for specific geographic markets. The number of terminals may be used as a measure, albeit imperfect, of the geographic coverage of a firms operations.

Chow noted that simple correlation coefficients for revenues and number of terminals and route miles were very high; .97 and .90 respectively. Partial correlation coefficients which controlled for the length of haul and average shipment weight were somewhat lower; .96 and .82 respectively.<sup>2</sup> It appears that general freight revenues are positively correlated with the number of terminals as well as route miles.

Wyckoff has pointed out that "the terminal is more than simply a loading, consolidation, and unloading facility. It is a local extension of the company in that area".<sup>3</sup> The branch management aspects of terminal operations include pick-up and delivery operations, sales functions, and until quite recently, all billing and rate setting operations.

<sup>1</sup>Ibid., p. 328.

<sup>2</sup>Cf. Garland Chow, "The Economics of Motor Freight", (Ph.D. dissertation: Indiana University, Graduate School of Business, 1977), pp. 221-222.

<sup>3</sup>D. Daryl Wyckoff, Organizational Formality and Performance in the Motor Carrier Industry, (Lexington, Massachusetts: D.C. Heath and Co., Lexington Books, 1974), p. 15.

In order to examine the terminal operations it is instructive to follow the movement of a typical intercity LTL shipment.<sup>1</sup>

First, the freight is collected by a city pickup and delivery driver as the result of a shipper's request. A bill of lading is prepared by the shipper which indicates the name, location, consignee's name and location, billing terms, specified routing, number of items, and commodity being shipped. Pickups can be made at the terminals of connecting carriers or, less frequently, may be delivered by the shipper to the outbound terminal.

Upon delivery to the outbound terminal the freight is unloaded and checked. Once the pickup and delivery driver has checked the condition, description, marking, and number of pieces, it is again checked at the terminal and weighed. At this stage the bill of lading is transferred to the rating operation. The rate is determined by tariffs on weight, commodity type, designated service and origin and destination. This bill is known as the waybill and is collected for each outbound trailer.

Generally, the freight has moved to a staging area and is loaded into the trailer for intercity movement. Depending on the volume and origin and destination it may be necessary to consolidate shipments through terminals known as "break-bulk" terminals.<sup>2</sup> Shipments may be rehandled at the dock platforms while in other cases it remains in the trailer and additional freight is added.

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<sup>1</sup>Ibid., p. 16-18.

<sup>2</sup>To break-bulk may be defined as the separation of a composite load into individual shipments and route to different destinations. It also refers to rehandling of freight en route.

Upon arrival at the destination terminal the shipments are unloaded, checked, and then loaded into pickup and delivery trucks or a connecting carriers' truck for final delivery.

Any terminal may be considered as an inbound and outbound terminal and may also perform the break-bulk transfer. There seems to be an increasing number of "break-bulk terminals" only.<sup>1</sup> These terminals operate in distinction to "revenue terminals" that primarily originate and/or terminate shipments.

Table III.4

Category of Operating Expense as Percent of  
Total Operating Expenses, Class 1 and Class 2 Carriers, 1974

	<u>Class 1</u>		<u>Class 2</u>	
	<u>All</u>	<u>Intercity</u>	<u>All</u>	<u>Intercity</u>
Transportation Expense	59.5	59.1	66.6	67.2
Garage and Maintenance	10.4	10.2	11.4	11.7
Terminal	12.9	13.9	4.9	3.6
Traffic and Sales	1.7	1.8	1.2	1.4
Claims and Insurance	3.1	3.2	3.1	3.4
Administration	<u>12.3</u>	<u>11.8</u>	<u>12.5</u>	<u>12.6</u>
	100.0	100.0	100.0	100.0

Figures may not add to 100.0 due to rounding

Source: Statistics Canada, Motor Carriers Freight, op. cit., p.

As may be seen from Table III.4 above the importance of terminal expenses varies significantly between Class 1 and Class 2 carriers. Given that total revenues are highly correlated with the number of terminals, the above would seem to indicate that on average Class 1 general freight carriers (which tend to offer intercity LTL carriage) operate a greater

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<sup>1</sup>Ibid., p. 18.

number of terminals. When intercity carriers only are examined the terminal expenses percentage share increases slightly for Class 1 carriers and decreases slightly for Class 2 carriers. Furthermore, it will be noted that "transportation expenses" increase significantly for Class 2 carriers reinforcing the presumed Class 2 traffic pattern of relatively greater TL intercity movement. In the absence of shipment data and commodity classification the above results cannot be considered definitive. Unless otherwise specified the scope of operations referred to in this study will refer to intercity, general freight.

#### Regulatory Framework

As a consequence of the provisions of the British North America Act each province in Canada has the right to regulate interprovincial trucking in the manner which the provinces consider appropriate. As has been discussed in the previous section, prior to 1954, extra-provincial regulation took place in a legal vacuum. With the passage of the Motor Vehicle Transportation Act of 1954 the federal government delegated the responsibility for extra-provincial regulation to the provinces and there it has remained. Each of the provinces has produced its own brand of regulatory policy and this system has been the subject of a good deal of criticism and debate.

The National Transportation Act of 1967 attempted to alleviate the problem of overlapping jurisdictions and excessive regulation but making provision for the federal government to resume control of extra-provincial regulation. The so-called Part III provisions were "pro-



claimed" in 1970 but have not, to this date, been implemented.<sup>1</sup>

All provinces have the authority to regulate both inter and intraprovincial for-hire motor carriers (i.e., common and contract carriers). However, the degree and type of control exercised varies considerably from province to province.

The differences in regulatory control varies on a number of dimensions. First, one may examine the incidence of so-called economic regulation which is usually interpreted as entry and rate regulation.<sup>2</sup> In addition to rate regulation there may be provisions for rate filing which requires carriers publish rates. Second, it is argued that a clear distinction must be made between de jure and de facto regulation. This distinction may also be discussed at the level of administrative vigor. For example, even though Manitoba is considered to be a province which regulates entry some will argue that closer inspection will reveal that entry control is exceedingly lax. Therefore, there may be a qualitative and quantitative distinction between "regulating" provinces such as Manitoba and Saskatchewan.

Based on information received from the Canadian Trucking Association, Maister prepared the following table:

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<sup>1</sup>The implementation has been delayed by the reluctance of the federal government to act in the face of concerted opposition by trucking firms and the provinces. However, the government has attempted to "rationalize" the regulatory structures through the CCMTA (Canadian Council of Motor Transport Authorities). In essence, the federal government has agreed not to implement Part III if the provinces move to coordinate and rationalize regulatory practices.

<sup>2</sup>Unlike other utilities the rate of return on capital is not the object of regulation in Canada.

Table III.5

## Canadian Trucking Regulation, 1976

Province	Intraprovincial		Interprovincial	
	Entry Regulation	Rate Regulation	Entry Regulation	Rate Regulation
British Columbia	Yes	Yes <sup>1</sup>	Yes	No <sup>2</sup>
Alberta	No	No	Yes	No
Saskatchewan	Yes	Yes <sup>2</sup>	Yes	No
Manitoba	Yes	Yes <sup>2</sup>	Yes	No <sup>3</sup>
Ontario	Yes	No <sup>3</sup>	Yes	No <sup>3</sup>
Quebec	Yes	Yes <sup>1</sup>	Yes	Yes <sup>1</sup>
New Brunswick	Yes	No <sup>3</sup>	Yes	No <sup>3</sup>
Nova Scotia	Yes	No <sup>3</sup>	Yes	No <sup>3</sup>
Prince Edward Island	Yes	No <sup>3</sup>	Yes	No <sup>3</sup>
Newfoundland	Yes	Yes <sup>4</sup>	Yes	Yes <sup>4</sup>

1. Filing of rates with approval required for all increases.
2. On intraprovincial traffic, Saskatchewan and Manitoba prescribe rates.
3. Filing of rates required.
4. Though Newfoundland's regulatory agency has the power to regulate routes on extraprovincial traffic, there is some doubt whether this power has ever been effectively applied. Even on intraprovincial operations, the power to disallow rate increases has rarely been exercised.

Source: David H. Maister, "Regulation and the Level of Trucking Rates in Canada" in Proceedings of a Workshop on Motor Carrier Regulation (Washington, D.C.: National Academy of Science, 1977), p. 202.

Maister estimated that approximately 44 per cent of tons transported in Canada in for-hire operations were subject to some form of rate regulation.

As the above table indicates, there may be significant differences in regulation between so-called regulating provinces. Bonsor has noted that "... the actual use of entry and rate regulation, where applicable, is not homogeneous across jurisdictions. Quebec,

Manitoba and Saskatchewan tend to control rates in a relatively vigorous manner in comparison to British Columbia. Entry into the industry tends to be more tightly controlled in Quebec and Ontario than in other provinces. It should be borne in mind that the impact of regulation will vary across sectors of the trucking industry in a given province".<sup>1</sup>

Bonsor expands on this point by noting it was difficult to determine precisely the degree of entry control imposed by the Ontario Highway Transport Board. In the course of his research he found that some classes of licences, especially general merchandise licences, were more difficult to obtain than others. Therefore, apart from any problems in comparing regulatory programs between provinces, the first step of determining the vigor of regulation within any one province turns out to be a difficult exercise.

There are dimensions of regulation other than those encompassed under the term "economic regulation". These are generally classified as administrative or health and safety regulations. However, the impact of these regulations may be of greater significance to the operating characteristics of the firm than so-called economic regulation. For example, it may be argued that weight restrictions, which tend to vary by province, assume importance on the cost side.<sup>2</sup> Unfortunately, no research has been carried out

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<sup>1</sup>Norman C. Bonsor, Regulation of the Highway Trucking Industry", Ontario Economic Council, Government Regulation Issues and Alternatives 1978 (Toronto: Ontario Economic Council, 1978), p. 119.

<sup>2</sup>Cf. R. K. House and Associates, Manitoba For-Hire Trucking Industry Productivity Study (Winnipeg: Manitoba Department of Industry and Commerce, 1974), pp. 155-160

on the relationship between these so-called non-economic dimensions of regulation and motor carrier industry performance between provinces.

The total dimension of regulation (economic or not) may be further subdivided into federal and provincial spheres, bearing in mind that there may be some variation in both federal and provincial regulation.

Table III.6 lists the bulk of regulations which apply to motor carriers. This table also breaks down the regulations as they relate to three classes of carriers; common, contract, and private carriers. For the purpose of this discussion only common and contract are considered. As may be noted there is very little regulation the common carrier is subject to that the contract carrier is not.

While one may suspect that federal programs are applied evenly through the provinces this need not be the case. For example, in the case of subsidies, carriers in the Maritimes receive a direct subsidy of 17½% of the rate for moving freight from any point in the Maritimes, and 30% of the Maritimes part of the movement originating with the Maritimes destined to other points in Canada.<sup>1</sup> In addition, the federal labour code applies only to extraprovincial carriers. Usually the provincial minimum wage and hours of work restrictions are less stringent than the Federal Labour Code.

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<sup>1</sup>Archer Consulting Ltd., The Influence of Regulation upon Common and Private Carrier Costs (Pointe Claire, Quebec: Archer Consulting Ltd., 1973), p. 10.

Therefore, while it is acknowledged that there may be differences in the efficacy of provincial regulation the fact remains that there may be a differential impact of federal legislation. This by no means exhausts the levels of regulation since the effects of municipal regulation have been excluded. This would include such factors as noise and exhaust pollution standards, specified routing for access and egress etc. These conditions are by no means standardized as well.

Table III.6

Distribution of Trucking Regulation  
by Federal and Provincial Authority

<u>Type of Regulation</u>	<u>Regulatory Authority</u>	<u>Class of Carrier</u>		
		<u>Common</u>	<u>Contract</u>	<u>Private</u>
<u>A. Entry or Expansion</u>				
Proving need	P	X	X	
Obtaining Permit	P	X	X	
Interline Agreements	P	X		
Acquisition	F/P	X	X	
Subsidies	F	X	X	
Tariff Filing	P	X	X	
Tariff Revision	P	X	X	
Insurance	P	X	X	X
Labour Regulations	P	X	X	X
Vehicle Licences	P	X	X	
<u>B. Operations</u>				
Permits - Routes	F/P	X	X	
LTL/TL	P	X		
Customers	P		X	
Dangerous Goods	F/P	X	X	
Livestock	F/P		X	X
Agriculture	F/P	X	X	X

<u>Type of Regulation</u>	<u>Regulatory Authority</u>	<u>Class of Carrier</u>		
		<u>Common</u>	<u>Contract</u>	<u>Private</u>
Highway Weights	F/P	X	X	X
Bridge Weights	F/P	X	X	X
Vehicle Dimensions	P	X	X	X
Federal Labour Code	F	X	X	
Oversize Loads	F/P	X	X	X
Provincial Labour Code	P	X	X	X
Reciprocity	P	X	X	
Customs	F	X	X	X
Agriculture Regulation	F	X	X	X
Health Regulation	F/P	X	X	X
Sales and Fuel Tax	F/P	X	X	X

#### Railroad and Private Motor Carrier Competition

One aspect of structure that has been studied extensively is the degree of product substitution arising from alternative modes of transport. Two modes of traffic which compete with motor transport are railroads and private motor carriage.

Apart from the economies of scale debate, the degree of intermodal competition between railroads and motor carriers has been the subject of considerable debate. The intermodal competition argument has two dimensions; the degree of intermodal competition that presently exists; and the appropriate division of traffic between railroads and motor carriers.

Studies which have attempted to measure cross-elasticity between railroads and motor carriers have not produced consistent results.<sup>1</sup> For example, Sloss, using Canadian data, and Morton, using

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<sup>1</sup>James Sloss, "The Demand for Intercity Freight Transport: A Macroeconomic Analysis" Journal of Business, 44 (January 1971), p. 64. Alexander Morton, "A Statistical Sketch of Intercity Freight Demand", Highway Research Record, 269 (Washington, D.C.: 1969), pp. 47-65.

American data, have estimated the cross-elasticity of intermodal substitution to be approximately minus one.<sup>2</sup>

Chow argues that the major drawback of these studies is the use of highly aggregated data. He argues that large portions of general freight traffic are secure from railroad competition.<sup>2</sup> He argues that "... over 30 per cent of the tonnage of general freight carriers were LTL shipments producing 60 per cent of revenue and 95 per cent of the shipments. At present, this type of traffic is immune to direct rail competition. Railroads have virtually eliminated their less-than-carload services (LCL) which required freight house handling and concentrated on carload (CL) traffic".<sup>3</sup> He also noted that small shipment by rail LCL dropped from 22,164 thousand tons in 1950 to 1,100 thousand tons in 1971. This is less than 2 per cent of motor carriage tonnage of such shipments.

Railroads may compete by offering CL rates or piggyback rates that compensate for service disadvantages of shipping in larger quantities. It is difficult to determine the competitive nature of CL or piggyback to TL and LTL rates, but in general the rates

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<sup>1</sup>Eugene Perle, The Demand for Transportation Regional and Commodity Studies in the U.S. (Chicago: Chicago Press, 1964), pp.52-53. A negative cross-elasticity suggests that an increase in truck rates would cause a reduction in rail volume. It would seem to be illogical to expect trucks to force railroads out of business by increasing rates. However, since WW II the motor carrier industry has increased its market share despite rate increases. Morton found the same results and suggested the negative relationship could be corrected by insertion of a time-trend to obtain a meaningful cross-elasticity. This author would suggest the trend variable to be included should be the decline in railroad service and improvement in truck service.

<sup>2</sup>Garland Chow, "The Economies of Motor Freight" (Ph.D. dissertation: Indiana University, 1977), p. 148. See also James Kneafsey, Transportation Economic Analysis (Lexington: D.C. Heath and Co., 1975), pp. 251-252.

<sup>3</sup>Ibid., p. 148.

would seem to be much less competitive for LTL service. The degree to which rail services are competitive with TL services is open to question. However, as Snow pointed out it is generally agreed that railroads do compete with TL services.<sup>1</sup>

In terms of the second dimension of intermodal competition, the appropriate division of traffic between railroads and motor carriers, most studies examining this issue suggest that railroads have an inherent cost advantage over all but the shortest inter-city distances.

Meyer et al. indicated that truck costs exceed rail costs after a distance of 100 miles.<sup>2</sup> Harbeson found a rail cost superiority over truck for all distances and piggyback superiority at approximately 100 miles.<sup>3</sup> Woods and Domenich calculated the breakeven distance between railroad CL and motor carrier TL costs to be 200 miles.<sup>4</sup>

Available data suggests that motor carriers compete with railroads for traffic moving much further than the 100-200 miles.

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<sup>1</sup> John W. Snow, op. cit., p. 8.

<sup>2</sup> John R. Meyer, et al., The Economies of Competition in the Transportation Industries (Cambridge, Massachusetts: Harvard University Press, 1959), p. 190-191.

<sup>3</sup> Robert W. Harbeson, "Toward Better Resource Allocation in Transport" The Journal of Law and Economics, 12 (October 1969), pp. 331-333.

<sup>4</sup> Douglas W. Woods and Thomas A. Domencich, "Competition Between Rail and Truck in Intercity Freight Transportation", Proceedings - Twelfth Annual Meeting of the Transportation Research Foundation, (Oxford, Indiana: Richard B. Cross Co., 1971), pp. 151-153.



The distances which traffic moves is very sensitive to the type of commodity. (It should be noted that the studies listed above based estimates on a representative shipment characteristic). Unfortunately, Canadian data do not merge commodity type, weight of shipment, and distance. However, based on the available data, motor carriers of fabricated materials (which will be assumed to be small shipments) earn about 66 per cent of their transportation revenues for hauls of up to 400 miles. However, about 10 per cent of the revenue is earned in hauls of greater than 1,000 miles. If one examines this breakdown in terms of "end products - inedible" the figures change significantly. For example, about 54 per cent of revenues of this commodity class are earned in hauls of up to 400 miles but over 20 per cent of revenues are earned in hauls of greater than 1,000 miles.<sup>1</sup> (It is assumed that the end product category is composed of small shipments).

Rakowski, after removing 5 commodity groups that are users of water transportation, suggested that trucks have a greater share of total freight tonnage than do rails up to 400 miles in distance and approximately 55,000 pounds in total shipment weight.<sup>2</sup> The clear implication of these data are that long-haul traffic, which would move by rail if the cost comparisons are correct, are in fact moving by general freight LTL carriers.

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<sup>1</sup>Statistics Canada, For-Hire Trucking Survey 1974 (Ottawa: Industry, Trade and Commerce, November 1976), p. 38.

<sup>2</sup>James P. Rakowski, "Competition Between Railroads and Trucks" Traffic Quarterly, 30 (April 1976), pp. 287-289.

The possibility that the cost comparisons are inaccurate may be one explanation for the differences in the actual traffic distribution to the expected cost-based distribution. For example, cost advantages must be adjusted for quality of service. The service adjustment would seem to be especially sensitive to the value per ton. Meyer<sup>1</sup> used \$2,500 per ton, Harbeson<sup>2</sup> used \$414 and Woods and Domencich<sup>3</sup> used \$740 per ton for high valued goods. The distribution of freight above these average values may account for truck participation.

Part of the discrepancy may be accounted for by underestimation of rail service disadvantages. For example, Boyer argued that some studies of railroad-motor carrier cost comparisons excluded the greater damage costs incurred by the rail shipper. He argued that once this factor was adjusted for no railroad rate reduction would divert significant amounts of motor carrier traffic.<sup>4</sup> Others have argued that railroad regulation has prevented the railroads from exploiting their inherent cost advantage. However, recent studies have shown that the railroad motor carrier cost differential may be narrower than supposed. Ton mile costs for strictly TL carriers (such as U.S. owner operators etc.) were found

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<sup>1</sup> John R. Meyer, et al., op. cit., p. 192.

<sup>2</sup> Robert W. Harbeson, op. cit., p. 330.

<sup>3</sup> Douglas Wood and Thomas A. Domencich, op. cit., p. 266.

<sup>4</sup> Kenneth D. Boyer, "The Price Sensitivity of Shipper's Mode of Transport Selection and the Intermodal Allocation of Traffic" (Ph.D. dissertation, University of Michigan, 1975), pp. 20-43.

to be comparable to current CL rates for some traffic considered to be rail secure.<sup>1</sup>

In conclusion, it may be argued that railways are effective competitors only on long haul, TL type of traffic. However, it seems that on this length of haul and shipment size that the cost advantage of railways does not deter significant motor carrier competition.

Perhaps the most interesting, but least known, intermodal competition arises from private carriers. Despite certain regulatory restrictions on private motor carriage, primarily the inability to solicit non-company back-haul traffic, the rise of private motor carriage is taken as prima facie evidence of the poor performance of the for-hire industry.<sup>2</sup>

Canadian data on private motor carriage are virtually nonexistent. Rakowski<sup>3</sup> in his analysis of the 1967 U.S. census concluded that there was an extremely heavy usage of private trucking for short-haul operations with a distinct drop as length of haul increases. Furthermore, he concluded that the shipment sizes of private motor carriage are in the 20,000 to 60,000 pound range. When private carriage is expressed as a per cent of total highway traffic by shipment size and length of haul, it rarely falls under

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<sup>1</sup>Garland Chow, *op.cit.*, p. 157. Also see D. Daryl Wyckcoff and David A. Maister, The Owner-Operator: The Independent Trucker, (Lexington: Massachusetts: D.C. Heath and Co., 1975), pp. 41-52.

<sup>2</sup>Cf. John W. Snow, "The Problem of Motor Carrier Regulation and the Ford Administration's Proposal for Reform", *op.cit.*, pp.10-14.

<sup>3</sup>James P. Rakowski, "Characteristics of Private Trucking in the United States" ICC Practitioners Journal, 41 (July-August, 1974), p. 573-574.

10 per cent. For example, about 55 per cent of all traffic in the 10,000 to 29,999 pound category, moving under 200 miles, is carried by private carriage. As shipment size and length of haul increases the share drops markedly.

In terms of types of commodities Chow argues that the majority of commodities moved by private carriage appear to be comparable to traffic moved by general freight carriers in TL shipment.<sup>1</sup>

While it is beyond the scope of this study to develop a detailed analysis of the rise of private motor carriage there appear to be a number of factors that account for the rise of private motor carriage.

First, it may be argued that for short hauls private motor carriage has a cost advantage over the for-hire carriers. Stuessy attributes this to the lower terminal costs.

"Terminal costs are especially significant for small weight and short distance movements. When distances are short, line haul costs per trip or per hundred weight mile are relatively small and terminal costs are a large share of total movement costs. Likewise, because much of the terminal costs are independent of weight and because the line haul portion of costs per trip are a linearly declining function of weight, terminal costs per trip for a small shipment are a greater percentage at small weight brackets than for large shipments. The lack of terminal operational and capital costs make (private motor carriage) costs lower than for-hire motor carrier costs at small outputs. As output (weight times distance, or ton-miles) increases, the line haul costs become more important in the total cost picture. Private carriers, incurring higher line haul costs eventually lose the advantage created by the absence of terminal expenses . . ." <sup>2</sup>

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<sup>1</sup>Garland Chow, "The Economics of Motor Freight", op.cit., p.159.

<sup>2</sup>Dwight Stuessy, "Cost Structure of Private and For-Hire Motor Carriage", Transportation Journal, 15 (Spring 1976), p. 41. See also Dwight Stuessy, "The Economic Determinants of Private Trucking" (Ph.D. dissertation, George Washington University, 1973).

Line haul costs are higher for private carriage because of the utilization of smaller vehicles and lower load factors. The higher line haul costs are a function of regulation which restricts the goods a private carrier may transport to his own goods and the prohibition against soliciting for other than his own goods for back haul traffic (or exempt commodities).

Private motor carriage growth is generally assumed to be a function of the existence of non-competitive and discriminatory rates by for-hire motor carriers. Stuessy tested this hypothesis and found that the incidence of private motor carriage is directly related to discrimination based on shipment weight, length of haul, and value of commodity. That is, private trucking will emerge when private carrier costs are below discriminating rates.<sup>1</sup>

The price discrimination argument must be tempered by analysis of cost and service features. As Sutton and Weitz point out the "early" rationale for private motor carriage was service failure. However, as the for-hire industry matured the rationale for private carriage shifted to cost considerations.<sup>2</sup> Given a mature for-hire industry the implication is that shippers demand a particular type of service which is not available from for-hire carriers at reasonable rates.

Table III.6 indicates the range of regulation that private, common, and contract carriers are subject to. As may be noted,

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<sup>1</sup>Dwight Stuessy, "The Economic Determinants of Private Trucking", op. cit., pp. 90-127.

<sup>2</sup>Robert M. Sutton and Donald W. Weitz, Case Studies of Private Motor Carriage (Washington, D.C.: U.S. Department of Transportation, 1973), pp.3-8.

private carriers are not affected by a great deal of regulation the cost importance of which is not easily determined. Therefore, apart from specific operating cost advantages private motor carriage may gain significant advantages from being able to avoid specific regulations (economic and non-economic regulation).

In conclusion, it may be argued that private motor carriage is a significant competitor for TL traffic moving over all distances and a relatively insignificant competitor for intercity LTL traffic. Were private motor carriers freed from backhaul restrictions they would probably solicit more long-haul TL traffic. Any shift towards the LTL traffic would probably alter the cost structure of private carriage so that differences between private motor carrier cost structure and for-hire cost structure would decrease.<sup>1</sup> Finally, more research needs to be done on the affect of regulations on growth in private trucking. This must include some analysis of cost savings due to avoiding regulation.

### Summary

This chapter has presented a profile of the large and diverse for-hire motor freight transport industry. Canadian data indicated a substantial size disparity between firms though the concentration does not appear to be very high.

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<sup>1</sup> See Dwight Stuessy, "The Economic Determinants of Private Trucking" op.cit., pp.200-217. Stuessy argues that deregulation would not significantly alter the competitive position of private motor transport.

It was concluded that for all types of carriers the intercity general freight carrier dominated the industry. It was found that this type of carrier tended to be among the largest carriers measured by revenue. Particular attention was paid to the terminal operations of these carriers. Many economists recognize the importance of terminal operations to the intercity general freight carrier but have not attempted to relate terminal operations to other characteristics of the firm. U.S. research indicated that the number of terminals were highly correlated to revenues and may be considered as a measure of geographic coverage. The implication of these results is that as the intercity general freight carrier increases in size, additional terminal facilities are required.

An overview of the regulatory framework within which the for-hire carrier operates indicate that there were significant differences in de facto and de jure regulation. By virtue of the overlapping regulations of the federal and provincial governments, and the variance in efficacy of provincial regulation, it was found to be difficult to arrive at a conclusion as to the full extent of motor carrier regulation in Canada.

Having determined that the general freight segment was the most dominant type of carrier, the intermodal competitive environment in which the firm operates was examined. Particular emphasis was paid to railroads and private motor carriage. It was argued that studies which have attempted to measure the cross-elasticity of demand between road and rail have not produced consistent results. The use of highly aggregated data and insufficient attention to service quality differences may be considered to

produce these results. Studies which have attempted to measure the cost advantages of rail over motor carrier do not conform to the existing reality. It was concluded that motor transport was a major competitor for certain types of traffic considered to be rail secure. The studies were considered to be lacking in their treatment of railway versus motor carrier service advantages. It was concluded that railways are effective competitors on long haul, truckload type of traffic.

Private trucking was considered to be the major competitor to the for-hire sector. The size and importance is now known<sup>t</sup> precisely, however, it is considered to be a very important mode of transport. It was concluded that the type of commodities carried by private carriage was comparable to general freight truckload movement. Private carriage was found to have specific cost advantages over for-hire transport over rather short distances. This was found to be related to the reduced need for terminal facilities. Comparison of regulation applicable to private carriage with that of for-hire indicated that private carriage could obtain cost advantages by the avoidance of certain types of regulation. The significance of these cost advantages could not be determined.

In conclusion, this chapter supports the conventional view as to the overall structure of the industry. It was noted that only certain segments of the for-hire sector are subject to external competition. The less-than-truckload general freight carrier did not appear to face external competition. The upshot of this view is that the truckload general freight segment of the industry is already competitive and that de-regulation would have its most



beneficial impact on the less-than-truckload segment of the industry. Chapter IV discusses the heterogeneous nature of the less-than-truckload segment of the industry and argues that the competitive benefits of de-regulation may be questioned.

## CHAPTER IV

### The Structure of Motor Freight Transport

#### Introduction

This chapter will develop arguments which question the conventional views of the structure of motor transport. Specifically, it will be argued that output homogeneity on the demand side may be used to define segments of sub-industries which may exhibit different structural characteristics. Each of these sub-industries will exhibit different competitive behavior in the absence of regulation.

It is argued that there are three important dimensions of service; size of shipment, length of haul, and extent of geographic coverage. These are continuous variables which define a continuum of motor carrier operations.

These motor carrier operations defined by these characteristics will be analyzed in relation to their threshold costs, factor mobility, and cost variability and indivisibility. It is convenient to segment the carriers by combinations of TL and LTL (to represent the size of shipment dimension), by long haul and short haul, and by extensive and limited geographic coverage. Particular attention will be paid to the importance of terminal operations and the development of the systems approach in motor carrier operations.

It will be argued that once this structure has been defined in this manner the expected behavior which follows from the structure does not conform to the conventional view. That is, there may be a propensity towards destructive competition and/or economies of scale. These will be discussed in greater detail in Chapter V and Chapter VI.

### Economic Dimensions of Service

Given that many of the conclusions regarding the nature of competition in motor freight transport are a function of the treatment of the unit of output it is necessary to examine the homogeneity assumption.

If in fact there are significant differences in the output between carriers one may conceive of the industry as being composed of separate industries or sub-industries each of which may exhibit different structural characteristics. Therefore, it may be argued that each of these sub-industries may exhibit different competitive behavior.

Such a view is not new. However, the amount of empirical evidence to support such a contention is conspicuously sparse. As Smith has pointed out in his study of concentration . . . "since small, medium, and large firms in the trucking industry produce a heterogeneous output, the problem of ascertaining whether smaller or medium-sized firms are more efficient as the larger sized firms is exceedingly complex".<sup>1</sup>

The methodological problems of determining the uniqueness of the output are substantial. One of the more important problems is the recognition that the motor freight firm may be a multi-product firm. Apart from the problem of allocating costs to output, which

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<sup>1</sup> Jay A. Smith, "Concentration in the Common and Contract Motor Carrier Industry - A Regulatory Dilemma" Transportation Journal (Summer 1973), p. 31. Also see R. W. Burdick "A Study of Diversification in the Motor Carrier Industry", Transportation Journal 9 (Summer 1970), pp. 16-32.

tends to be arbitrary, is the problem of using a single variable to describe the diversity of output. The standard treatment is to assume that though carriers may have a different product mix, those carriers producing a similar product produce a similar product mix.

One method of determining the uniqueness of the output and hence providing the justification for labelling sub-industries is to measure the cross-elasticity of demand for the output in question with other outputs. While such studies have been attempted on an intermodal basis<sup>1</sup> no studies exist on the cross-elasticities on an intramodal basis.

The bulk of research in this area has been to analyze shippers' preferences for a particular service.<sup>2</sup> While a great deal of this work is useful it tends to suffer from inaccurate or overlapping characteristics. Furthermore, revealed preferences may be a function of the availability and quality of existing services.

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<sup>1</sup>R. Fosbrooke and G. Hariton, Transport Demand Elasticities (Ottawa: Canadian Transport Commission, Economic and Social Analysis Branch, September 1975).

<sup>2</sup>Cf. Charles Hilton, "An Evaluation of Motor Carrier Services" (Ph.D. dissertation, Michigan State University, 1973).

William S. Christenberry, "Development of a Company Level Freight Modal Split Model Using Shipper Perceptions of Transport Service Characteristics" (Ph.D. dissertation, University of Tennessee, 1976).

Fareh A. Salek, "An Empirical Examination of Industrial Buyer Behavior: A Motor Carrier Selection Application" (Ph.D. dissertation, Ohio State University, 1970).

R. E. Evans and W. R. Southard, "Motor Carriers' and Shippers' Perceptions of the Carrier Choice Decision", The Logistics and Transportation Review 10 (1974).

Charles A. Taff, Commercial Motor Transportation (Homewood, Illinois: Richard D. Irwin, 1969).

Many other studies are to be found in standard traffic management and physical distribution texts.

Based on a review of other work in the area and his experience in dealing with motor freight transport management, Chow identified the following dimensions of trucking output which appeared to be the most significant for general freight carriers:

- (a) the size of shipment the carrier is willing to move;
- (b) the distance of haul; and
- (c) geographic coverage.

He listed three other characteristics which were considered to be less important:

- (d) time aspects (speed, frequency, etc.);
- (e) reliability; and,
- (f) information and advisory services.<sup>1</sup>

The first three dimensions will be discussed in some detail.<sup>2</sup>

An approach to estimating substitutability is "to deduce and make rough estimates of the non-transport savings resulting from a particular type of service".<sup>2</sup> Since shippers are assumed to be willing to pay for additional quality of service any estimate of the non-transport savings would provide an indication of how much shippers are willing to bear under the circumstances.

### The Size of Shipment Dimension

Chow's thesis focuses primarily on general freight carriers

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<sup>1</sup>Garland Chow, "The Economics of Motor Freight" (Ph.D. Dissertation, Indiana University, Graduate School of Business, 1977), p. 102.

<sup>2</sup>While the importance of the second three characteristics cannot be denied the fact remains that it is virtually impossible to obtain data about them.

<sup>3</sup>Ibid., p. 106.

which move less-than-truckload and truckload movements of general freight with the former predominating.<sup>1</sup> If only general freight carriers are considered the question arises whether the size of shipment variable is relevant, given a common carrier obligation to serve the general public. He argued that since carriers may adopt a long and short run marketing strategy that influences the type of freight tendered to the firm for shipment, that the size of shipment is important.

The size of shipment is usually measured by weight though the volume of the shipment is an important consideration. Given that measuring volume tends to be a more difficult measurement problem, the size of shipment usually refers to weight only. The weight of shipments is usually broken down into TL and LTL categories with TL being anything over 10,000 pounds.<sup>2</sup> It is frequently argued

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<sup>1</sup>Cf. John C. Spychalski, "Criticisms of Regulated Freight Transportation: Do Economists' Perceptions Conform with Institutional Realities?" Transportation Journal 14 (Spring 1975), p. 7. Spychalski argued that motor freight firms tend to specialize in one of three categories or maintain separate operating divisions if the carrier operates in more than one category. These categories are: truckload movements of specific types of packaged and bulk commodities, LTL and TL general freight, and LTL package shipments. In effect this classification reflects the argument that the capacity to handle various types and sizes of shipments defines service quality. John Snow made a similar argument when he stated that "... general freight carriers usually specialize in smaller shipments ... these carriers also carry large shipments, but in many cases such freight is handled by a separate truckload division". John W. Snow, "The Problem of Motor Carrier Regulation and the Ford Administration's Proposal for Reform" John W. Snow and Paul W. MacAvoy, eds., Regulation of Entry and Pricing in Truck Transportation (Washington, D.C.: American Enterprise Institute, 1977), p. 5.

<sup>2</sup>ICC definition of LTL/TL.

that TL and LTL segments define separate sub-industries where the structural conditions in the LTL segment are conducive to concentration whereas in the TL segment they are not. (Snow implies that the TL versus LTL services are not close substitutes). Hence, the argument concerning the competitive outcome of each sub-industry is a function of the substitutability of the output.

In order to determine the economic value of different transportation products, a straightforward application of the inventory analysis model developed by Meyer et al to demonstrate the value of lower minimum shipment sizes may be used.<sup>1</sup> Chow suggested that by replacing the minimum weights used in the Meyer rail-truck comparison by minimum weights for TL or LTL service, the model could be applied to a hypothetical set of carriers specializing in service characterized by different shipment sizes or by a carrier providing both TL and LTL service.

Chow's analysis produced a surprising result. Specifically, it was found that shippers on average are willing to pay for more than the measurable benefits. That is:

"The LTL class rates and TL commodity rates probably represent what large shippers with bargaining power are paying while small and medium shippers probably utilize class rates completely. The revenue differential paid to the carriers . . . exceeds by far the largest inventory savings computed. In fact, the large shippers are paying a larger difference to get purportedly lower inventory savings (if the assumption

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<sup>1</sup> John R. Meyer et al., Competition in the Transportation Industries (Cambridge: Harvard University Press, 1959), pp. 348-53.

that large shippers are dominant users of commodity rates is correct). The revenue-inventory savings comparison indicates two things; shippers must value LTL service for reasons other than inventory savings or we have under-estimated the value of inventory savings by using the wrong parameter . . . ." <sup>1</sup>

In conclusion, he argued that "TL and LTL service represent significantly different levels of service, enough to warrant a sizeable demand for LTL service even when the lowest profitable price is charged for TL service".<sup>2</sup>

### The Length of Haul

In discussing the length of haul dimension an attempt to focus on the qualitative as well as the quantitative aspect of the length of haul must be made. That is, a frequency distribution of the length of haul may indicate a central tendency regarding the average length of haul, but it does not deal with the preference of single versus joint line movement.

Given that transportation provides time and place utility, a long haul movement is inherently different from a short haul movement. Any preference for single line as opposed to joint haul movement is a function of the value of service. Locklin has pointed out that:

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<sup>1</sup>Garland Chow, "The Economics of Motor Freight", op. cit., p. 117.

<sup>2</sup>Ibid., p. 118., See Appendix B.



"There is an abundance of evidence that shippers prefer to ship by a motor carrier which provides one carrier service . . . Shippers are reluctant to make shipments that involve interchange with one or more connecting carriers when it can be avoided. Problems of tracing shipments and of collecting loss and damage claims account for the reluctance to employ the services of carriers who cannot complete the movement of the shipment to destination. <sup>1</sup>

A number of factors contribute to the lower quality of service deemed to exist in the case of joint carrier service (also known as interlining). The major problem seems to be the rehandling of freight between carriers and the increase in shipping time and loss and damage. This is not to argue that joint line service is inferior in all cases. One may hypothesize about single line service which produces the same sort of problems as joint line service. The inherent appeal of a single line service is based on the control, and more importantly, the accountability of a single carrier.

Another problem relating to joint line movement is the reluctance of carriers to cooperate in order to provide the service. This may stem from the presence of competition on some lines and compatibility problems which arise if equipment must be interchanged.<sup>2</sup> However, Chow's perusal of interline agreements suggested that much of the joint line short haul service is complementary with single line long haul movement. That is, the long haul carrier provides the line haul movement between two key points while the short haul carriers

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<sup>1</sup> D. Phillip Locklin, Economics of Transportation, 7th ed., (Homewood, Illinois: Richard D. Irwin, 1972), pp. 644-45.

<sup>2</sup> Garland Chow, op. cit., p. 121. Also see Charles A. Taff, Commercial Motor Carrier Transportation, (Homewood, Illinois: Richard D. Irwin, 1969), pp. 219-220.

assemble and distribute freight to smaller traffic generating points around the key points.

In conclusion, it is argued that . . . "motor carriers are producing different products with respect to length of haul. Joint service by short haul carriers as a substitute for long haul service is viewed as a lower quality of service which must cost at least as much as single line service. Joint line service is a potential substitute that is available to shippers with longer haul demand when the quality and price of single line service become unacceptable due to monopolistic behavior".<sup>1</sup>

#### Geographic Coverage

Geographic coverage is defined as the number of direct points served by a carrier. The greater the coverage the greater the ability of a carrier to accommodate the shipping needs of a large number of shippers.

Coverage may be defined to incorporate several dimensions. For example, coverage has a density dimension, that is, coverage to points within a given area. In addition, there is an extensiveness dimension which refers to the length and width of the route structure and network. Length of haul is related to the extensiveness since length of haul is limited by route structure.

Chow argues that extensive coverage will differentiate one carrier's service from another simply by making available service

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<sup>1</sup>Garland Chow, op. cit., p. 122.

to locations not served by another carrier. It is argued that the single line movement is preferred, as indicated previously. However, there may be cost advantages to the shipper in terms of using a limited number of carriers.

For example, the Interstate Commerce Commission, Bureau of Accounts, developed variable cost estimates for single and two line movements by length of haul and weight.<sup>1</sup> It was shown that a cost advantage of single line carriers diminishes with larger weights and longer hauls. This may be considered to reflect the spreading fixed terminal costs over larger weights and distance and the reduced probability of platform handling. There was a substantial cost differential for weight brackets below 5,000 lbs. over all distances suggesting a distinct cost advantage for the single line carrier for the movement of LTL traffic.

Chow argues that additional information about the importance of geographic coverage is meager. However, Lawrence has argued that extensive point coverage is a major determinant of a firm's LTL service demand and a major factor in its marketing strategy.<sup>2</sup> It is difficult to develop a reliable measure to distinguish between

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<sup>1</sup>Interstate Commerce Commission, Bureau of Accounts, Cost of Transporting Freight by Class I and Class II Motor Common Carriers of General Commodities - Central Region - 1971, (Washington, D.C.: Government Printing Office, 1973), Table 13.

<sup>2</sup>Michael L. Lawrence, "Economies of Scale in the General Freight Motor Common Carrier Industry: Additional Evidence", Proceedings - Seventeenth Annual Meeting of the Transportation Research Forum, (Oxford, Indiana: Richard B. Cross Co., 1976), p. 171.

differences in geographic coverage by carriers. Lawrence suggested using the number of terminals on the assumption that a carrier would require a fixed facility at each traffic point in order to carry out consolidation activities. Unfortunately, this is not necessarily true for a carrier may rely on agents, etc. to perform some of the consolidation functions without using a fixed facility.

In conclusion, it is argued that ". . . like length of haul, several carriers with less coverage in combination can produce the the same time and place utility that a carrier with extensive coverage can produce. The qualitative evidence, though not rigorous, suggests that shipper costs incurred in using many carriers as opposed to fewer, infers a real quality of service advantage upon high coverage carriers".<sup>1</sup>

Defining industry boundaries (or in this case sub-industry boundaries) presents many practical problems for the researcher. Many of these problems involve a measure subjective or judgemental appraisal. However, this problem is not unique to transport analysis.

The view is taken that any particular carrier produces a cluster of services characterized by multiple and identifiable dimensions of service. Dimensions such as length of haul, size of shipment, and geographic coverage are physical traits which are assumed to be readily identifiable by shippers and distinguish the product of one carrier from another.

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<sup>1</sup>Garland Chow, op. cit., p. 129.

Because the physical characteristics of trucking may vary on a continuous scale it is difficult to measure structural characteristics in discrete quantities which are appropriate to each sub-industry. However, an analytical framework which focuses on examining the changes in structural characteristics as the composition of the industry changes. For example, how are threshold costs related to the length of haul and geographic coverage? Threshold costs to enter that sub-industry characterized by long hauls and extensive geographic coverage may be significantly different from those of entering another sub-industry. This type of analysis will be the subject of the following section.

#### Structural Cost Characteristics

The previous section examined the demand heterogeneity of the output of motor carrier firms. It was concluded that there were several dimensions of service which serve to distinguish carriers. Given that the variables considered were continuous, a continuum of optimal size firms may exist as the variables change.

This section will examine the supply side of output. That is, an attempt will be made to relate structural conditions such as threshold costs, factor mobility, and cost indivisibility with the output dimensions.

The conventional view of motor transport is that the initial investment required to enter the industry is relatively small and not particularly risky. This view is based on the assumption that revenue equipment (trucks) form the basis of the capital investment. Furthermore, this view is reinforced by the arguments that there

are no economies of scale and service is homogeneous. Given that economies of scale exist (discussed in the following chapter) and that there is output heterogeneity, it is worthwhile to re-examine the notion of "threshold costs" as a barrier to entry.

### Threshold Costs

The methodology of this section is to conceptualize the relationship between levels of threshold costs and the dimensions of output. Where possible empirical observations will be used to substantiate the relationships conceptualized.

Capital inputs may be considered to consist of revenue equipment and support investments (such as terminals, etc.). Revenue equipment includes trucks, tractors, trailers, etc. Tractors and trailers are generally used on line-haul operations, while trucks are primarily used for pick-up and delivery operations.<sup>1</sup>

Prices for a tractor and trailer combination may vary widely. Tractor price is a function of type of power unit, horsepower, transmission, etc. For example, though diesel engines are more costly than gasoline engines they are much more durable and cheaper to operate on long-haul routes. Trailers vary in price according to length, number of axles, weight, etc. A U.S. Small Business Administration Report stated that on the basis of 100 trucking loans

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<sup>1</sup> Trucks may form the largest part of equipment if the carrier specializes in local freight. That is, less than 15 miles according to Canadian definitions.

the average price of a tractor-trailer combination was \$25,000 - \$35,000 in 1973.<sup>1</sup>

An option to purchasing new revenue equipment is to purchase used equipment. The prices of used equipment are substantially lower than for new equipment. Though no data are available it seems reasonable to assume that financial institutions would be reluctant to finance used equipment. The reason for this reluctance may be that depreciated revenue equipment does not represent good collateral. Of course, the financial institution may finance the purchase of used equipment if the potential entrant makes a substantial cash down payment. In conclusion, it may be stated that entry into motor transport at the single vehicle level is not restrictive.

The other component of threshold capital inputs is support or so-called loading inputs. This includes such items as terminal facilities, freight handling systems, etc. Of these, terminal facilities are the most important. In Chapter III terminal facilities were discussed and the relationship between operating revenues and number of terminals examined. This relationship was based on U.S. Class I general freight carriers which specialized in LTL intercity traffic. If the carrier specializes in TL traffic only the need for terminal facilities is minimized.

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<sup>1</sup>Eileen K. Bagwell, "Work, Stability, are Keys of Drivers Given Finance Aid", Transport Topics, June 18, 1973, p. 81. With inflation and vehicle design changes required by federal safety and energy regulations the cost of a tractor-trailer combination has increased substantially. It should be noted that specific tractor-trailer configurations may be related to highway and bridge weight regulations which vary between provinces.

The physical size of any terminal may be measured by the number of doors or loading bays. "For a terminal performing local consolidation and dispersion doors are needed for the following traffic flows: outbound traffic to be located for destination terminals, inbound traffic to be loaded on delivery vehicles, traffic to be unloaded from line haul vehicles, traffic to be unloaded from pick-up and delivery vehicles, and traffic to be unloaded from interline arrivals".<sup>1</sup>

The actual number of doors is a function of the number of destinations, the number of inbound trucks, the number of trucks for local delivery, etc. However, an additional dimension to the terminal operation is the rate of loading and unloading. The number of doors required may be calculated by dividing unloading rates per hour by loading rates (subject to the constraint of total loading time). The required number of doors decreases as the average terminal loading and unloading rate increases. However, a significant increase in rates may only be possible with the use of mechanized freight handling equipment which may increase capital investment. Finally, the rate at which inbound and outbound traffic coverage will have an impact on the total number of doors.

Therefore, it may be argued that there is a correlation between terminal sizes (by number of doors) and the level of service offered by the carrier. In general, as geographic coverage increases, both

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<sup>1</sup>Garland Chow, "The Economics of Motor Freight", op. cit., p. 190. Also see American Trucking Association Inc., Shipper-Motor Carrier Truck Planning Model (Washington, D.C.: n.d.,) pp. 22-49.



in terms of distance and extensiveness, the greater the number of doors required. Maintaining these service standards implies some balance is required between short term traffic in balances and capacity. It would seem reasonable to expect some excess capacity in terminals to exist.

It is difficult to determine the capital costs of a terminal facility since costs will vary by volume of freight, quality of service rendered, and geographic differences in building costs. Any observed variations in terminal costs may also be due to degree of mechanization. Chow suggests that based on observations of terminal openings the modal cost per door appears to be from \$8,000 to \$10,000 with the cost per door doubling if mechanized handling equipment is used.<sup>1</sup>

In conclusion, both revenue equipment costs and terminal capital costs, are not relatively large. These costs would not be out of the range of many potential entrants. However, this is a "reduced argument" in the sense that it ignores systems effects. This will be discussed below.

### Systems Effects

The previous chapter profiled the motor carrier industry and noted the importance of terminal operations. Implicit in this view is that carriers providing higher standards of service in terms require a system of terminals to provide the service. The growth of the systems concept in motor transport is not well documented. It

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<sup>1</sup>Garland Chow, "The Economics of Motor Freight", op. cit., p. 198.

may be argued that the notion of motor transport systems paralleled the development of "physical distribution management" as a management specialty.

Physical distribution management is a relatively new management specialty and relates to

"...(a) broad range of activities concerned with the efficient movement of goods from the end of the production line to the consumer, and in some cases includes the movement of raw materials from the source of supply to the beginning of the production line. These activities include freight transportation, warehousing, material handling, protective packaging, inventory control, plant and warehouse site selection, order processing, market forecasting, and consumer service".<sup>1</sup>

The present status of physical distribution management is one of relative maturity. Smykay argues that an analogy between mass production techniques in the 1930's and physical distribution in the 1970's is appropriate. He argues that physical distribution management will increase in importance for the reason that "...in business a need exists for the development of an exacting logistical network. Physical distribution deals with the tangible aspects of material, space, and time".<sup>2</sup>

A good deal of the literature of physical distribution management deals with market penetration and competitive advantage. For example, Smykay notes that by shipping in CL (rail) lots a firm may cover a substantial market. However, the firm may also serve the entire area by LTL shipments if it established an inventory distribution center. This may reduce the consolidation of shipments problems

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<sup>1</sup>Edward W. Smykay, Physical Distribution Management, 3rd ed., (New York: MacMillan Publishing Co., 1973), p. 5.

<sup>2</sup>Ibid., p. 21.

and may reduce overall inventory stocks.<sup>1</sup>

A study carried out by Stanford University listed a number of factors which have fundamentally altered transportation requirements in general and motor carriers operations in particular.<sup>2</sup> These were: (a) changes in industrial location and growth; (b) changing shipment characteristics and (c) the increasing importance of physical distribution management. The shift of manufacturing to outlying (non-metropolitan areas), the shift to smaller but more dense shipments, and the distribution cost awareness of firms have tended to impose technological and operational requirements on motor carriers firms. In turn, the motor carrier industry has responded with technological changes in the size, durability, load carrying capacity of revenue equipment, and operational characteristics.

It has been noted that the number of terminals are correlated to operating revenue. In the absence of a detailed analysis of operating authorities it would be difficult to relate the size of carrier to a presumed degree of systems design. However, one may draw some conclusions as to the systems requirements by reference to the route pattern. That is, geographic coverage is not only a function of the number of points served but also the spatial distribution of points. For example, if one were to examine route maps of carriers (stratified by length of haul groups) one would expect to find that small carriers exist within every mileage bracket.

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<sup>1</sup>Ibid., p. 83-84.

<sup>2</sup>Stanford Research Institute, Evaluation of Potential Effects of U.S. Freight Transportation Advances on Highway Requirements, (Washington, D.C.: U.S. Department of Transportation, 1972), pp. 139-153.

However, in the long haul class the smaller carriers would have a route system shaped like a thin line whereas the largest carriers would have a route system blanketing key points in several regions, (i.e., a very wide band). As the length of haul decreased the route pattern of smaller carriers would shorten and widen whereas the largest carriers would blanket one or more regions, serving key points and/or distribution communities.

The overall impact of the systems effect may be summarized as follows. With the emergence of motor transport systems a mix of terminal facilities and revenue shipment is required. In the case of terminal facilities a range of facilities are required from consolidating points to break bulk terminals. Within the range of facilities different technology is applied in terms of freight handling equipment (e.g. drag lines). In the case of smaller carriers terminal facilities may be converted warehouses or function as warehouses in addition to terminal functions. In the case of revenue equipment one must now refer to equipment "fleets" consisting of a mix of trucks and tractor-trailer combinations. There must be systems coordination of the fleet relative the route and terminal systems subject to the relative operating costs of each type of revenue equipment.

It is very difficult to measure the aggregate threshold costs for motor carrier firms because of the level of cost is a function of the degree of service provided. Based on the previous section it may be inferred that the terminal and revenue equipment considerations may be very small depending on the level of service. For example, a firm may operate with a very small fleet of vehicles and

no terminal facilities if only TL shipments are moved. The importance of terminal facilities increases if the firm operates in the LTL segment of the market. However, if a small number of points are served these costs would not seem to be prohibitive. As geographic coverage and length of haul increases the terminal requirements and revenue equipment fleet size increases.

As Harrison noted "to expand means, primarily, to expand geographically . . ."<sup>1</sup> It is a basic postulate of location theory that as distance increases the flow of products decreases since transport costs mitigate differences in relative prices for a commodity between two points. It is more difficult for LTL carriers to build maximum loads, ceteris paribus, as distance increases. Large LTL carriers are likely to operate a wide system of terminals in order to obtain consolidation benefits and achieve maximum vehicle loads.

Chow analyzed terminal costs (land and structures), revenue equipment costs (trucks), and other expenses of a number of Class I carriers specializing in LTL service.<sup>2</sup> The carriers were stratified by length of haul.

He found that the "threshold costs for entering any length of haul market are negligible providing the service area is limited. Immediate entry into longer haul more extensive markets require larger investments. Large capital investments from \$20 million to \$200 million are observed for the largest carriers in each mileage bracket above 100 miles. These amounts may be reduced if economies

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<sup>1</sup>A. J. Harrison, "Economies of Scale and the Structure of the Road Haulage Industry", Oxford Economic Papers 15 (November 1963), p. 300.

<sup>2</sup>Garland Chow, "The Economies of Motor Freight", op. cit., p. 232-236.

of scale do not justify the size carriers observed, by short term rental and leasing of productive resources, and buying used assets".<sup>1</sup>

### Factor Mobility

The competitive view of motor transport requires mobility of input factors. Factors of production which cannot be transferred to alternative uses or different markets imply that a firm will not be able to adjust capacity to changing demand conditions.

Terminal facilities (and associated requirements such as offices, freight handling equipment, garages, etc.) would seem to be much less mobile than revenue equipment. Terminal assets are fixed in a geographic sense in that they are only transferable to another user at a particular location. While some of the components of the facility may be stripped and transferred the building is fixed.

In addition, the terminal assets seem to have a relatively long life. While data on the life of terminal assets are exceedingly scarce one report suggests that they may range up to 50 years.<sup>2</sup> While it is possible to vary the dimensions of terminals and to rent out any unused capacity it is inappropriate to argue that system capacity is divisible by adding or subtracting individual terminals

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<sup>1</sup>Ibid., p. 233. A detailed analysis of the reduction in threshold costs which may result due to the leasing and the purchase of used facilities and equipment is beyond the scope of this study. However, it is possible that this type of operation may reduce threshold costs (at original cost) by 50 per cent. Of course, replacement cost could be expected to be higher.

<sup>2</sup>Jack Faucett Associates, Inc., Capital Stock Measures for Transportation, (Washington, D.C.: U.S. Department of Transportation, 1972), pp. 3-40.

since the quality of service is altered.

Capital investment in terminal facilities may represent a very substantial portion of a carrier's assets. Based on this analysis of selected U.S. Class I carriers Chow concluded that "... the relative importance of fixed assets embodied primarily in land and structures is above 20 per cent industry wide but individual carriers can greatly exceed or go below that figure on book cost. Large LTL carriers with extensive networks of terminals are observed to be on the high side, as much as 50 per cent. When adjusted for depreciation allowances the relative importance of fixed assets loom even larger".<sup>1</sup>

Therefore, the notion that trucking assets are mobile and have relatively short-lived lives may not be true in the case of terminals. This lumpiness of assets is usually associated with economies of scale. The fact that LTL carrier assets may be distinguished from TL carrier assets suggests that an additional comparison may be made in terms of investment risk as a function of asset sale value. This risk is related to threshold cost because suppliers of capital will want to reduce the probability of losing a portion of their investment in the case of business failure. The loss probability will be reduced if the major assets of the firm are capable of being sold quickly.

Unfortunately, no research has been carried out on the differential risk across a spectrum of firm sizes and operations. There

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<sup>1</sup>Garland Chow, "The Economics of Motor Freight", op. cit., p. 229.

has, however, been considerable research done on the risk involved in motor carriage per se. For example, Levine and Wang compared a group of publicly held motor carriers to unregulated industries on the basis of five financial ratios. The analysis indicated poor performance of motor carriers relative to the unregulated industries. This may be interpreted to support a high risk hypothesis.<sup>1</sup> More direct evidence may be found in the work of Silberman who agreed that, on the basis of similar analysis, that the motor carrier industry exhibited a degree of risk in significantly above that found in unregulated industries.<sup>2</sup>

The conclusion one may arrive at is that financing may be more accessible in the case of TL entry. That is, since revenue equipment are good collateral and fixed terminals are not, the LTL entrant may face significantly higher threshold costs. One may extrapolate from this conclusion and argue that entry will be on very small scale and concentrate on TL operations and/or LTL operations with very limited geographic coverage.

#### Cost Variability and Indivisibility

Under perfect competition, costs always equal prices, marginal

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<sup>1</sup>Harvey Levine and Nai Chi Wang, "Motor Carrier Financing and Earnings Regulation: The Other Side of the Coin", ICC Practitioners Journal, 42 (November-December, 1974), pp.30-25. Cf. James R. Nelson, "Motor Carrier Regulation and Financing of the Industry" ICC Practitioners Journal, 41 (May-June, 1974), p. 482.

<sup>2</sup>Irwin H. Silberman, The "Sum of Money" - A Five Year Analysis, (Merrick, New York: Irwin H. Silberman and Associates, 1974), p. 100.



cost and minimum average cost being equal and the same as price. All of the costs are directly identifiable with the products; costs and output of the firm and adjustable to the price which the firm accepts as given. These precise relationships will not obtain, however, when competition departs from the model of perfect competition.

It is frequently asserted that motor transport displays a very low ratio of fixed to variable costs. The implication of this statement is that since virtually all costs are related to output motor carriers should be able to smoothly expand or contract output in response to demand conditions. Hence, the possibility of destructive competition cannot arise.

A number of studies have examined the importance of variable costs but it is generally accepted that over 90 per cent of costs are variable with output. Other estimates find variable costs to be much lower. For example, Shirley found variable costs to be approximately 65 per cent.<sup>1</sup>

The estimates differ primarily because they measure cost variability over different periods of time. For example, ICC estimates are purportedly long run measures of cost whereas the Shirley estimate is clearly short run.<sup>2</sup> The ICC methodology has

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<sup>1</sup>Robert K. Shirley, "Analysis of Motor Carrier Cost Formulae Developed by the Interstate Commerce Commission". Transportation Journal 8 (Spring 1969), p. 25.

<sup>2</sup>ICC, Bureau of Accounts and Cost Finding, Explanation of the Development of Motor Carrier Costs with Statement as to Their Meaning and Significance, Statement No. 4-59 (Washington, D.C.: 1959), pp. 74-77.

been criticized by a number of authors such as Meyer et al and Friedlander. Friedlander points out that the cost functions used by the ICC are actually a hybrid formulation between a short run and a long run cost function.<sup>1</sup>

This discrepancy between short run and long run cost functions assumes great importance if short run variable costs determine rates. For example, Locklin agreed that:

"In the short run, however, motor carriers have a substantial proportion of their costs fixed or constant. This can be seen by considering the case of an individual who undertakes to engage in for-hire transport with only one or two vehicles. If he finds it difficult to obtain business, he is tempted to take any business at a cut rate price... Under these circumstances he recognizes that interest on investment in vehicles, property taxes on the vehicles, motor vehicle registration fees, and at least part of the depreciation on vehicles are fixed costs and are incurred whether he moves any traffic or not. Short run variable cost, rather than long run costs will determine what rates he charges. The situation which we have described often occurs in the trucking industry..."<sup>2</sup>

The short run determination of fixed and variable costs is an inexact process. For example, depreciation is generally considered a fixed cost. However, there are other costs which do not conform to a category as easily. For example, some costs (such as dockworker wages) may be fixed to a certain level of utilization but then become variable costs. Some costs are subject to managerial discretion, and may vary with output but not in any direct proportion.

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<sup>1</sup>Ann Friedlander, "The Dilemma of Freight Transport Regulation, (Washington, D.C.: The Brookings Institution, 1969), pp.82-83.

<sup>2</sup>D. Phillip Locklin, Economies of Transportation, 7th ed., (Homewood, Illinois: Richard D. Irwin, Inc., 1972), p. 652.

Clearly one of the more important problems is the overstatement of fixed costs over a short time such as a year. This occurs because not all fixed costs expire with the time period.<sup>1</sup> Though many criticisms may be levelled at Shirley's segregation of fixed and variable costs the fact remains that he shows that the ICC assumption of 10 per cent constant costs is not appropriate if carriers have planned or unexpected overcapacity.

Economic theory states that variable costs is a floor below which prices cannot fall. However, this assumes that inputs and costs are perfectly divisible. In all modes of transportation cost indivisibilities arise because of joint products. With the production of more than one output, joint and common costs must be assigned on an arbitrary basis to individual shipments. The pricing floor represents the portion of variable costs that can be attributed to it. Any divergence between marginal cost and total cost may be considered to represent fixed costs which may or may not be divisible but cannot be escaped.

For the general freight LTL carrier the consolidation and movement of a number of shipments produces common costs which must be allocated to the costs of the haul. This allocation may be very difficult. For example, terminal function may be composed of divisible and indivisible activities relative to particular shipments. Loading may be considered as a divisible cost, however, costs associated with the maintenance of the terminal and supervision of

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<sup>1</sup>W. A. Lewis, "Fixed Costs", Denys Munby, ed., Transport, (Middlesex, England: Penguin Books, 1968), p. 64.

the shipment handling are common costs.

As far as the LTL carrier is concerned most of its costs would be common costs. One implication of this is that there would be a tendency for aggregate revenues to be less than divisible and indivisible costs. As Spychalski points out:

"If carriers are possessed of substantial cost and asset indivisibilities, long-lived assets, and some excess capacity were to enter into pervasive and intense intramodal rate competition, and if marginal costs...were employed as floors for the establishments of rates in a majority of the numerous sub-markets served by each carrier, it is obviously conceivable, if not highly probable, that the general level of rates would, ceteris paribus, gravitate toward marginal costs, thus producing aggregate revenues equal or greater than total divisible costs, but less than the sum of divisible and indivisible costs. Carriers party to such a state of disequilibrium and seeking to pursue an economically rational course of action would, individually, find themselves capable of maximizing short run gains...by accepting traffic at rates equal to or greater than marginal cost but less than average cost...." <sup>1</sup>

One would expect to find high cost variability, in TL long haul carriers and the converse for LTL carriers. Though one would expect fixed costs to be greater than the usual 10 per cent the importance of joint and common costs may increase this significantly.

### Summary

The chapter examined the methodology and the structural implications of output homogeneity on the demand side. It was argued that there are three, inter alia, important dimensions of service; size

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<sup>1</sup> John C. Spychalski "Criticisms of Regulated Freight Transport: Do Economists' Perceptions Conform with Institutional Realities?", Transportation Journal 14 (Spring, 1975), p.8.

of shipment, length of haul, and extent of geographic coverage. These dimensions define sub-industries of carriers which possess different combinations of these dimensions. The three dimensions of service are continuous variables and hence relate to a continuum of carriers.

The sub-industries exhibit different structural features in terms of threshold costs, factor mobility, cost variability, and indivisibility and economies of scale. Threshold costs of entering any length of haul market are negligible providing service area is limited. Threshold costs increased as the size of shipment declined. That is, the move from TL to LTL carriers. This was due to the need for LTL terminal facilities.

Terminals represent highly immobile, long-lived assets. While some terminal facilities may be stripped the buildings are not mobile. Hence, the conventional argument that the motor carrier industry exhibits high factor mobility may be questioned.

It was argued that LTL carriers indicated a higher ratio of fixed cost to total cost than TL carriers. Furthermore, LTL carriers would be subject to substantial cost indivisibility allocation problems.

In general, as the size of shipment declined (LTL) factor mobility was reduced and the ratio of fixed costs to total costs increased. The discussion was not able to determine the precise sensitivity of threshold costs, factor mobility, etc as the length of haul and geographic coverage increased.

On the basis of the information presented in this chapter TL carriers conform to the competitive model. The LTL carriers do not exhibit conformity with the competitive model due to the systems of

terminal operations.

It was argued that if short run variable costs set the floor for prices, and given substantial asset and cost indivisibilities, short run pricing may produce rates which cover marginal costs but not average costs. This may be interpreted as a propensity towards destructive competition in the absence of regulation.

The fact that LTL carriers have organized themselves into rate bureaus to enforce a pricing structure is consistent with the above structural elements. However, it is beyond the scope of this study to discuss the operations of rate bureaus.

## CHAPTER V

### Economies of Scale

#### Introduction

The importance of understanding the cost structure of the motor transport industry in order predict the likely market structure and behavior of the industry under a diffierent regulatory environment has long been recognized.

If motor transport were subject to economies of scale, that is, the largest firms were able to provide a given level of service quality at lower average cost, the larger firms would have a competitive advantage in terms of driving out smaller firms. The higher costs experienced by all but the largest firms would serve as an effective barrier to entry to new firms. If motor transport were not subject to economies of scale an argument for regulation no longer has any relevance. The conventional view is that there are no, or relatively insignificant, economies of scale in motor transport.

This chapter will discuss briefly the theory of economies of scale and review the relevant articles on economies of scale in motor transport. It will be argued that the early studies were deficient in a methodology and technique. The use of relatively more sophisticated techniques provides some indication of the existence of economies of scale. The more sophisticated techniques are applied to homogeneous groups of carriers and attempt to account for the heterogeneous output of the motor transport industry.

Economies of scale relate to the reduction in unit cost as output increases, assuming the optimum combinations of labour and capital.<sup>1</sup> Given the construction of different sized plants the unit cost/output relationship (i.e., short run average cost) may be determined and define a plant size which will minimize unit costs for a specific level of output. The focus of such points is referred to as the long run average cost curve (envelope curve). Each long run average cost curve assumes that, for the relevant time period, technology and relative factor prices are fixed, and that the short run average cost curves of the various plant sizes are based on the latest technology.

Such a static long run average cost curve relates to real economies. By real economies one means that physical quantities of factors of production such as man-hours, raw materials etc. Therefore, changes in the costs of production represents changes in quantity of physical factors of production.<sup>2</sup>

As Scherer points out the principal basis of scale economies in production is specialization. Specialization may be achieved

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<sup>1</sup> Cf. Paul K. Gorecki, Economies of Scale and Efficient Plant Size in Canadian Manufacturing Industries, Research Monograph Number 1 (Ottawa: Research Branch, Department of Consumer and Corporate Affairs, 1977), pp. 5-18. The classic presentation of cost curves is found in Jacob Viner, "Cost Curves and Supply Curves" in George Stigler and Kenneth Boulding, eds., Readings in Price Theory (Chicago: Richard D. Irwin, 1962), pp. 198-226.

<sup>2</sup> It is customary to point out that real economies of scale differ from pecuniary economies. That is, costs of production may change because of a change in factor prices and/or the physical quantity of the factors of production. If the prices of factors of production remain unchanged for different levels of output then real and pecuniary economies of scale are the same.



within a particular plant or production complex and also, when the firm operates more than one plant complex, across plant lines.<sup>1</sup>

Scale economies, or as they have been called, principles of efficiency, may be classified as follows: the principle of bulk transactions, the principle of multiples, and the principle of massed reserves.<sup>2</sup> The principle of bulk transactions is based on the observation that costs of dealing with large quantities are no greater than those of dealing in small quantities. For example, an increase in the size of a truck does not require additional crew - only one driver is needed. The principle of multiples is based on the fact that specialized equipment and personnel are indivisible and that capacities may differ. For example, given a three stage production process, the output necessary to fully utilize each process and minimize production costs is determined by the least common multiple of each process output. The principle of massed reserves is related to the law of large numbers. That is, as a sample size drawn from any probability distribution increases the probability that the average value of the sample will deviate from the mean of the probability distribution declines. For example, the probability that a factory with a large number of machines will have X breakdowns is less than the probability of a proportionally smaller firm having same proportion of breakdowns.

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<sup>1</sup>Frederick M. Scherer, Industrial Market Structure and Economic Performance (Chicago: Rand McNally Publishing Co., 1970), pp. 72-103.

<sup>2</sup>Herbert Mohring, Transportation Economics (Cambridge, Mass.: Ballinger Publishing Co., 1976), pp. 135-164.

Economies of scale may arise at the plant level, firm or enterprise level, and the multi-plant level. Firm level economies are those economies that are external to the plant but internal to the firm. Therefore, the centralization of research and development activities are considered as firm level economies. Multi-plant economies of scale refer to the specialization of particular plants in producing a variety of products.

Generally, economists are concerned with plant economies. In addition, there is usually a distinction made between plant economies of scale and economies of size. This distinction has been termed product specific and plant specific economies.<sup>1</sup>

The former refers to the scale of product runs and rate of output per unit time. The latter refers to those economies arising from indivisibilities, increased dimensions, specialization, etc. This distinction may be clarified if one considers product specific economies to be related to the "down time" of equipment. Therefore, the longer the production run the lower the costs of change over and set-ups. Scherer found both types of economies to be important, however the relative importance of each type varied from industry to industry.

Finally, economies of scale may also be considered in a dynamic setting. In a dynamic framework technology does not remain

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<sup>1</sup>Frederic M. Scherer, Economies of Scale and Industrial Concentration (Berlin: Berlin International Institute of Management, 1974), p. 29. Also see Paul K. Gorecki, Economies of Scale Specialization Agreements, Mergers, and the Competition Act, Simon Fraser University, Department of Economics and Commerce Discussion Papers Series, 1977.

constant nor is it freely available to all. One example of dynamic scale economy is the "learning curve". That is, the unit cost may decline over several production runs because of the improvement in the skills of workers and managers through repetition.<sup>1</sup>

Neglecting for the moment the analysis of economies of scale the problem of judging their significance arises. The first reference point to answer this question is the minimum efficient size of plant. That is, the smallest size of plant or production run that will minimize production costs. It is customary to deflate the estimate of minimum efficient size by the relevant market size. Therefore, if minimum efficient size is large relative to market size then scale economies may be considered to be significant. The implication of large minimum efficient size relative to the market suggests that the market can support only one or a few firms.

The implication of significant economies of scale and a minimum efficient size which is large relative to the market is that it could lead to concentrated market structures. That is, large producers could produce their output at significantly lower average costs per unit than relatively small producers. This in turn has important ramifications for public economic policy in terms of industrial strategy, economic development, and competition policy.

Scherer points out that a number of methodologies exist for measuring the cost-scale relationships.<sup>2</sup> The more important

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<sup>1</sup>Frederic M. Scherer, Industrial Market Structure and Economic Performance, p. 74.

<sup>2</sup>Ibid., pp. 79-82.

methodologies are: the survivor technique, the engineering technique and the statistical cost approach. All of these methodologies are open to some criticism on the conceptual and/or practical level.

The survivor technique as developed by Stigler suggests that an efficient plant size is the plant size which most successfully withstands all of the various market forces and constraints.<sup>1</sup> This technique tends to reflect what is and not necessarily what ought to be. That is, it refers to private costs and benefits and not to social efficiency.

For the purpose of this study the statistical cost methodology and the engineering method are more relevant. This is due to the fact that the statistical cost approach attempts to determine the shape of the long-run average cost curve and the engineering method allows many of the ceteris paribus assumptions embodied in the long-run average cost curve to be made. The engineering method involves the estimation of unit costs of production at pre-determined scales of output using the best current technology and assuming constant factor prices. While the drawbacks of the engineering method are well known it "probably affords the best single source of information on the cost-scale question".<sup>2</sup> The engineering method has been

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<sup>1</sup>George Stigler, "Economies of Scale " Journal of Law and Economics (October, 1958), ppp. 54-71. For a discussion of the drawbacks of this technique see William Shepherd, "What Does the Survivor Technique Show About Economies of Scale", Southern Economic Journal (July, 1967), pp. 113-122.

<sup>2</sup>Frederick M. Scherer, Industrial Market Structure and Economic Performance, p. 83. For a discussion of the problems of this approach see F. M. Scherer et al, The Economies of Multi-Plant Operation: An International Comparison (Cambridge, Mass.: Harvard University Press, 1975).

primarily used for studies of manufacturing plants.

The statistical cost approach attempts to relate observations on average production cost over a broad cross-section of plants to observations on the output of those plants. Of the three techniques, the statistical cost approach is the most relevant to the study of economies of scale in trucking.<sup>1</sup> There are variants to this approach and they will be discussed in the following section.

### Economies of Scale - Review of the Literature

Over the last 20 years or so there has been a significant controversy as to whether economies of scale exist in motor transport.<sup>2</sup> A great deal of the literature about motor transport is related to this issue and the various policy pronouncements as to the probable competitive effects stemming from de-regulation are based on the studies which support this view. However, the controversy is far from over.

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<sup>1</sup>Cf. J. Johnston, Statistical Cost Analysis (New York: McGraw-Hill, 1960).

<sup>2</sup>Cf. Merril J. Roberts, "Some Aspects of Motor Carrier Costs: Firm Size, Efficiency, and Financial Health", Land Economics, 32 (August, 1956), pp. 228-238.

Robert A. Nelson, The Economic Structure of the Highway Carrier Industry in New England. Report to the New England Governors Committee on Public Transportation (Boston, 1956).

Edward W. Smykay, "An Appraisal of the Economies of Scale in the Motor Carrier Industry", Land Economics 34 (May, 1958), pp. 143-148.

Edward W. Smykay, "The Economies of Scale in the Motor Carrier Industry: A Rejoinder" Land Economics 35 (May, 1959), pp. 185-187.

continued

The nature of motor carrier costs have been a central concern in the debate over motor carrier regulatory reform. However, with the increasing sophistication of models and econometric techniques the debate has livened in the last few years. If trucking is a decreasing-cost industry de-regulation would expose the public to the risk of monopolization; if not, a basic justification for regulation vanishes.

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Paul W. Emery, "An Empirical Approach to the Motor Carrier Scale Economies Controversy", Land Economics 41 (August, 1965), pp. 285-289.

Stanley L. Warner, "Cost Models, Measurement Errors and Economies of Scale in Trucking" in M. L. Burstein et al., The Cost of Trucking: Econometric Analysis (Dubuque, Iowa: William C. Brown Co., 1965), pp. 1-65.

Garry N. Dicer, "Economies of Scale and Motor Carrier Optimum Size" Quarterly Review of Economics and Business (Spring, 1971), pp. 31-37.

R. K. Koshal, "Economies of Scale", Journal of Transport Economics and Public Policy 12 (May, 1972), pp. 147-151.

Mark Ladenson and Allen J. Stoga, "Returns to Scale in the U.S. Trucking Industry" Southern Economic Journal, 40 (January, 1974), pp. 390-396.

Michael Lawrence, Economies of Scale in the General Freight Motor Common Carrier Industry: Additional Evidence" Proceedings - Seventeenth Annual Meeting of the Transportation Research Forum, (Oxford, Indiana: Richard B. Cross, 1976), pp. 169-176.

Richard Klem, "Market Structure and Conduct" in Paul W. MacAvoy and John W. Snow, eds., Regulation of Entry and Pricing in Truck Transportation (Washington, D.C.: American Enterprise Institute for Public Policy Research, 1977), pp. 119-138.

The earlier empirical studies supported the view that economies of scale do not exist. Recent work by Klem and Dailey<sup>1</sup> support this earlier work. The studies by Emery, Warner, Ladenson and Stoga, and Lawrence, for example, suggest the opposite conclusion. Adding to the confusion are authors such as Wilson<sup>2</sup> who argue that there are constant returns to scale but firm size and quality of service are related. Hence, in the absence of regulation one should naturally expect a growth in concentration.<sup>3</sup>

Some of the more important studies on economies of scale are listed in Table . As may be seen the more recent studies attempt to determine economies of scale by fitting a statistical cost or production function. The earlier studies compared differences in average costs. It will be argued further on that the multiple regression technique would seem to be the preferable approach.

There are some common features to all these studies. First, they referred only to general freight carriers in order to achieve some degree of sample homogeneity. Second, virtually all of the studies utilized cross-sectional data for a relatively large number of carriers at one point in time.<sup>4</sup> This procedure reduced distortions

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<sup>1</sup>Victoria M. Dailey, "The Certificate Effect: The Impact of Federal Entry Controls on the Growth of the Motor Common Carrier Firm", (Ph.D. dissertation, University of Virginia, 1973), pp. 78-98.

<sup>2</sup>George W. Wilson, "The Nature of Competition in the Motor Transport Industry", Land Economics, 36 (November, 1960), pp. 387-391.

<sup>3</sup>George W. Wilson, op. cit., p. 389.

<sup>4</sup>Note that Warner used pooled time series and cross sectional data.

Table V.1

Summary of Existing Economic Studies of Motor Freight Economies of Scale in the U.S.

Author	Type of Study	Date Used, Population Size & Geographic Territory Considered	Additional Homogeneity Properties of Sample
Roberts 1956	Approximation of long run average cost curve relationship by size groups.	1952 cross section of 114 Class I motor carriers operating in Central Territory for primary analysis. 1952 across section of 92 Class I transcontinental carriers for supplementary analysis.	General Freight, Regular route, intercity assumed (criteria not specified).
Measure of Scale and Approximate Range of Scale			
	(1) Largest (2) Smallest	Dependent Variable	Independent Variables
Tangible Assets-General Territory Sample:		Average cost per vehicle mile (excluding terminal expenses).	Average length of haul Percent of truckload freight to total freight Route to average haul
	(1) about \$2,000,000		
	(2) less than \$350,000		
Interterritorial Sample:			
	(1) greater than \$8,000,000		Vehicle mile per route mile.
	(2) not given		

Representative Conclusion

" . . . small companies who were not disadvantaged in utilization and haul characteristics performed as efficiently as bigger ones".

Source: Garland Chow, "The Cost of Trucking Revisited" in Proceedings - A Workshop on Motor Carrier Economic Regulation, (Washington, D.C.: National Academy of Sciences, 1977), p. 89.



Author	Type of Study	Date Used, Population Size & Geographic Territory Considered	Additional Homogeneity Properties of Sample
Nelson 1956	Approximation of long run average cost curve relationship by size groups using rank correlation.	1954 cross section of 102 Class I motor carriers domiciled in New England and 65 Class I carriers but domiciled outside of New England.	General Freight Intercity (criteria not specified).
Measure of Scale and Approximate Range of Scale (1) Largest (2) Smallest		Dependent Variable	Independent Variables
Revenue -- New England Sample		Average cost per vehicle mile, Average cost per ton-mile.	Average length of haul
(1) \$9,480,000			Average load
(2) not given			
Non-New England Sample			
(1) \$47,820,000			
(2) not given			
<u>Representative Conclusion</u>			
"... size of firm bears little relation to operating cost".			

Author	Type of Study	Date Used, Population Size & Geographic Territory Considered	Additional Homogeneity Properties of Sample
Emery 1965	Approximation of long run average variable cost curve relationship by size groups.	1960 cross section of 233 Class I and II motor carriers operating in Middle Atlantic territory.	General Freight, intercity. Intercity carriers must receive at least 70% of revenue from intercity service.
Measure of Scale and Approximate Range of Scale (1) Largest (2) Smallest		Dependent Variable	Independent Variables
Revenue		Average cost per ton-mile.	Percent of truckload to total freight.
(1) greater than \$12,401,300			
(2) averaged \$226,000			
<u>Representative Conclusion</u>			
"Relating the carriers total expenses to their ton-mile of output a perfect progressively declining expense per ton-mile from 21.67¢ for the smallest to 8.98¢ for the largest carrier size group was found".			

Author	Type of Study	Data Used, Population Size & Geographic Territory Considered	Additional Homogeneity Properties of Sample
Warner 1965	Long linear long run total cost function estimated.	1953-1960 pooled cross section - time series of 72 Class I motor carriers operating in the U.S.	General Freight, inter-city (criteria not specified) no owner-ship entanglements and continuous data available from 1953 to 1960.
Measure of Scale and Approximate Range of Scale (1) Largest (2) Smallest		Dependent Variable	Independent Variables
Number of shipments, statistics not given; however largest carrier by revenue was about \$14,000,000 and by assets \$10,000,000.		Total Operating Cost.	Average length of haul Average weight of shipment.

#### Representative Conclusion

"... the results clearly suggested economies of scale ... the economies suggested are not overpowering in the sense that such differences as there are cannot be overcome by a favorably situated small firm.

Author	Type of Study	Data Used, Population Size & Geographic Territory Considered	Additional Homogeneity Properties of Sample
Dailey 1973	Log linear long run average cost function estimated.	1968 cross section of 69,85,62 and 32 Class I and II motor carriers operating in TRINCS regions: New England, Pacific-Southern, Central States, and Southwest, respectively.	General Freight, Intercity (critiria not specified).
Measure of Scale and Approximate Range of Scale (1) Largest (2) Smallest		Dependent Variable	Independent Variables
Revenue--New England		Average cost per ton-mile.	Average length of haul. Average load. Annual miles per power unit.
(1) \$ 9,551,000			
(2) \$ 374,000			
Pacific-Southern			
(1) \$59,902,000			
(2) \$ 374,000			
Southwest			
(1) \$45,385,000			
(2) 351,000			
Central States			
(1) \$262,662,000			
(2) \$ 320,000			

#### Representative Conclusion

"Our results for our cost function suggest that the primary determinants of variations in motor common carrier costs are average length of haul, average load per vehicle, and, to a lesser degree, size of firm . . . there are actual diseconomies of scale once route structure is held constant".

Author	Type of Study	Data Used, Population Size & Geographic Territory Considered	Additional Homogeneity Properties of Sample
Lawrence 1976	Log linear long run total cost function estimated.	1973 cross section of 124 Class I motor carriers.	General freight carriers subgrouped by revenue size and length of haul.
Measure of Scale and Approximate Range of Scale (1) Largest (2) Smallest			
Dependent Variable		Independent Variables	
Total tonnage, statistics not given but revenue sizes were:		Average length of haul	
Group 1 -		Average load	
(1) \$10,000,000		Ratio of less-than-truck-load (LTL) tonnage to total tonnage. Average tons per LTL shipment.	
(2) \$1,000,000		Percent of business in large metropolitan areas.	
Group 2 -			
(1) \$50,000,000			
(2) \$10,000,000			
Group 3 & 4			
(1) not given			
(2) \$50,000,000			
Group 5			
(1) not given			
(2) \$10,000,000			

#### Representative Conclusion

"The research reported here generally reveals the same type of results reported by Warner . . . these same regression coefficients for output, if valid, generally reflect highly significant economies of scale".

Author	Type of Study	Data Used, Population Size & Geographic Territory Considered	Additional Homogeneity Properties of Sample
Ladenson and Stoga 1974	Log linear Cobb-Douglas production function estimated.	1971 cross section of 116 randomly picked motor carriers in the U.S.	General Freight, intercity. Intercity carrier must receive at least 50% revenue from intercity service.
Measure of Scale and Approximate Range of Scale (1) Largest (2) Smallest			
Number of employees		Dependent Variable	Independent Variables
(1) greater than 2,000 employees		Ton-miles per unit of labour input.	Labour--Ratio of total wages and salaries to average hourly wage of drivers and platform workers, or ratio of the sum of total workers to the average wage ratio.
(2) 1-50 employees		Ton-miles per unit of capital input.	Capital--Net Carrier Operating Property on the sum of depreciation and amortization, road and property taxes paid and 5 percent of net worth.
Ratio la labour to capital.			

Representative Conclusion

"With one exception, our estimates . . . indicate that once the firm has attained a size of fifty employees or more it is subject to increasing returns to scale".

of the cost-scale relationship arising from variations in factor prices over time.

Unfortunately, such attempts at sample homogeneity do not come to grips with the diversity of trucking operations. For example, a carrier may be classified as a general freight carrier and still move a very significant amount of specialized commodities. In addition, carriers may operate in a number of geographic regions and be subject to geographic variation in costs.<sup>1</sup>

Only two of the studies listed in Table V.1 indicate that the authors specified general freight carriers which earned a relatively large portion of their revenue from intercity freight. The failure to analyze this feature may produce significant cost variations. For example, some of the 100 largest general freight carriers in Canada provide very little intercity traffic.<sup>2</sup> That is, the bulk of their revenues may be related to local cartage operations which tend to have higher costs due to congestion and

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<sup>1</sup>It may be noted that some of the authors isolated carriers by region, based on the assumption that intra-regional carriers would be subject to similar cost influences of terrain, traffic, density, and population. A priori this may be considered to be good practise. However, more research is required in order to separate the shipment characteristics (size, type, length of haul) from the regional effects. If regional cost influences are indeed a function of shipment characteristics then these may be dealt with separately. Cf. Edward W. Smykay, "The Economies of Scale in the Motor Carrier Industry: A Rejoinder" Land Economics 35 (May 1965), pp. 185-187.

<sup>2</sup>Cf. R. K. House and Associates, Manitoba For-Hire Trucking Industry Productivity Study: General Industry Report, Manitoba Department of Industry and Commerce and Manitoba Trucking Association, February 1974, p. 39.

the use of smaller vehicles.<sup>1</sup>

The studies varied somewhat in terms of the measures of scale and cost variables. All of the studies using the cost function approach used assets or revenue as a measure of scale. While assets tend to be a relatively unambiguous measure of scale as far as plant capacity is concerned, the fact is that motor carrier output may be increased (extension of routes for example) without a corresponding increase in investment. Such expansion cannot be classified as a move down the short run average cost curve nor a change in the scale of operations. Furthermore, it may be difficult to measure assets between firms if the amount of leased equipment varies between firms.<sup>2</sup>

Revenues may not be a reliable measure of scale since increased revenues may not indicate changes in scale but rather shifts in product carried priced at the value of service. For example, carriers tend to charge significantly higher rates for transporting nylon hose as opposed to cotton hose even though the shipment characteristics may be virtually identical.<sup>3,4</sup>

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<sup>1</sup> Conversation with Wayne Reinhardt, Motor Carrier Division, Statistics Canada.

<sup>2</sup> For a discussion of the leasing problem in Ontario see Norman Bonsor "The Development of Regulation in the Highway Trucking Industry in Ontario" in Ontario Economic Council, Government Regulation: Issues and Alternatives 1978 (Toronto: Ontario Economic Council, 1978), pp.109-110.

<sup>3</sup> John Snow, "The Problem of Motor Carrier Regulation and the Ford Administration's Proposal for Reform" Paul MacAvoy and John W. Snow, eds., Regulation of Entry and Pricing in Truck Transportation (Washington, D.C.: American Enterprise Institute, 1977), p. 18.

<sup>4</sup> Josephine Olson, "Price Discrimination by Regulated Motor Carriers", American Economic Review, (June 1972), pp.395-402.



The two studies which do not use either the assets or revenues as the measures of scale are those of Ladenson and Stoga and Warner. Ladenson and Stoga use the number of employees as a scale measure in their production function. Employees as a measure of scale suffers from the same problem as that of assets, namely, that an increase in the number of employees need not indicate a change in scale. Warner uses physical output, the number of shipments, as the measure of scale. In light of the preceding analysis this would seem to be the ideal measure, however, it raises the problem of ensuring that all the dimensions of the output are accounted for. The large variation in the number and characteristics of shipments must be accounted for.

This raises the more general problem of the appropriateness of certain variables used to isolate the effect of scale on costs. For example, many of the studies use capacity utilization measures to isolate the cost-scale relationship. Nelson, Emery, Dailey and Lawrence use average load whereas Roberts used a route utilization ratio. Dailey also used a measure of vehicle utilization annual miles per power unit. The use of capacity utilization variables in a cost equation may not expose differences in service since such variables may not represent product dimensions nor an operating disability which is exogeneous to the firm. For example, changes in utilization may be a function of management ability or a sign of efficiency due to size.

The difference in average loads is a function of average shipment size which in turn is a function of the carriers traffic mix. For example, and LTL carrier may increase average load by

obtaining increases in average weight which may lower the cost of higher average load by avoiding terminal expenses of consolidating loads. This cost relation may create a built-in bias against economies of scale when revenues or assets are used as a measure of scale.

This bias against economies of scale will occur unless the effect of the average shipment weight on cost is taken into account and such as variable tends to be used frequently. Warner used the average weight per shipment, Lawrence used the average weight per LTL shipment and Roberts and Emery examined the effect on cost of TL to total traffic. A priori one would expect that shipment size is a major factor influencing costs. However, the variable used must involve a greater degree of precision than simply greater than or less than 10,000 pounds.

The work of Roberts, Emery, and Nelson indicated the absence of economies of scale. The methodologies of these studies were similar in that all compared costs for different sizes of carriers. Both Roberts and Emery found declining expenses per ton-mile (or vehicle-mile) from the smallest to the largest size groups of carriers. However, inverse relationships were found between average haul and route utilization with units costs. Given that short hauls and low route utilization were found to contribute to high units costs, but these factors were not necessarily a feature of small firms, it was concluded that no economies of scale

were present.<sup>1</sup> A major criticism which may be levelled against the work of Roberts is that if there are a number of cost variables affecting each firm it is only by holding all variables but the one in question constant that one can come to a valid conclusion about the relationship of a single variable to costs.

Nelson avoided this problem by using samples of firms which were homogeneous within narrow ranges of average haul and load. This essentially held constant the other factors affecting costs and Nelson found that there was no relationship between vehicle-miles cost and size.<sup>2</sup> The major problem with Nelson's study was the small sample size, that is, 10 and 12 carriers for New England and non-New England carriers respectively. In order to increase the reliability of the results Nelson would have had to reproduce his results using a greater number of homogeneous samples.

Rather than using a large number of samples the multiple regression techniques allows for the examination of the relationship between dependent and each independent variable with the effect of others being held constant. This was the technique used by Dailey, Warner, and Lawrence. While the scale measures and cost variables have been discussed there is the possibility of other statistical problems emerging in the multiple regression analysis.

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<sup>1</sup> Emery analyzed profits in relation to costs. However, it may be argued that the inverse relationship between profits and length of haul is not the same thing as costs and the length of haul.

<sup>2</sup> Nelson used a relatively more sophisticated technique to judge the strength of the relationships, the rank correlation procedure. It should be noted that such a measure is sensitive only to certain types of correlation.

For example, there may be a high correlation between the independent variables which could lead to serious multi-collinearity problems. While it is somewhat difficult to judge the overall effect of multi-collinearity a more serious problem may be the presence of heteroscedasticity, that is, unequal variances of the error term. This problem tends to arise in cross-sectional work. A priori, one would expect the variance of cost is greater for larger firms than for smaller firms.<sup>1</sup> While the estimators of such a regression may be unbiased the tests of significance are unreliable.

Unfortunately, these studies do not come to grips with the dimensions of service discussed in Chapter IV. Some very recent studies have attempted to incorporate certain of these dimensions into regression analysis of costs. The results were not conclusive.

Klem tested the hypothesis that LTL carriers may exhibit economies of scale. Using a relatively small sample he found weak, but significant economies of sale.<sup>1</sup> He used a number of formulations such as partitioning the sample by revenue, shipments, and including a second order term to allow for variable elasticity. Though he did not discuss his results in detail one may infer that the hypothesis was supported.

Chow tested the same hypothesis but included other dimensions:

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<sup>1</sup>Richard Klem, "Market Structure and Conduct", Paul W. MacAvoy and John W. Snow, eds., Regulation of Entry and Pricing in Truck Transportation (Washington, D.C.: American Enterprise Institute, 1977), pp. 135-137.

"The results of the statistical model suggest that economies of scale are present in the LTL segment . . . and constant returns to scale are found in the TL segment . . . The LTL segment was broken down into length of haul groups and size groups within each length of haul. Economies of scale were found to be strongest in the short and medium haul groups and weakest in the long haul groups".<sup>1</sup>

In an earlier study Chow had argued that by partitioning the groups by revenue and by breaking down length of haul within the revenue groups (including an independent variable for average shipment weight) presented an adequate method for including the service dimensions.<sup>2</sup> He concluded that LTL-short haul-extension coverage carriers exhibited the strongest economies of scale and LTL-long haul-extensive coverage indicated the weakest economies of scale.

Unfortunately, this methodology may have introduced a bias in the results. Revenue is highly correlated to cost, the dependent variable. By partitioning the sample by what may be considered as the dependent variable results in a situation where the error term is no longer uncorrelated with the regressors. Chow's conclusion that not including revenue in his regression model avoided any problems between the error term and the regressors must be viewed as highly suspect.

It is true that underspecification of the model by leaving out

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<sup>1</sup>Garland Chow, "The Cost of Trucking Revisited" in Proceedings - A Workshop on Motor Carrier Economic Regulation, (Washington, D.C.: National Academy of Sciences, 1977), p. 91.

<sup>2</sup>Garland Chow, "The Economics of Motor Freight", (Ph.D. Dissertation, Indiana University, 1977), pp. 335-336.

a variable for geographic coverage would bias the model. Given that most studies have found the scale elasticity coefficients to be in the range of .93 to .98. Hence, the margin for error is very small and the appropriate specification of the model assumes great importance.

It may be accepted that LTL carriers exhibit economies of scale. However, it is necessary to extend this conclusion to incorporate length of haul and degree of geographic coverage. One may hypothesize that LTL-short haul-extensive coverage carriers exhibit stronger economies of scale than LTL-long haul-extensive coverage. Wilson suggested that "... costs rise slowly with distance as the length of haul increases from low levels, but the rate of increase rises as distance increases from higher levels".<sup>1</sup>

This may be due to the fact that driver wages for a short haul carrier may be constant over a range of haul. Increasing the length of haul within the range allows a firm to spread its costs. Drivers on long haul routes may be paid by the mile which makes this cost vary with distance. In addition, as the relative weight given to line haul costs increases relative to total cost, the more sensitive total costs would be relative to changes in the length of haul. However, LTL-long haul-extensive coverage carriers tend to be the largest of all carriers and tend to maintain the most comprehensive terminal systems.

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<sup>1</sup>George W. Wilson, "On the Output Unit in Transportation", Land Economics, 35 (August 1959), p. 274.

Given that the effects of underutilized loads are compounded by distance it is in the interest of these carriers to obtain the largest possible loads. Chow found that as LTL carrier length of haul increased, it was accompanied by significantly larger<sup>1</sup> loads than short haul LTL carriers. Hence, it may be argued that any possible scale effects due to terminal operations are counter-balanced by the costs of consolidating shipments over a wide area. The fact that short haul carriers tend to underutilize equipment suggests that output could be increased without a corresponding increase in costs.

In general, it seems that long haul costs are more directly variable with distance than short haul costs.

#### Summary

This chapter reviewed the theory of economies of scale and some of the more important literature on this topic. The question of whether economies of scale exist in motor transport has been actively debated over the last 20 years or so. Its importance stems from the argument that if no economies scale exist in motor transport deregulation should not introduce any tendencies toward undue concentration.

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<sup>1</sup>Garland Chow, "The Economics of Motor Freight", op. cit., p.358.

<sup>2</sup>Chow noted that LTL costs were about twice as sensitive to distance as TL costs. Given the larger loads shipped in LTL long haul carriers one could expect the same sort of relationship to exist.

It was argued that the early studies on economies of scale used relatively unsophisticated methodologies that did not account for the heterogeneous nature of motor transport output. More recent studies which have attempted to come to grips with this problem have found significant but weak economies of scale.

It was postulated that the LTL carriers would exhibit economies of scale. The basis for this argument related to the fixed investment in terminal operations. It was also postulated that as length of haul decreased and extent of geographic coverage increased that relatively more significant economies of scale would be found. This type of operation would exhibit high threshold costs. Finally, it was argued that in spite of economies of scale for the system that a new entrant only serving two points of that system may have lower costs and prices below the existing carrier.



## CHAPTER VI

### Destructive Competition

#### Introduction

This chapter will draw together the conclusions arrived at in previous chapters in order to assess the impact of structure on behavior. This is, it will discuss whether the conventional view is adequate in assuming that the structure of motor transport is such that a stable equilibrium would result in the absence of regulation.

First, the historical record will be discussed. This will include a brief discussion of the definition and prerequisites of destructive competition. The historical record will examine the economic conditions of the depression period in order to discuss the sources of destructive competition. Second, it will be argued while some doubt may be expressed as to the existence of destructive competition in the motor transport market it is clear that railroads were adversely affected by motor carrier competition. In addition, it is argued that the adverse impact of competition on the railroads contributed to the passage of motor carrier regulation. Third, the conventional argument as to the likelihood of destructive competition is reviewed. This will include reference to a period of de-regulation in Canada in the early 1950's. Finally, there is a review of the literature which will examine the stability characteristics of non-regulated motor carrier.

#### The Historical Record

Historically, a prime argument for the regulation of motor transport was that competition between carriers tended to be destructive or

excessive or cut-throat.

Unfortunately, economic theory does not provide a precise definition of the term. However, it is safe to say that excessive competition causes prices to be driven below average cost.<sup>1</sup> Economic theory suggests a number of conditions which could result in destructive competition. Scherer suggests that there are two chief prerequisites: capacity substantially in excess of current and probable future demands, and rigidities which retard the re-allocation of capital and labour toward growing industries. Therefore, "unless there is some artificial restraint such as a government price support program...or tightly knit cartel agreements, competition is likely to drive prices down to levels which yield investors much less than a normal return on capital".<sup>2</sup>

As far as motor transport is concerned an additional factor which may serve as a source for destructive competition is the prevalence of joint and common costs. Every forward haul creates a back haul as a

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<sup>1</sup> Destructive competition and predatory pricing have a common heritage in that though these terms tend to be given importance in popular economic history, standard theoretical analysis treats them as a form of non-maximizing (and to some extent, irrational) behaviour. The phrase "selling at a loss" is applied to both of these terms and usually refers to the use of a price which fails to cover short-run average cost. This definition produces a much higher figure than either short-run marginal cost or average variable cost, both of which are preferable on theoretical grounds. See Roland H. Koller, "The Myth of Predatory Pricing: An Empirical Study", Anti-trust Law and Economics Review 4 (Summer-1971) pp. 105-123.

<sup>2</sup> Frederick M. Scherer, Industrial Market Structure and Economic Performance. (Chicago: Rand McNally and Co., 1970), p. 199. It should be noted that Scherer agrees that this situation may occur in atomistic industries.

joint product. Since the back haul may be viewed as a cost incurred in producing the forward haul, the marginal cost of the back haul may be very low. However, if one carrier's back haul is another carrier's forward haul a situation may arise where the carrier's reduce the rates on the back hauls and drop round-trip rates below renumeration levels.

Given that certain motor carriers group a number of separate shipments on one truck the common costs are divided among the various shipments. These joint and common costs may be assigned on essentially an arbitrary basis. Furthermore, Spychalski points out that prices may fall below average total cost for some period of time if the carrier can only identify costs for specific commodities over specific distances and time periods.<sup>1</sup> An extension of the above argument is that new entrants may not have knowledge of the costs of running their enterprise. This may be termed the "irrational selling argument."

Finally, economic theory suggests that the presence of high fixed costs makes certain industries highly susceptible to breakdowns in pricing discipline. That is, in periods of declining demand "where demand falls below levels which will sustain capacity output, the profit-maximizing enterprise with fixed costs cut prices more sharply and suffers more severe erosion of profits than a similarly-inclined firm with low costs. This result is quite general, for marginal costs must fall more steeply with reduced output from the point at which (average total cost)

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<sup>1</sup> John C. Spychalski, "Criticism of Regulated Freight Transport: Do Economists' Perceptions Conform with Institutional Realities?" Transportation Journal (Spring, 1971), p. 9

is minimized for a firm with higher fixed and lower marginal costs at below-capacity production levels".<sup>1</sup>

The historical evidence of destructive competition in trucking is somewhat mixed. From the phenomenal growth of motor transport during the 1920's the depression of the 1930's reduced the flow of transport which resulted in more competition for that which remained. However, while the depression slowed the growth of motor transport it created economic changes which tended to favour motor transport. Specifically, the reduction in the size of orders and inventories placed a premium on the cost and service advantages of motor transport. Data indicate that despite the rapid decline of business activity during the depression the volume of intercity truck movement increased in absolute terms and in relative terms to rail traffic.<sup>2</sup>

The prevailing view of motor transport in the 1930's was that it was disorganized and unstable. Roberts argued that the basic reasons for the instability was "the relative ease of entry and the availability of large numbers of vehicles with small or no down payment, coupled with the fact that no special skills or training was required, made the trucking industry a haven for the unemployed of the other sectors of the economy".<sup>3</sup> Jackman, commenting on the Canadian situation, felt that the lack of training and skill of operators, plus their propensity

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<sup>1</sup>Scherer, op. cit., p. 193

<sup>2</sup>Merril J. Roberts, "The Motor Transport Revolution", The Business History Review, 30 (March 1956), p. 78.

<sup>3</sup>Ibid., p. 79

to cut prices, indicated that "the moral fibre of many of these men is lacking".<sup>1</sup>

Jackman also seemed to support the "irrational seller" argument. He stated that "...in most cases the truck owner has no knowledge of his costs and keeps inadequate, if any, accounts. He takes whatever business he can get at a rate which the shipper will pay, in the hope that his aggregate financial returns will be favourable...".<sup>2</sup>

The results of the conditions described above are summarized by Fair and Williams:

"...there was a surplus of transportation of all kinds. Competition became destructive. Large numbers of operators were engaging in motor transportation, their rates were not published. Many small operators were not aware of the costs of doing business and they made such rates as seemed required to secure traffic. Many of them failed and went out of business, but others promptly took their places. There was no rate structure, variations in individuals rates were wide, rates were constantly changing, charges to various shippers using the same carrier were often different and the service neither stable nor reliable. Shippers found it increasingly difficult to do business with motor carriers because of the unreliability of service and the financial unreliability of many of the carriers, and they were distressed at fluctuating rates and differential treatment...in order to encourage their freight costs in a period of depressed prices and business activity, (shippers) sought to capitalize as far as possible on the situation".<sup>3</sup>

To summarize, the historical record indicates the prevalence of excessive competition during the depression period. Given the decline

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<sup>1</sup>W.J. Jackman, Economic Principles of Transportation (Toronto: University of Toronto Press, 1935), p. 841.

<sup>2</sup>Ibid., p. 842.

<sup>3</sup>Marvin L. Fair and Ernest W. Williams, Jr., Economics of Transportation, Rev. ed., (New York: Harper and Bros., 1959), p. 488.

in demand and the relative ease of entry, competition did drive prices down. Furthermore, it is clear that shippers contributed to the resulting deterioration of service by attempting to minimize their short-run transportation costs.

While the relevance of the argument about destructive competition to modern motor-transport will be discussed below, some comments are in order concerning the historical record. First, the evidence indicates that motor transport costs were not static, indeed, they declined. Given the availability of used vehicles and cheap credit, plus the willingness of labour to accept lower wages, reduced the average costs. Indeed, if financial institutions were willing to defer any credit payments until the operator had built up traffic (and there is some indication that this in fact happened) the motor transport operator had negligible fixed costs in the short-run and lower variable costs.

Second, most of the historical/analytical accounts of the depression period emphasize the entry problem as opposed to the exit problem. That is, the authors of historical analysis do not emphasize that fact that firms did not exit the industry in the face of declining demand but rather that the rate of entry exceeded the rate of exit. It is likely that firms did not exit as quickly as they might have had relatively normal market conditions prevailed. Given the high unemployment of the period the re-allocation of labour was retarded. However, as has been discussed above, motor transport did in fact grow during the depression period and would tend to attract labour from other sectors. Also, given the availability of labour and trucks entrants probably did underestimate their costs and rates or over-

estimated their ability to capture traffic for their services.

Third, from a "theory of regulation" point of view it is clear that whatever the impact of competition on trucking per se it was the railroads with their high fixed costs that felt the brunt of motor transport competition. By 1931-1932, when the Duff Royal Commission held its hearings, truck competition was beginning to be recognized as one of the most serious problems for the financially ailing railways in Canada.<sup>1</sup> Though the Commission felt that regulation of road transport fell within provincial jurisdiction<sup>2</sup> it felt that "...because (the railways) are essential and because the railway rate structure implies conditions approximating to a quasi-monopoly, the railways require, if they are to continue to operate efficiently, a measure of protection from long distance road competition and in equalization of the conditions under which short distance traffic is carried".<sup>3</sup> This report is generally taken to represent the initial discussions of motor transport regulation in Canada.<sup>4</sup>

Jackman, writing in 1935, was much more direct in his support of the railways. He felt that regulation of motor transport was necessary "...to correct the abuses which have come into commercial

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<sup>1</sup>Cf. Canada, Royal Commission into Railways and Transportation in Canada, Report, (Ottawa: King's Printer, 1932).

<sup>2</sup>This position was later declared incorrect by the Supreme Court of Canada (1951) and the Judicial Committee of the Privy Council (1954) in (1951) 4 D.L.R. 529 and (1954) 4 D.L.R. 657.

<sup>3</sup>Royal Commission into Railways and Transportation in Canada, op. cit., p. 56.

<sup>4</sup>The Commission suggested that trucks be licensed only for operations within "reasonable" distances of manufacturing and distribution centres. It should be noted that the organized truckers appealed to the Commission for the imposition of minimum rate regulation.

business as a result of the vagaries of rate making by motor truck operators".<sup>1</sup> He argued that "...if, instead of the great mass of motor haulers there were only a few large concerns which were not operating on a cut-throat basis but were endeavouring to meet legitimate requirements of substantial business, the ascertainment of costs and the desirability of making rates on that basis would tend to introduce a vital morale into the business."<sup>2</sup> To this end Jackman suggested, the limitation of the number of motor vehicles; tests of the operator's equipment, fitness to operate, and conditions of operation; reasonable taxes on motor carriers; and, publication of tariffs by common and contract motor carriers.<sup>3</sup>

G.P. de Glazebrook was not quite as rigid in his thinking "...it is not sufficient to adopt the negative attitude that the country's investment in the railways must, above all things, be protected ... emphasis on different forms of transport changes from time to time, and it is neither wise nor possible to attempt to stop the hands of the clock".<sup>4</sup> Unfortunately, de Glazebrook's argument regressed to the view that railroads and motor transport should be contained within their respective "spheres" without specifying the dimensions of the spheres.<sup>5</sup>

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<sup>1</sup>W.T. Jackman, op. cit., p. 847.

<sup>2</sup>Ibid., p. 842.

<sup>3</sup>Ibid., pp. 860-880.

<sup>4</sup>G.P. de Glazebrook, A History of Transportation in Canada, (Toronto: Ryerson Press, 1-38), p. 452.

<sup>5</sup>Ibid., p. 452.



The first discussion of regulation in forms of the industry itself emerged in the 1939 report of a Royal Commission in Ontario.<sup>1</sup> Because of the rate cutting practices of the 1930's the Commission recommended that:

1. There should be no undue restriction or stimulation of the industry.
2. There should not be over-regulation of the industry.
3. Motor transport characteristics should be recognized.
4. Basic regulations of such items as safety should be applicable to all commercial vehicles, private and for-hire.
5. Regulations should be strictly enforced.
6. Cost of regulatory enforcement should not be excessive.<sup>2</sup>

The point is that while there maybe some evidence of excessive competition as far as motor transport per se is concerned, the regulatory imperative stemmed from the effect of motor transport competition on rail transport. This conclusion is not novel since writers such as Roberts have discussed the point at length. However, it should be recognized that the periods of "chaos" that led to trucking regulation were not confined to motor transport. For example, the phenomenal growth of trucking in the WWI period was due to the inability of the railroads to handle all traffic necessary to supply the war effort. The pattern of a railway disruption followed by a growth in motor transport and the inability of the railways to recapture traffic would be repeated a number of times in the future.

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<sup>1</sup>Ontario, Royal Commission on Transportation, Report, (Toronto: King's Printer, 1939).

<sup>2</sup>Royal Commission on Transportation, op. cit., pp. 151-152.

### Relevance of Destructive Competition

The debate as to the likelihood of destrutive competition occurring in motor transport in the absence of regulation seems to revolve about the issue of the tendency for excess capacity to remain rather than exit the market. That is, the failure to cover total costs, including a normal rate of return on investment, does not serve as a signal for de-investment and the exit of ecesss capacity.

Proponents of de-regulation argue that the situation which prevailed in the 1930's - an inelastic supply of labour, vehicles, and entrepreneurs - is unlikely to occur again in the future. Macroeconomic policies have tended to reduce the inelastic supply of labour to the industry and capital investment has increased markedly.<sup>1</sup>

However, Canadian opponents of de-regulation point out that a more recent example of "chaos" in motor transport occured during 1950-1954, which culminated in the passage of Motor Vehicle Transport Act.<sup>2</sup> In August, 1950 a nine-day railway strike created a pressing demand for long-haul trucking service. "Short-lived as it was, the strike was a notable test and demonstration for the trucking industry. It opened the door for an expansion of long-hand trucking that otherwise would probably have taken years to accomplish".<sup>3</sup>

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<sup>1</sup> John R. Meyer, Merton J. Peck, John Stenason, and Charles Zwicke. The Economics of Competition in the Transportation Industries (Cambridge: Howard University Press, 1959) pp. 216-217.

<sup>2</sup> 2-3 Elizabeth II, c. 59.

<sup>3</sup> D.W. Carr and Associates, "Truck-Rail Competiton in Canada" in Royal Commission on Transportation, Report Vol. 3 (Ottawa: Queen's Printer, 1961) p. 13.

While the rail strike of 1950 provided the impetus for an expansion of long-haul trucking, a legal battle was shaping up which would fundamentally affect motor transport regulation in Canada.

The case was first heard as S.M.T. (Eastern) Ltd. V. Winner in the Chancery Division of the New Brunswick Supreme Court. Reference was made by this Court to the Appeal Division of the New Brunswick Supreme Court on certain questions of law arising in the action, and it was there that the case was first decided.<sup>1</sup> The plaintiff (S.M.T. (Eastern)) was a large bus and truck operator in the Maritimes. He asked for an injunction preventing the defendant's Winner buses from picking up and discharging passengers within New Brunswick. Winner, a U.S. citizen, operated a bus line and held a license from the New Brunswick Motor Carrier Board which allowed him to carry passengers from the U.S. to Nova Scotia and New Brunswick. The license expressly prohibited him from intraprovincial transportation of passengers within New Brunswick.

The defence argued the New Brunswick Motor Carrier Act was ultra vires under 10(a) of Section 92 of the British North America Act. The defence argued that the New Brunswick legislature had exceeded its authority by legislating on motor transport regulation and hence the Act was null and void.

The Court found in favour of the plaintiff and declared the Act itself to be intra vires. The defendant appealed to the Supreme Court of Canada and the earlier decision was reversed.<sup>2</sup> In addition, the

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<sup>1</sup>(1950) 3 D.L.R. 207.

<sup>2</sup>(1951) 4 D.L.R. 529.

Supreme Court held that the Act was ultra vires, in that while provinces had the power to regulate intraprovincial road transport they could not regulate interprovincial or international road transport. The decision left unanswered the question of how a motor carrier's operations could be adequately segmented into intra and extraprovincial.

This problem was resolved in 1954 by the British Privy Council. Two appeals were launched; Attorney General for Ontario et al. v. Winner et al. and a cross appeal from the same decision entitled Winner et al. v. S.M.T. (Eastern) Ltd. et al.<sup>1</sup>

The Privy Council's decision dismissed the appeal and allowed the cross-appeal. The decision held that any provision of regulations which a province might make in regard to its roads must not interfere with interprovincial traffic. In addition, intraprovincial operations could not be separate from interprovincial operations of the same undertaking for the purpose of application of provincial legislation.

This interpretation left many of Canada's motor carriers free from any regulation at all. To fill the regulatory vacuum left by the Privy Council's decision the federal government passed the Motor Vehicle Transport Act of 1954 which delegated the federal government's power to regulate extraprovincial motor carriers to the provinces.

It has been argued that the regulatory vacuum developed during the entire period of the Winner decision. Hailey has argued that in the three years or so that it took to resolve

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<sup>1</sup>(1954) 4 D.L.R. 657. It should be noted that the number of parties interested in the case increased considerably in 1951. The additional respondents included the Attorney General of Canada, and the provinces of Ontario, Quebec, Nova Scotia, British Columbia, P.E.I., Alberta, CNR and CPR, as well as two large eastern carriers.

the Winner Case that many poorly qualified long-haul trucking companies had started operations.<sup>1</sup> Carr has stated that while costs were high many carriers made substantial profits.<sup>2</sup> Furthermore, of the many firms induced to enter the market after the rail strike many attempted to stay in the business but were forced to adjust rapidly to renewed railway competition. "For others who held on, but lacked experience and versatility it meant a gradual decline in profits that eventually forced them to abandon it (long-haul transport). This weeding out of the long-haul truckers apparently continued for several years after the rail strike".<sup>3</sup>

The two events described above: the railroad strike of 1950, which gave a vital boost to the growth of long-haul trucking; and, the years of the Winner decision, which caused a regulatory vacuum to develop, produced a situation which some have argued was similar to that which existed in the 1930's. However, "...it is important not to confuse normal adjustments in a dynamic market economy with destructive competition".<sup>4</sup> The failure of the railways coupled

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<sup>1</sup>A.F. Hailey, "An Appraisal of the Motor Carrier Industry" in J.-C. Lessard, Transportation in Canada, Royal Commission on Canada's Economic Prospects, (Ottawa: Queen's Printer, 1956) p. 148.

<sup>2</sup>D.W. Carr, op. cit., p. 13 ff.

<sup>3</sup>D.W. Carr, op. cit., p. 14.

<sup>4</sup>W.G. Waters II, "Public Policy and Transport Regulation: An Economic Perspective" in Karl M. Ruppenthal and W.T. Stanbury eds., Transportation Policy: Regulation, Competition and the Public Interest (Vancouver; Center for Transportation Studies, University of British Columbia, 1976), p. 17.

with a surge in demand for transport induced the entry of a large number of motor carriers. Following a period of intense motor carrier competition and the recovery of the railways a period of "weeding out" motor carriers took place. Whether or not this process represented destructive competition is open to debate.

Unfortunately, beyond these historical accounts very little empirical evidence is available to answer some important questions. During the "weeding out" period was there a high rate of entry of firms? Was there a surge in the rate of bankruptcy? What was the competitive situation at the intraprovincial level? "...It is possible to have markets with destructive competition in an economic efficiency sense (that is, with prices below long run costs of production). However, it is unlikely that these circumstances actually exist or that they would persist over time. In any case their real economic significance is open to question".<sup>1</sup>

The question reverts to the exit of excess capacity. That is, given the characteristics of trucks is there some reason for the slow withdrawal of excess capacity. Kahn argues that there is no reason for excess capacity to remain for any prolonged period of time. In reference to vehicles he states:

"...their depreciation (is) far less subject to obsolescence, which is a function only of time and a fixed cost, and far more a function of their rate of use, hence a variable cost. It also means that motor-carried companies are within very short periods of time constantly facing the decision of whether to replace their capital equipment and are in a position therefore to do so only if prices cover average total cost.... Second, the investment involved in each is comparatively small. The consequence is that truckers can increase their capacity in small increments, thereby greatly diminishing the

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<sup>1</sup>W.G. Waters II, op. cit., p. 17.

pervasiveness of excess capacity. Contrast their situation with that of industries where producers are few and the economics of scale are such that they must build capacity ahead of demand in large jumps. Third, they are mobile. The capacity can, without any difficulty at all, be transferred from one market to another; there is no reason, therefore, for excess capacity to hang over any one part of the market for extended periods of time, as long as demand in other markets is growing".<sup>1</sup>

The proviso that demand in other markets is growing is central to Kahn's agreement. He does not answer the question of the propensity to destructive competition based on slow exit of excess capacity in situations where demand in other markets is not growing. Furthermore, implicit in Kahn's agreement is that the levels of fixed costs are very low.<sup>2</sup> As has been discussed previously this is not necessarily true.

Miklius and DeLoach have argued that assuming a reduction in demand the tendency for motor carrier operators to disregard losses may be due to the overstatement of the true opportunity costs of the owner-driver, "... the loss at which a trucking operation may appear to be running may be due to an application of an incorrect imputed wage".<sup>3</sup> The application of the "correct" imputed wage may be difficult because of the problem of quantifying the "independence" factor. This

<sup>1</sup>Alfred E. Kahn, op. cit., pp. 188-190.

<sup>2</sup>Cf. Robert K. Shirley, "Analysis of Motor Cost Formulae Developed by the Interstate Commerce Commission" Transportation Journal 8 (Spring, 1969), pp. 21-27. Shirley argued that for many carriers that fixed costs were approaching 20-30% of total costs.

<sup>3</sup>W. Miklius and D.B. DeLoach, "A Further Case for Unregulated Truck Transportation" Journal of Farm Economics 47 (November, 1965), p. 937.

argument does not apply to entrants to the market who tend to over-estimate their revenues. However, Miklius and Deloach argue that given a learning function revenues will be correctly projected and rather than leading to destructive competition will lead to a joint supply equilibrium:

"... a trucker would not undertake a trip unless his expected revenue for the round trip would at least equal expected cost. The revenue from the first leg of the trip is usually known at the start of the round trip (as in the case of an offer from a shipper); the return trip, however, may yield various amounts (including zero), each amount being associated with some probability. Since a trucker is faced with a probability function of revenue on his return trip his realized revenue on any particular trip may not cover his variable (out-of-pocket) costs. Thus, the situation described by Nicholson implies a continuing error in estimating return trip revenue. Although occasional errors will be made, learning is expected to eliminate the source of error which would cause truckers to continually over-estimate their return trip revenue. In the long, run, market entry and exit of firms has to be relied upon for the movement toward joint supply equilibrium". <sup>1</sup>

However, assuming the existence of some indivisible costs and net traffic is imbalanced, if all carriers do not allocate these indivisible costs in the same manner the long run adjustment to a joint supply equilibrium postulated by Miklius and Deloach may not occur.

The dynamic process of shifting demand may make it difficult to achieve a joint supply equilibrium or to learn from past mistakes.

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<sup>1</sup>W. Miklius and D.B. Deloach, op. cit., p. 937. It should be noted that Nicholson argued that the carrier would indeed know his round trip expenses and would have no incentive to begin a round trip if he did not expect to cover his variable costs. However, Nicholson argued that in general, the excess capacity generated by the back-haul would tend to depress rates. Cf. Howard E. Nicholson, "Motor Carrier Rates and Minimum Rate Regulation" The Quarterly Journal of Economics 72 (February, 1958), pp. 139-152.



For example, the demand for transportation in one direction only may cause a high rate to be charged to cover the round-trip costs. If, a low rate will stimulate demand in the opposite direction it may be offered up to the point where any unutilized capacity is absorbed. If the high-rated freight should cease to move the low-rated commodity will be forced to pay a higher rate or not move at all.<sup>1</sup> Such a rate structure tends to be unstable as competition forces low rated traffic to become the main source upon which full costs must be recovered.

The concern about the effects of destructive competition played an important role in the emergence of motor carrier regulation. Presently, the same concern is used to attempt to dissuade policy maker from pursuing deregulatory practices. It is clear that a prime force for motor carrier regulation came from the railroads which were adversely affected by motor carrier competition. It may be argues that the continuing railway crisis plays an important part in the continuation of motor carrier regulation.<sup>2</sup>

Apart from the limited information on destructive competition in the 1930's there are some additional sources of information which

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<sup>1</sup> John C. Spsychalski, op. cit., p. 13. Spsychalski's article is one of the first which discusses the possible effects of market power on the buyers side of the market. Concessions to powerful shippers may take the form of price discrimination. While little is known about the incidence of buyer concentration in motor transport, and given it is inherently difficult to control because of the possibilities of product differentiation, the net effect may be to reinforce a move to a general rate level that may not cover total costs, especially if there is a large fixed and joint cost segment. In addition, buyer concentration may cause radical shifts in demand for carriers.

<sup>2</sup> Cf. George Stigler, "Theory of Regulation", Bell Journal of Economics and Management Science, 2 (Spring 1971), pp. 3-21. Stigler argued that one of the effects of regulation is to allow outsiders to exert a powerful influence on the industry.

shed some light on the topic. If the motor carrier industry were unstable one would expect that the rate of business failure would be greater for motor carrier than either the national average or the failure rate for firms with similar economic characteristics.

McLachlan argued that "... on the basis of (a) limited amount of information the failure of trucking and warehousing does not appear to be any worse than that of two other compatible Canadian industries".<sup>1</sup>

McLachlan's analysis does not answer the question since regulation, if effective, would presumably restrict entry and reduce the rate of business failure.

The fact that Canada has a variety of regulatory schemes would allow one to test whether an unregulated province like Alberta has a significantly higher rate of motor carrier failures than a regulated province such as Ontario. Bailie attempted this type of analysis and his results suggest that the number of bankruptcies do not seem to be related to provincial regulation, however the causes of bankruptcy are related.<sup>2</sup> Of the 2066 bankruptcies from 1950-1972 in Canada Alberta had 166 as compared to 710 in Ontario and 957 in Quebec. However, because Bailie did not have data on the total number of firms by province per year nor the entry and exit per year. Hence, Bailie does not generate a rate of failure.

In terms of causes of bankruptcy, Bailie noted that about 13

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<sup>1</sup>D.L. McLachlan, "Canadian Trucking Regulations" The Logistics and Transportation Review 8 (1972), pp. 59-81.

<sup>2</sup>J. Gerald Bailie, Trucking Bankruptcies in Canada 1950-1972, (Ottawa: Transport Canada Unpublished Paper)

percent of bankruptcies in Alberta were due to "undue low rates and excessive competition" whereas this reason was stated only 9.1 percent for all of Canada. Unfortunately, these data were obtained from bankruptcy forms and the bankrupt were asked to state the reasons for the business failure. The responses may have been conditioned by the prevailing regulation. For example, low rates and excessive competition were cited in 13 percent of the cases, as opposed to about 6 percent for Ontario and Quebec. However, "lack of work" was cited in about 13 percent of cases in Alberta as opposed to 22 percent for Ontario and 29 percent in Quebec. A priori, one would expect that any excess capacity in Alberta would be reflected in one or both of these reasons. The fact that the results of Alberta stand out against those of Ontario and Quebec in terms of the relative importance of "competition" and "lack of work" suggests that the Alberta results may be biased.

The Australian experience with de-regulating motor carriers indicated that "...instability and destructive and wasteful competition so frequently forecast by established road haulage interests as the inevitable outcome of free entry have not been apparent".<sup>1</sup> There was a period of intense competition immediately following de-regulation which was damped by labour and highway weight limit regulation. That is, "... a combination of economic attrition and the stricter enforcement of load limits and driving-hour regulations slowly weeded out the weak, so that by late 1957, a state of uneasy equilibrium had been

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<sup>1</sup>Stewart Joy, "Unregulated Road Haulage: The Australian Experience", Oxford Economic Papers (July, 1964), p. 275.

attained".<sup>1</sup>

Joy noted that the basis of the industry in the individual owner-driver, operating as a subcontractor for larger firms. He noted that a small group of nation-wide haulers offering comprehensive service from smalls and parcels to full loads operated between all state capitals.

"The reasons for the size of these particular firms that they either grew out of already well-established local cartage firms, or as new entrants their management was adequate for the period of growth of the firm ... and they offer comprehensive service in the parcels and smalls field..... With their own fleets and access to a large number of subcontractors, many of whom prefer to work exclusively for them because of regular work and reliable payment, the larger firms can command higher rates from shippers than can owner-drivers having only a limited number of vehicles and customers. Such higher rates include a premium for the larger firms ability to handle a widely fluctuating volume of traffic from each shipper". 2

Joy comments on the importance of terminals in LTL traffic:

"The growth of a few larger firms, once they have crossed over some as-yet-unmeasured threshold of capital for terminals, or of turnover, is evidence of economies of scale, not in road haulage but in parcels and smalls groupage and agency functions. Two separable products are involved, 'terminal' operations, and the line haul, which is predominantly purchased wholesale from subcontractors". 3

Joy also noted that de-regulation of motor carrier did not cause the demise of railways. In fact, motor carrier de-regulation forced the railways to become more efficient by standardizing equipment and specializing in line-haul (that is moving out of LCL operations).

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<sup>1</sup> Ibid., 276-277. The results of the enforcement of load limits and hours of operations may be interpreted to suggest that these non-economic forms of regulation are substitutes for economic regulation.

<sup>2</sup> Ibid., p. 279.

<sup>3</sup> Ibid., p. 279.

While some care must be applied in relating these outcomes to the Canadian environment it seems safe to say that the Australian experience conforms to the relationships between output and structure described in the previous chapters. On the other hand one could argue that the continued growth of large firms (with the subcontractors absorbing fluctuations in demand) may be more cause for concern than destructive competition.

As Westfield has pointed out "... if the social optimum ... described by the price-marginal cost equality could be brought into being by a costless restructuring of the regulated industry into one behaving like a competitive industry, then the social choice is trivial".<sup>1</sup> However, if pure competition or its simulation are not viable alternatives to the regulated status quo and the outcome is oligopoly "... it is not a valid proposition that the entry of firms, threats of entry, and oligopolistic rivalry will be an improvement over regulated monopoly".<sup>2</sup>

### Summary

This chapter discussed the prerequisites of destructive competition, examined the historical record in Canada of destructive competition, and reviewed the literature concerning the stability of motor carrier operations in the absence of regulation.

Some doubt was cast upon the appropriate definition of destruction

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<sup>1</sup>Fred M. Westfield, "Methodology of Evaluating Economic Regulation" American Economic Review - Papers and Proceedings, (May, 1971), p. 211.

<sup>2</sup>Ibid., p. 211

competition. It was argued that while destructive competition may have occurred in the motor transport industry during the depression era the mode most seriously affected by motor carrier competition was the railroads. In the period of declining demand and substantial excess capacity the railroads, with their very high fixed costs, felt the blunt of motor carrier competition.

However, drawing upon conclusions arrived at in Chapter IV and Chapter V it was argued that at present a greater propensity for destructive competition may exist. That is, due to the present importance of fixed costs to total costs and the development of terminal systems, which are composed of long-lived, relatively immobile assets, that free entry to points on a system may result in destructive competition. In addition, it was argued that the conventional argument concerning the stability of motor transport may be questioned. The increase in importance of fixed costs plus the indivisibility of certain costs suggested that the stable equilibrium may not be attained.

Studies which attempted to assess the stability characteristics of non-regulated motor transport were reviewed. No firm conclusions could be drawn from Canadian research on the rate of bankruptcy between regulated and non-regulated jurisdictions. A review of the effects of de-regulation of motor carriers in Australia lends some tentative support to the arguments developed in Chapters IV and V. That is, the industry became highly concentrated in the LTL short-haul extensive geographic coverage markets due to economics of scale of LTL operation.

It was noted that immediately after de-regulation in Australia there was a period of intense competition which was brought under

control by load limit regulation and control of hours of operation. This suggested that some of the so called forms of non-economic regulation may be substitutable for economic regulation. It was assumed that in spite of free entry smaller firms would not attempt to capture particular markets in a system in the face of consumer demand for the LTL service and the existence of economies of scale. However, due to the lack of information about the Australian experience it was felt that caution must be exercised in any attempt to generalize from this situation.

## CHAPTER VII

### Measuring The Effects of Regulation

#### Introduction

This chapter will examine two important studies which attempt to measure the effects of regulation on rate levels. The methodology employed is to isolate the effects of regulation on rate levels for regulated Canadian carriers by means of multiple regression analysis.

The implicit assumption in both of these studies is that the market structure of carriers in non-regulated jurisdictions is inherently competitive and would lead to acceptable conduct and performance. Jurisdictions which regulate entry and rates increase or sustain the economic power of the industry. In short, regulated jurisdictions produce or sanction cartels.

The differing regulatory environments in Canada would seem to present an ideal opportunity to test this hypothesis. It must be assumed that the structure of the motor carrier industry is sufficiently homogeneous across all provinces so as to allow for meaningful comparisons.

In essence, these studies attempt to assess the effects of structure on performance. This methodology may be seen as an extension of the producer protection hypothesis. This hypothesis assumes that given an assumed competitive structure any non-competitive behavior and performance is sufficient to argue that regulation has altered the competitive structure.

In this chapter the producer protection hypothesis is reviewed



and two of the more important studies on rate effects of regulation are discussed in detail. Whereas Chapters 1 to 6 examined the conventional arguments of structure to behavior, this Chapter 7 will examine the relationship between structure and performance.

### The Producer Protection Hypothesis

In the following section two of the more important studies on the effects of regulation are examined. These studies were selected because they are representative of a common technique used to evaluate regulation. That is, that rates of regulated motor carriers are significantly higher than rates of unregulated motor carriers. In essence, what these studies attempt to do is to evaluate the performance of regulated motor carriers.

Performance is a multi-dimensional concept in industrial organization theory. Stated in simple terms performance is an appraisal of the divergence between actual and potential performance indicators. As Bain has noted" . . . (it) is the crucial indicator of how well the market activity of the firm has contributed to general material welfare".<sup>1</sup>

Economists studying unregulated industries seem to have reached a reasonable degree of agreement on the major dimensions of industrial performance. Caves summarized these dimensions as follows:

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<sup>1</sup>Joe Bain, Industrial Organization, 2nd ed., (New York: John Wiley and Sons Inc., 1968), p. 372.

"The amount of resources in an industry should be just large enough that the marginal value of its output equals marginal cost. This basic condition for proper resource allocation we normally test by examining rates of return. Resources within a sector of the economy should be combined efficiently, with plants large enough to exhaust economies of scale, technology, and with input combinations chosen optimally, and horizontal and vertical integration pushed far enough to exhaust economies in these directions. Enough resources (and no more) should be devoted to sales promotion and providing information to consumers. Enough resources (and no less) should be devoted to the pursuit of innovations in products and technology. Finally, some would add performance tests relating to the adaptability of an industry's market price and investment rate to national goals of stabilizing employment, promoting growth, and avoiding inflation".<sup>1</sup>

Once regulation has been introduced to an industry the analysis of performance takes a slightly different form. The emphasis shifts to an analysis on the effects of regulation on performance. Hence, ". . . the appraisal of direct regulation of an industry depends on measuring the differences between going market performance under regulation and its potential performance under some different regulatory standard or alternative system of social control".<sup>2</sup> Though this point is implicit in many of the analyses of regulated industries, it is rarely made explicit.

This point of view requires that the structure, conduct, performance paradigm existing under one state of affairs may be compared

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<sup>1</sup>Richard E. Caves, "Direct Regulation and Market Performance in the American Economy", American Economic Review - Papers and Proceedings, 54 (May 1964), p. 172.

<sup>2</sup>Ibid., p. 173.

with the theoretical or actual paradigm under another state of affairs. Industrial organization economists have long recognized that it is difficult to evaluate performance given any particular structure and conduct situation.<sup>1</sup> Yet many are willing to compare differential performance indicators and argue that any differences between the two must be due to regulation and regulation alone.

The willingness to make these types of analyses is a function of the strength of the belief that the structure of motor transport is inherently competitive. Though not usually stated, the arguments concerning regulation and performance may be framed as a variant of the producer protection hypothesis.<sup>2</sup> The essence of this hypothesis is that the actual effect of regulation is to increase or sustain the economic power of an industry; in short, to produce or sanction a cartel.

As stated by Jordan one would expect to find, inter alia; such thing as ". . . increasing prices, promoting price discrimination, reducing or preventing entry of rival firms, and increasing industry profits".<sup>3</sup>

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<sup>1</sup>Cf. Almarin Phillips, "Structure Conduct and Performance - and Performance, Conduct, and Structure" in J. W. Markham and C. F. Papenek, eds., Industrial Organization and Economic Development, (New York: Houghton Mifflin Co., 1970), p. 29. "We can neither predict market performance from market structure, nor can we tell from structure alone how competitive the processes of the market are".

<sup>2</sup>Cf. William A. Jordan, "Producer Protection, Prior Market Structure, and the Effects of Government Regulation", Journal of Law and Economics 15 (April 1972), ppp. 151-176.

<sup>3</sup>Ibid., p. 153.

One implication of this hypothesis is that it is regulation per se and not the form of regulation which creates the cartel conditions. Economists which have attempted to isolate some regulatory effects find themselves using the same piece of evidence to support different arguments. For example, Snow argues that the capitalized scarcity value of operating rights is a function of rate regulation and then proceeds to argue that the value of operating rights are proof that entry control increased rates.<sup>1</sup>

Another implication of this hypothesis is that the fact that higher prices, higher profits, and price discrimination exist is taken as proof that there is a cartel. Generally speaking, there is a body of research which tends to support the view of higher prices, etc. However, the results are by no means conclusive because of comparability problems.

Evidence for the high price argument stems from research into the "before" and "after" rates for poultry (fresh and frozen) and fruits and vegetables as a result of placing these items in the exempt commodity category. A U.S. Department of Agriculture Study found that rates dropped by 35 per cent on fruits and vegetables and service improved.<sup>2</sup> However, it is generally agreed that these

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<sup>1</sup> John W. Snow, "The Problem of Motor Carrier Regulation and the Ford Administration's Proposal for Reform" in Paul W. MacAvoy and John W. Snow, eds., Regulation of Entry and Pricing in Truck Transportation, (Washington, D.C.: American Enterprise Institute, 1977), pp. 3-23.

<sup>2</sup> James R. Snitzler and Robert J. Byrne, Interstate Trucking of Fresh and Frozen Poultry under Agricultural Exemption, U.S. Department of Agriculture, Marketing Research Division, MRR-224, March 1958.

results must be interpreted with caution since the characteristics of the shipment and equipment changed.

Second, the fact that motor carrier operating rights have a scarcity value is taken as proof that rates are too high. That is, the fact that these operating permits have value is evidence that they are generating monopoly rents.<sup>1</sup>

Third, the increasing importance of private motor carriage is taken to be an important indicator that prices are too high. This is considered to be a potent argument since private carriers are not allowed to generate back-haul traffic.<sup>2</sup> However, Steussey argues that despite the importance of regulatory cost differences for for-hire and private carriers it is the nature of transport service that makes private carriage more attractive than for-hire.<sup>3</sup>

The fact that motor carriers price discriminate has also been the subject of research.<sup>4</sup> For example, high valued goods are charged higher rates than low valued goods - even though the transportation and handling characteristics would be virtually identical.<sup>5</sup> However,

<sup>1</sup>Cf. James C. Miller, "Special Discussants Comments" in Proceedings of a Workshop on Motor Carrier Regulation (Washington, D.C.: National Academy of Sciences, 1978), pp. 290-293 and sources cited therein.

<sup>2</sup>Cf. Drake Sheahan and Stewart Dougall, Private Carriage Motivation and Impact of Rural Location PS-50367 (Washington, D.C.: Prepared for the U.S. Department of Transportation, 1975).

<sup>3</sup>Dwight Steussy, "The Economic Determinants of Private Trucking" (Ph.D. dissertation, George Washington University, 1973).

<sup>4</sup>Josephine Olson, "Price Discrimination by Regulated Motor Carriers, American Economic Review (June, 1972), pp.345-402.

<sup>5</sup>John W. Snow, op. cit., p. 18.

Roberts and Simmie have argued that "price discrimination is a likely outcome under either regulation or de-regulation. ". . . certainly an unregulated carrier would be in a position to attempt price discrimination, especially in markets where rail competition is not a factor."<sup>1</sup>

Given these rather limited examples of the effects of regulation and their bearing on either structure or conduct it is necessary to examine a performance indicator. The available research has not been able to find that these effects are manifest in the rate of return. That is, one finds no excess profits. For example, Jordan noted ". . . all-in-all it is clear that regulated industries . . . are not assured of profits."<sup>2</sup> McLachlan noted ". . . it would appear that by far the largest proportion of the evidence indicates that truckers' profits have been much the same under competition or regulation".<sup>3</sup>

The implications of this result may be interpreted as follows. If there are no differences in the rate of return between regulated and unregulated carriers, and if it may be shown that rates are higher for regulated than unregulated carriers, then costs for regulated carriers must be higher. While Snow would place the blame

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<sup>1</sup> John Roberts and Peter Simmie, "Profits Price Discrimination and Entry: The Motor Carrier Industry in Differing Regulatory Environments" in Proceedings of a Workshop on Motor Carrier Regulation, op. cit., p. 381.

<sup>2</sup> William A. Jordan, op. cit., p. 175.

<sup>3</sup> D. L. McLachlan, "Canadian Trucking Regulations" The Logistics and Transportation Review, 8 (1972), pp. 59-81.

for these higher costs clearly on regulation the fact remains that there are other sources for these higher costs such as higher input compensation, or relatively more x-inefficiency, or over-service.

If costs are increased due to regulation then ". . . such costs are dead losses to the economy, no matter what other allocations exist, since it is always desirable to expend as few resources as possible in providing a service. Any saving can generate additional goods and hence is preferable in terms of Paretian optimality. Second-best considerations do not hold here, for, as Mishan has pointed out, it is always desirable to eliminate imperfections that lead to smaller output,"<sup>1</sup> The regulatory effects in question here relate to licenses which restrict the commodity carried or the routes and tend to result in the underutilization of capacity.

In the light of the above discussion the Canadian case takes on special importance. As Maister has pointed out:

"Opportunities to trace the impact of de-regulation are few and far between, and, independent of the methodological problems of resolving whether this has been 'good' or 'bad', the generalization of the results of such experience is complicated by the fact that most of them have taken place in foreign countries, with specific industry structures, competitive conditions, and institutional framework, or have occurred in highly specialized areas of the trucking industry (for example, agricultural movements in the United States and dump-truck operations in the province of Ontario in Canada".<sup>2</sup>

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<sup>1</sup> Thomas G. Moore, "De-regulating Surface Freight Transportation" in Almarin Phillips, ed., Promoting Competition in Regulated Markets. (Washington, D.C.: The Brookings Institution, 1975), pp.57-59. It should be noted that service competition may yield benefits to shippers and hence the benefits must be subtracted from the losses.

<sup>2</sup> David H. Maister, "Regulation and the Level of Trucking Rates in Canada" in Proceedings of a Workshop on Motor Carrier Regulation, op. cit., p. 199.

Of the empirical analyses cited in the motor carrier regulatory debates, the Canadian case is unique in being based primarily on cross-sectional analysis as opposed to time series analysis. This avoids the problem of changes in market conditions and other exogenous factors during the period of analysis. In addition, the Canadian case is of particular interest to the United States, since of all countries, its economy and motor carrier industry bear the closest resemblance to those of the United States.<sup>1</sup>

### The Sloss Study

One of the more important studies on the effects of regulation, surely one of the most quoted, is the analysis of rates carried out by James Sloss.<sup>2</sup> Sloss attempted to measure the rate effects associated with the provincial regulation of the motor transport industry. He felt that "province-to-province differences in regulation in Canada produce statistical information on the for-hire motor truck industry making it possible to estimate the rate levels associated with particular degrees of regulation".<sup>3</sup> The analysis was extended to the for-hire industry in the United States and suggested that the same conditions may account for increased motor freight charges of some \$300 million per year.

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<sup>1</sup>Ibid., p. 199.

<sup>2</sup>James Sloss, "Regulation of Motor Freight Transportation: A Quantitative Evaluation of Policy" The Bell Journal of Economics and Management Science 1 (Autumn, 1970), pp. 327-366.

<sup>3</sup>Ibid., p. 327.



Sloss examined the motor transport regulation which existed in the ten provinces over the period 1958-1963 and classified them into two groups:

<u>Regulated</u>	<u>Unregulated</u>
British Columbia	Alberta
Saskatchewan	Ontario
Manitoba	New Brunswick
	Nova Scotia
	Prince Edward Island
	Newfoundland

Dividing the provinces into the regulated and unregulated categories Sloss proceeds to fit the following regression equation:

$$(1) \hat{Y} = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + u$$

where:

$\hat{Y}$  = Estimated average revenue per ton-mile for the years 1958-1963 for each province

$X_1$  = Average length of haul

$X_2$  = Average net weight per loaded vehicle

$X_3$  = Average fuel tax per gallon

$X_4$  = Average license costs per truck or tractor per year

$X_5$  = Average annual wage per employee

The regression equation was applied to intraprovincial and extraprovincial and international trucking. His first attempt at fitting this regression was successful, however, he noted that "the experimental trials portended generally successful results, subject, however to certain modifications".<sup>1</sup>

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<sup>1</sup>Ibid., p. 358.

The modifications consisted of dropping Prince Edward Island and Newfoundland from the analysis and shifting Quebec from the regulated to the non-regulated category. Sloss justified these changes on the following grounds:

"Newfoundland and Prince Edward Island were excluded from the model because of (1) the relatively small size of their for-hire populations, (2) their insular locations, resulting in unique transportation problems, (3) caution expressed in D.B.S. reports that estimates for these provinces contained a large degree of sampling error, and (4) the impracticality of prorating to these provinces a reasonably accurate share of their costs and revenues when published in consolidated form for the Atlantic Provinces as a whole".<sup>1</sup>

Sloss justified the change in classification of Quebec from regulated to unregulated on two grounds; first, that initial analysis "produced results for this province which differed markedly from a priori expectations and from results calculated for other provinces which had been classified as 'regulating'".<sup>2</sup> Second, that while the Quebec Transportation Board clearly had the power to adjust rates and restrict entry Sloss noted that, "the Annual Reports of the Quebec Transportation Board attest to the Board's adherence to a policy of unusual liberality in its regulation of trucking, both in rates and in permitting entry of new firms and expansion of service by existing firms".<sup>3</sup>

Having made these modifications Sloss proceeds to fit the regression and perform "residual analysis". That is, rather than focus

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<sup>1</sup>Ibid., p. 358.

<sup>2</sup>Ibid., p. 340.

<sup>3</sup>Ibid., p. 340.

on the significance of the independent variables he concerns himself with the coefficient of determination ( $R^2$ ) of the regression equation and the distribution of the residuals.

The logic of the procedure is that the independent variables are cost variables and since these variables "may not have been, themselves, affected by regulation"<sup>1</sup> the effects of regulation would be absorbed by the error term. Therefore, Sloss identifies the residuals for the regulated and non-regulated provinces and uses a "t-test" to test for significant differences in the means of the two groups of residuals. Given the possibility that the two groups of residuals are not distributed normally Sloss used a non-parametric chi-square test (a 2 x 2 contingency table) to compare the observed frequency of the residuals and the expected frequency. Sloss expected the residuals from the regulated provinces to be positive, above the regression line, and the residuals from the unregulated provinces to be negative, below the regression line.

He fitted the regression using the intra-provincial data only:

$$(2) \hat{Y} = 9.7691 - .0102X_1 - .7779X_2 + .1983X_3 \\
\begin{array}{ccc}
(.0056) & (.1807) & (.0740) \\
- .0096X_4 + .0021X_5 \\
(.0029) & (.0007)
\end{array}$$

$$R^2 = .7241$$

$$\text{Standard Error of Estimate} = 1.1667$$

$$n = 48$$

The results of fitting the regression equation above indicate that about 70% of the variation in intra-provincial rates is explained

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<sup>1</sup>Ibid., p. 342.

by the five independent variables. Though Sloss does not include the "F" statistic, it is significant at the 5% level.

Before going on to examine the statistical results it is necessary to discuss his methodology. Sloss admits that the problems of identifying which provinces are regulated and which are not. In fact, it may be argued that the classification is based largely on a subjective evaluation. "In point of fact, classification was anything but easy. Variations in the phraseology of the provincial statutes, in combination with the diverse interpretations and degrees of enforcement of these statutes by the regulating authorities, have made the allocation process quite judgmental".<sup>1</sup> Therefore, the shifting of provinces from the regulated to the non-regulated category - such ex post alterations of data are generally considered to be suspect - may be excused to some extent.

Sloss has used the technique of residual analysis in a rather special way. This technique is usually applied to determine if the residuals of a regression are normally distributed. However, Sloss uses the technique to argue that the unexplained variation is in fact a proxy for regulation and that the pattern of the residuals reveals certain facts about the costs of regulation.

For example, Sloss assigned the residuals to the regulated and non-regulated categories, calculated the means of the residuals for the two groups, and used a "t-test" to indicate that there was

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<sup>1</sup>Ibid., p. 334.

a significant difference in the means. The residuals were placed in a 2 x 2 contingency table (with "regulated" and "non-regulated" classifications on the vertical axis and "<sup>+</sup>t" and "-" on the horizontal axis) which produced a 4 cell matrix. He carried out a chi-square test and found that the calculated chi-square was significantly different from zero at the 2% level. Therefore, he argued, "this pattern of residuals is assumed to have followed from significantly higher prices in the regulated provinces".<sup>1</sup>

Given a difference of .8672 cents per ton-mile in the means of the residuals Sloss argued that when difference is multiplied by the number of ton-miles the transportation cost savings that could have been achieved over the time period were in the order of \$10 million per annum.

Though Sloss's use of residual analysis has some merit, the fact remains that the error term represents all influences not specified as independent variables. Therefore, factors such as geographic characteristics, commodity mix, load characteristics such as TL and LTL traffic, regulatory features other than entry and rate regulation (for example, weight restrictions), etc. are included.

Sloss does not discuss the features of equation (2), however, there are some unusual results. For example, the coefficient of variable  $X_4$  (the average annual license cost) is negatively related to the average rate per ton-mile. A priori, one would expect a positive relationship. Furthermore, the fact that the simple

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<sup>1</sup>Ibid., p. 344.

correlation coefficient between average annual license costs and average annual wage per employee is greater than the  $R^2$  value. Klien has argued that such an occurrence may indicate harmful multi-collinearity. Harmful multi-collinearity may be defined as that which causes the signs of the independent variables to change. The negative sign for  $X_4$  may be due to multi-collinearity, however, since this is not an important variable (the simple correlation between  $X_4$  and the average rate per ton-miles is  $-.214$ ) further tests are required.

In addition, the variable  $X_1$  (the average length of haul) is insignificant. The implication that the length of haul is not related to the average rate per ton-mile is indeed surprising. A priori, one would expect a strong relationship. In fact, one could expect a negative relationship to account for a distance taper.

Sloss proceeded to fit regression (1) using inter-provincial data. Though the  $R^2$  was high the pattern of the residuals did not indicate any excess revenue per ton-mile attributable to regulation. That is, there was no significant difference in the means of the residuals from regulated and unregulated provinces. When the intra-provincial data was pooled with inter-provincial (including international traffic) data the results found for regression equation (2) held.

One feature of the consolidated fit is that the variable  $X_1$  (average length of haul) has a negative sign, however, the coefficient is insignificant. In all three regressions variable  $X_4$  (average annual license fee per year) retains the negative sign.

From the consolidated data Sloss finds a difference in the

residuals of .6929 cents per ton-mile which translated into \$16 million per year of excess revenues of rates per ton-mile.

Though Sloss did not explicitly attempt to relate the pattern of residuals for inter-provincial trucking to the price coordinating effects of rate or tariff bureaus he stated that "these organizations . . . were conceptually in a position to enforce a measure of control over prices of their own. This control may or may not have replaced or enhanced the effects of regulation."<sup>1</sup>

Following his analysis of the Canadian motor transport industry Sloss applied his analysis to the U.S. Using an Interstate Commerce Commission annual statistical series for 1958 through 1963 which applied to motor carriers, Sloss consolidated geographic regions for Class I and Class II carriers. Since no comparable U.S. data were available regarding fuel taxes this variable was dropped from the regression equation.

The equation for the U.S yielded:

$$(3) \hat{Y} = 20.0607 - .0166X_1 - 1.4081X_2 + .0032X_4 + .004X_5$$

(.0021)      (.1667)      (.0006)      (.0002)

The re-estimated equation for Canada, grouping all traffic, but excluding the fuel tax variable was:

$$(3) \hat{Y} = 14.8294 - .0067X_1 - .6331X_2 - .0058X_4 + .0006X_5$$

(.0027)      (.1471)      (.0025)      (.0006)

Sloss felt that "a moderately close resemblance between the signs and coefficient values in the two equations is obvious; only

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<sup>1</sup>Ibid., p. 354.

the signs for the variable ( $X_4$ ), average annual license costs, were in disagreement".<sup>1</sup> All the coefficients in each equation were significant except for  $X_5$  the average annual wage per employee

Sloss proceeded to combine the U.S. and Canadian data and fitted the regression again.

This resulted in the following:

$$(5) \hat{Y} = 14.7933 - .0095X_1 - .8221X_2 + .0004X_4 + .0004X_5$$

$$(.0015) \quad (.0808) \quad (.0005) \quad (.0001)$$

$$R^2 = .7406$$

Standard Error of Estimate 1.0374

n = 102

The residuals were allocated between regulated and non-regulated sectors: the three Canadian provinces of Manitoba, Saskatchewan, and British Columbia, as well as the entire geographic regions of the U.S. fell into the regulated sector. The non-regulated sector was composed of the five Canadian provinces of Nova Scotia, New Brunswick, Quebec, Ontario, and Alberta.

The "t-test" indicated that the means of the residuals were significantly different. The chi-square test, which although not as conclusive as the outcome of the "t-test" was within the range of statistical significance. Therefore, Sloss concluded that "revenues per ton-mile received by U.S. and Canadian regulated freight haulers were .045 cents per ton-mile greater than those of Canadian un-regulated trucking firms during the 1958-1963 period".<sup>2</sup> Furthermore,

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<sup>1</sup>Ibid., p. 349.

<sup>2</sup>Ibid., p. 350.



Sloss calculated that approximately \$348 million per year could have been saved over the period by one method of calculation and \$361 million per year another.

This section of Sloss's study has been subject to the most widespread, and justifiable, criticism. First, Sloss does not compare statistically equations (3) and (4). In some sense this is understandable since he is not interested in the coefficients as much as the residuals. However, it is inappropriate for Sloss to argue correspondence without further testing (such as Chow test, for example).

The attempt to reconcile the difference in the equations yields some interesting results. For example, a table comparing the Canadian and U.S. data indicates that the average revenue per ton-mile in Canada is higher than the U.S. This is true despite the fact that the data indicates that the average annual wage per employee and the average annual license fee are twice as large in the U.S. as compared to Canada. Sloss does note that the average length of haul (which was found to be insignificant in equation (2)) is much shorter in Canada (about half) compared to the U.S. The implication of these results is that profit margins are much higher in Canada than in the U.S. Therefore, the implication is that lower rates or lower revenues per ton-mile stemming from de-regulation would be based on a reduction in these operating costs.<sup>1</sup>

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<sup>1</sup>Cf. James E. Annable, Jr., "The ICC, the IBT, and the Cartelization of the American Trucking Industry" The Quarterly Review of Economics and Business 13 (Summer, 1973), pp. 34-47. Annable argues that through the application of its superior bargaining strength the International Brotherhood of Teamsters (IBT) has been able to expropriate excess profits which accrue to "the trucking cartel" produced by the Interstate Commerce Commission (ICC) and the IBT.

Williams<sup>1</sup> felt that there was a possibility of a curvilinear relationship, especially if Alberta were excluded from the analysis. If in fact the true relationship is curvilinear the  $R^2$  values will increase and residuals will decrease.

Furthermore, Williams argued that the sample upon which Sloss's analysis was based may have simply overstated Alberta's ton-miles and driven the revenue per ton-mile downward. Williams argued that "while Alberta has only 13 to 14 per cent of total Canadian revenues and expenses it has 18 per cent of vehicle miles and 20 per cent of the ton-miles. The ton-miles per vehicle-mile for Canada stand at 7.7 and for Alberta they are 8.3. But the cost of a vehicle-mile for Canada is 28 2/3 cents while it is only 20 2/3 cents for Alberta. To coin a phrase something smells badly in the Province of Alberta . . . Furthermore, Alberta's residual is -9. The total for the unregulated according to Mr. Sloss is 9½."<sup>2</sup>

Finally, Williams argues that Sloss figured average load in Canada by dividing net ton-miles by loaded vehicle-miles rather than the total vehicle-miles that he used in the U.S. When both sets of data were standardized to total vehicle-miles for the U.S. and Canada the corrected data did not pass the chi-square test.

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<sup>1</sup>U.S. Congress, Committee on Interstate and Foreign Commerce, Part 3 Transportation Act of 1972, Hearings, before a Subcommittee on Transportation and Aeronautics, House of Representatives, on H.R. 11824, H.R. 78126, and H.R. 11207, 92nd Cong., 2nd sess., 1972, pp. 912-923. (Appendix A, Harter W. Williams, "Measuring the Cost of Regulating Motor Carriers or Through the Residual Jungle with Gun, Camera, and Computer or Statistical Games People Play").

<sup>2</sup>Ibid., p. 916.

In conclusion, one may argue that while Sloss's approach may have some intuitive appeal it is seriously deficient. This chapter has centered on the Sloss study in some detail for the simple reason that this study has had wide acceptance in the writings of other academics.<sup>1</sup> Clearly, a great deal more work needs to be done on the methodology.

### The Maister Study

A recent study by Maister<sup>2</sup> uses a somewhat more sophisticated methodology to examine the variables which affect rates. Though Maister did not intend to examine the effects of regulation per se, it played an important part in his study. Furthermore, Maister attempted to correct for some of the data problems that he felt may have affected Sloss's results. "The present study was motivated by the complete revision of Statistics Canada data collection methodology, and by some serious questions which have been raised about the validity of the previous Statistics Canada data upon which Sloss's, Palmers', and McLachlan's studies were based."<sup>3</sup>

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<sup>1</sup>See Thomas Gale Moore, "De-regulating Surface Freight Transportation" in Promoting Competition in Regulated Markets, ed. Almarin Phillips (Washington, D.C.: The Brookings Institution, 1975), pp. 55-98 and W. Bruce Allen and Edward B. Hymson, "The Costs and Benefits of Surface Transport Regulation - Another View", in Regulation of Entry and Pricing in Truck Transportation, eds. Paul W. MacAvoy and John W. Snow (Washington, D.C.: American Enterprise Institute for Public Policy Research, 1977), pp. 93-115.

<sup>2</sup>David H. Maister, "An Analysis of Trucking Rates in Canada," (Unpublished, Occasional Paper No. 11, The Center for Transportation Studies, University of British Columbia, 1976).

In reference to the data Maister does not criticize the survey methodology but notes that the data are limited in the universe they purport to represent. For example, the universe excludes carriers earning less than \$100,000 annually from intercity carriage, strictly local carriers, unregulated for-hire or private carriers and those domiciled outside Canada. In addition, international traffic (U.S.-Canada) and local traffic were excluded from the survey, which considered only intercity domestic traffic.<sup>1</sup>

Using the 1973 For-Hire Survey<sup>2</sup> Maister grouped and ordered the data to obtain 70 observations (out of a potential 100) from province-to-province pairs. That is, for each of the 10 provinces he listed the total revenues, ton-miles, etc. in relation to every other province. He classified the provinces into regulated and non-regulated on the basis of rate regulation. Since all provinces regulate entry into inter-provincial operations, and all but Alberta into intra-provincial operations, he felt it was not necessary to create a variable for entry regulation.

<u>Regulated</u>	<u>Non-regulated</u>
Prince Edward Island	Newfoundland
Quebec	Nova Scotia
Saskatchewan	New Brunswick
Manitoba	Ontario
British Columbia	Alberta

Using the data generated from the For-Hire Survey Maister

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<sup>1</sup> Ibid., p. 3.

<sup>2</sup> Statistics Canada, For-Hire Trucking Survey 1973, Catalogue 53-224.

fitted the regression displayed on the following page. While the definitions of most of the explanatory variables are self-evident some comment is required on the balance of traffic and commodity mix variables. The balance of traffic variable, while imprecise, allows Maister to test for the bulk-haul problem. That is, the significance of the coefficient of this variable indicates that rates are influenced by the imbalance of originating and terminating traffic. The commodity index variable is a complex one. It is based on the hypothesis that differences in the average rate per ton-mile may be due to differences in the types of commodities carried. The index was constructed using six commodity grouping found in the For-Hire Survey. These were: live animals, food, feed, beverages, and tobacco; crude materials; fabricated materials, and products, and general or unclassified freight.

For each traffic lane the percentage of tons of each commodity group was calculated. A weighted average of these percentages was created, using the national average rate per ton-mile for each group as weights. Then the weighted averages were divided by the national average rate per ton-mile for all commodities. Therefore, an index of greater than 100 would indicate a higher than average rated mix of traffic.

Maister fitted the regression using a technique as "stepwise" regression where variables enter or leave the equation according to predetermined "F" statistics for the entire operation.

The results of the first regression were rather mixed. The most important contribution to the  $R^2$  (24%) derived from traffic terminating in Prince Edward Island. Maister found that distance

$$\begin{aligned}
 &\frac{\text{Average Rate/Ton-Mile}}{\text{Length of Haul}} = \frac{\text{Traffic Density}}{\text{Balance of Traffic}} \\
 &\frac{\text{Total Revenue}}{\text{Total Ton-Miles}} = b_0 + b_1 \frac{\text{Total Ton-Miles}}{\text{Total Tons}} + b_2 \frac{\text{Originating + } b_3}{\text{Ton-Miles}} + \frac{\text{Total Originating Tons}}{\text{Total Terminating Tons}} \\
 &\quad \frac{\text{(Dummy)}}{\text{Province of origin}} \quad \frac{\text{(Dummy)}}{\text{Province of Destination}} \quad \frac{\text{(Dummy)}}{\text{Intra-Provincial Dummy}} \\
 &\quad +b_4 - b_{12} \text{ (0 or 1)} + b_{13} - b_{21} \text{ (0 or 1)} + b_{22} \text{ (0 or 1)} \\
 &\quad \frac{\text{(Dummy)}}{\text{Regulation}} \quad \frac{\text{Commodity Mix Index}}{\text{Weighted Average of } \cdot/\cdot \text{ share of each of 6 commodity Groups (weighted By National Average Rate/Ton Mile National Average/Ton-Mile Rate for all Commodities)}} + U
 \end{aligned}$$

Derived from Maister, op. cit., pp.4-8.

and commodity mix contributed 11% and 16% respectively to the  $R^2$ . However, Maister felt that the first run clearly indicated that Newfoundland and the Maritimes represented a special case since it was shown that significantly higher rates existed for these provinces. Nowhere in the analysis did regulation (nor the variables it was correlated with) appear as a significant variable. Furthermore, the variable which distinguished intra-provincial from inter-provincial traffic did not appear as a significant variable.

Based on these initial results Maister decided to run the regression again using the data for six provinces and excluding Newfoundland and Prince Edward Island. Only three variables appeared to have a significant effect on rates at the .05 level: distance (a fall of 1 cent for every increase of 1,000 miles) commodity mix (a rise of .6 cents for every 10 point increase in the index), and traffic density (a rise of .07 cents for every increase of a million tons.<sup>1</sup> While regulation did enter the regression at one point in the analysis it was removed at a later stage. However, the entry and subsequent removal of variables is a normal procedure in stepwise regression. Once again variables such as the intra-provincial dummy, and balance have either negligible or no effect.

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<sup>1</sup> Ibid., p. 16. While one would expect rates to be negatively related to traffic density the positive relationship may be due to the fact that high density lanes may have a higher percentage of high rates LTL traffic than low density lanes which may specialize in relatively low-rated TL traffic.

Given the results of the first run of the regression Maister felt that the balance variable warranted further analysis. For example, traffic destined to Newfoundland, Nova Scotia, and New Brunswick bear premiums of 2.7, 1.9, and 1 cent per ton-mile respectively. However, rates out of Newfoundland bear a discount of 2.3 cents per ton-mile making the difference in rates between inbound and outbound traffic equal to about 5 cents.

Maister argued that this was a clear example of "backhaul" pricing. Contrary to expectations, the sign of the balance coefficient was negative suggesting that as the ratio of originating/terminating tons gets larger the originating rate declines, which he argues would tend to encourage even more originating traffic.

Since backhaul pricing could be revealed by either the provincial dummies or the balance variable, Maister developed a new dependent variable known as the rate balance, which was the ratio of the originating rate to the terminating rate. Furthermore, all intra-provincial traffic was removed from the data base. A new variable, commodity balance, was defined as the originating commodity mix (originating commodity mix/terminating commodity mix).

He fitted the regression which included the new variables and found that commodity (mix) balance accounted for 40% of the variation in rate balances and the Newfoundland and Prince Edward Island were special cases. The balance variable accounted for a small but significant percentage of explained variation and once again was negative. As Maister points out an "explanation may be provided by suggesting that the Canadian trucking industry has failed to utilize backhaul pricing to correct imbalance of flows, and that the current



imbalance is due to inefficient pricing structures. If correct, this interpretation leads to the obvious recommendation that the trucking industry should re-evaluate their pricing behaviour".<sup>1</sup>

In total, the results of his analysis show that the most significant variables which explain variations in rates are the length of haul and the commodity mix. Traffic to (and from) the Maritimes and Newfoundland (particularly inbound to Prince Edward Island) appears to have rate significantly different from other traffic lanes. The balance of traffic variable assumes importance only in relation to the Maritimes and Newfoundland.

Furthermore, there seemed to be no significant differences between intra-provincial and inter-provincial rates that could not be accounted for by factors such as distance, density, and commodity mix. Finally, the regulation of rates did not appear to explain any of the variation in rate levels.

Some caution is order in the interpretation of the conclusion regarding regulation. Maister does not elaborate the characteristics of effective rate regulation. Though he discounts the effect of entry regulation (which itself may or may not be effective) Maister does not include a variable for weight restrictions. In addition, Maister could not disaggregate the data to obtain more homogeneous groupings of carriers. His results may simply reflect the law of large numbers.

Maister has improved upon the methodology of analyzing factors

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<sup>1</sup>Ibid., p. 19.

affecting rates. The fact that variations in rates were not systematically related to rate regulation may suggest that either rate regulation is unimportant or that there is no underlying logic to rate regulation. Furthermore, unlike Sloss's conclusions, Maister finds no "special cases" in the residuals. That is, the residuals for Alberta do not stand out.

Maister may have encountered a multicollinearity problem since on the complete data base the simple correlation coefficients for the intra-provincial dummy and traffic density (originating tons); and, regulation and traffic terminating in Quebec are .561 and .56 respectively. Both of these values are higher than the  $R^2$  of .50. For the reduced data base no simple correlation coefficients are greater than the  $R^2$ .

Given that the balance variable has a negative sign for the total data base but is insignificant in the reduced data base one may suspect multicollinearity.

In 1977 Maister produced a revised version of his paper in an attempt to bring better data to bear on the problem.<sup>1</sup> This study will not be reviewed since the methodology was similar. However, Maister's conclusions apply both to his previous work and that of other economists.

"... the ultimate conclusions of this paper must be that: (1) little confidence can be held in the results of previous attempts to apply regression techniques to detect the level of regulation in Canada; (2) applying these techniques to more recent (and reliable)

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<sup>1</sup> See Donald H. Maister, "Regulation and the Level of Trucking Rates in Canada" Proceedings of a Workshop on Motor Carrier Economic Regulation, op. cit., pp. 199-227.

data suggest that there is no strong relationship between rate regulation and the level of trucking rates in Canada, although because of multicollinearity and omitted variables, this cannot be considered a definitive conclusion; (3) there is weak, but suggestive evidence that there is no significant effect of entry regulation on rates; and, finally, that the problems associated with the application of regression techniques to this problem are both numerous and complex . . . ."

In light of the preceeding chapters of the study perhaps the operational phrase in the above quotation is "omitted variables". All of the studies foundered in terms of model specification, that is, they have attempted to measure the effect of regulation by employing a single regulatory criterion which grouped disparate regulatory structures. The alternative would have been to specify a model with accounted for all non-homogeneities between provinces that may be expected to have an effect on rates. However, even if such a set of explanatory variables were available, a strong a priori argument could be developed for their exclusion. That is, most, if not all, of these explanatory variables may interact with the regulatory variable. The possibility of this interaction may make model specification most difficult.

### Summary

The chapter examined the studies of Sloss and Maister which attempted to compare rate levels between regulated and non-regulated jurisdictions. Both studies assumed that regulation produced a cartel situation and that higher rates would obtain for carriers in the regulated jurisdiction. In addition, they assumed comparability of carriers across jurisdictions. In essence, the authors attempted

to evaluate comparative performance on the basis of an assumed structure.

Neither of the two studies may be considered to have demonstrated any significant relationship between regulation and rates. Apart from the data problems it may be inferred that the structures of the motor carrier industry are too diverse and complex to allow relatively simple techniques to capture the hypothesized relationship.

In spite of the theoretical, methodological, and empirical problems inherent in this approach it continues to have great appeal for policy makers. The notion that there is one kind of regulation leading to a unique result has an intuitive appeal. However, without a detailed analysis of comparative structure and conduct, de-regulation may produce results not accounted for in these models. For example, it is not clear that if certain segments of the industry became highly concentrated that this state of affairs is preferable to the regulated status quo.

## CHAPTER VIII

### Summary and Implications

#### Summary

The objective of this study was to question the underlying assumptions of the conventional view concerning the structure of the motor freight transport industry. The conventional argument concerning motor transport is that the structure is inherently competitive and if free of regulation the industry structure would conform to the competitive model and reach a position of stable equilibrium. Two inter-related methodologies have been employed to support the conventional argument. First, some authors have attempted to identify those structural conditions which, based on a priori theory and some empirical evidence would lead to acceptable conduct and performance. Second, authors have assessed the conduct and performance of carriers not subject to regulation with the conduct and performance of regulated carriers.

The analysis centered on intercity for-hire general freight carriers. Based on Canadian data an industry profile was presented which argued that this portion of the industry was the most important in terms of revenues generated and equipment operated.

The underlying assumptions of the conventional view were questioned within the framework of the two above-mentioned methodologies. The conventional view is that motor transport exhibits low threshold cost requirements, high factor mobility, and high variability of cost with respect to output and no significant economies of scale. Implicit in

this view is that there are no tendencies toward undue concentration or destructive competition.

It was argued that at the core of the conventional view was the notion of output homogeneity. It was argued that motor carrier output has many dimensions the most of important which are size of shipment, length of haul, and extent of geographic coverage. These continuous variables defined a spectrum of carriers which may be considered to constitute a series of sub-industries. The cross elasticity of demand between these sub-industries was considered to be low.

Given output heterogeneity on the demand side, structural differences across the spectrum of firms were examined. These structural differences were analyzed in relation to the elements of the conventional argument.

Chapter III contained a profile of the motor transport industry. This profile made reference to the importance of terminal facilities as part of the structure of the firm. It was noted that terminals were highly correlated to revenue and that the larger carriers tended to be general freight carriers. The analytical significance of terminal operations was raised in Chapter IV. Threshold costs were found to be higher for LTL carriers than TL carriers because TL carriers did not require extensive terminal facilities. Terminals were considered to represent relatively immobile, long-lived assets. Hence, not only were threshold costs higher but factor mobility reduced. The importance of the terminal facilities was found to vary with the three dimensions of output. It was concluded that these facilities would be most important for LTL short haul carriers with extensive geographic coverage.

A review of U.S. literature concluded that the ratio of fixed

to total cost was increased for LTL carriers. In addition, apart from the prevalence of joint and common costs, LTL terminal facilities were subject to indivisibilities.

A review of the literature in Chapter V concluded that as a result of these structural differences economies of scale may exist in the motor transport industry. Earlier studies were criticized for assuming that the output of the motor transport industry is homogeneous and for employing relatively unsophisticated methodologies. More recent studies have compensated (to some degree) for these deficiencies and found significant, but weak, economies of scale.

It was suggested that the significance of economies of scale would vary with the size of shipment, length of haul, and extent of geographic coverage. In particular, LTL carriers operating short haul routes with extensive geographic networks were presumed to exhibit significant economies of scale. The source of economies of scale was presumed to be based on the extent of terminal operations.

In general, TL carriers seemed to conform to the conventional view of the motor carrier industry. This is due to the fact that these carriers do not require a system of terminals, that fixed costs are low, that the factors of production are highly mobile, and no economies of scale are found to exist. Once the heterogeneous nature of LTL carrier service was brought to light the conventional argument may be questioned.

The theory and historical record of destructive competition were reviewed in Chapter VI. It was argued that the rise of regulation of motor transport was due to the excessive competition felt by the railroads from motor carrier expansion. It was argued that given the

structural features discussed in the previous chapters that a propensity towards destructive competition may exist. That is, given a relatively high ratio of fixed to variable cost in the short run and the presence of cost and asset indivisibilities, one might expect rates which cover marginal costs but not average costs. A down-turn in the activity of LTL carriers might produce such a result. It was recognized that in the presence of economies of scale destructive competition might arise. A firm may be operating a system; however, entry of a lower fixed cost firm, intent on capturing points of that system, may give rise to destructive competition.

A review of the stability characteristics of the motor transport industry in de-regulated jurisdictions was presented. Though no firm conclusions could be arrived at in reference to the rate of bankruptcy, it was argued that the Australian experience tended to support the arguments developed in previous chapters. That is, increased concentration emerged in the LTL portion of the market due to the economies of scale of terminal operation. The literature did not contain any references to the emergence of destructive competition. It also concluded that the TL long haul portion of the market tended to conform to the competitive model.

In conclusion, it was argued that the conventional view of motor transport applies in the case of TL carriers but not in the case of LTL operation. Both theory and fact suggest that the conventional view is an inadequate base from which to frame a de-regulation policy.

Chapter VII reviewed two studies which attempted to measure the effects of regulation on rate levels. It was argued that unlike the previous analysis, which essentially related structure to behavior,



these studies in effect related structure and performance. It was concluded that both of these studies were deficient in terms of the assumptions underlying the structure of motor transport as well as being deficient in terms of the methodology employed. While the arguments may have some intuitive appeal the use of highly aggregated data and inaccurate specification of regulatory variables did not support the hypothesis. Maister found that regulation did not seem to have an effect on the level of rates. Any variance in rates could be explained by commodity mix, distance, and density variables.

The conventional argument did not take into account the heterogeneous nature of output of motor carriers. Differences in structural characteristics across a spectrum of carriers indicated that an alternative specification of structure would lead to behavior which did not conform to the competitive model. In addition, this specification is supported tentatively by fact. Due to the complex and diverse nature of motor carrier operations existing studies have not been able to show that non-regulated carriers perform differently than regulated carriers.

#### Implications for Competition

Based on the information developed above it is useful to hypothesize about the competitive responses that might be expected in the absence of regulation.

The TL market appeared to be the most competitive. These carriers exhibit low threshold costs, factor mobility, low ratio of fixed cost to total cost, and no apparent economies of scale. Therefore, this market would seem to conform to the competitive model. These condi-

tions would appear to hold over all lengths of haul and of geographic coverage. The TL carriers would be subject to competition from rail and private carriage. If the industry were de-regulated one would expect a minimal impact on these markets.

The LTL markets do not conform to the competitive model. It may be assumed that economies of scale are to be found in all LTL market classifications. For the short haul limited geographic coverage carriers weak economies of scale may exist though threshold costs may be assumed to be low because of the reduced need for terminal facilities. On the other hand, these carriers would have some difficulty in exiting the market. If the industry were de-regulated it would seem likely that destructive competition would arise. Economies of scale would not protect the firm from a competitor attempting to capture points within the system. Since these carriers have terminals it may be expected that time lag would exist in adjusting capacity to demand.

Carriers which specialize in short haul-extensive coverage operations would probably exhibit the most significant economies of scale. This type of carrier would require an extensive system of terminals which are highly immobile. One would expect to find relatively higher threshold costs for this market which may discourage entry. However, the comments regarding the loss of points within a system would hold here as well.

Carriers which specialize in LTL long haul operations would probably have limited economies of scale. On the other hand, it appears that these carriers would be the largest firms and the threshold costs may be assumed to be quite high. These threshold costs would probably discourage entry.

In conclusion, it may be argued that de-regulation of LTL carrier would not produce results postulated by the competitive model. This is not to argue that regulatory reform is uncalled for. Though the research has not been able to isolate the impact of regulation on prices or profits, the available information suggests that regulation significantly increases costs. There are many obvious inequities and inefficiencies in the granting of operating authorities that could be corrected. A discussion of this point is best dealt with elsewhere.

#### Implications for Further Research

A great deal more research is required to expand upon the economic characteristics of motor freight transport discussed in this study. Specifically, empirical research on threshold costs, economies of scale, and cost indivisibilities is required in order to frame public policy. The greatest impediment to meaningful empirical research is the lack of data. Recent efforts by Statistics Canada may alleviate the problem though the absence of reliable time series data will limit the possible research.

More work needs to be done on the refinement of product dimensions. For example, the time aspects of service need to be incorporated into the framework discussed in Chapter IV.

It is necessary to expand the definition of regulation. This may have a number of dimensions. Within the context of economic regulation (entry and rate control) differences between de facto and de jure regulation need to be discussed. Rather than classifying provinces as regulating or non-regulating provinces it may be more appropriate

to argue that for those provinces that regulate motor transport there are ranges of regulation. Furthermore, it is considered necessary to examine aspects of non-economic regulation. Perhaps the most important of these are the cost effects of differential weight limits. Researchers may find that the divergence between a "regulated" industry and a competitive industry may not be as large as is generally assumed.

Though this study has examined certain structural characteristics of the industry it would be desirable to close "Bain's paradigm". That is, some effort should be made to incorporate conduct and performance into the analysis. Once this has been accomplished, a range regulatory reform options may become more clearly defined. To paraphrase Westfield the choice is not simply regulation versus de-regulation. Rather, the question becomes one of how to remove some of the more obvious inefficiencies and inequities caused by regulation. On the basis of the issues discussed in this study, it is not clear that the competitive benefits will follow de-regulation.

APPENDIX AICC Motor Carrier Profile

In a recent paper on regulatory reform options, Mr. Daniel O'Neal of the ICC prepared a profile of the industry.<sup>1</sup> He suggested that a distinction between general commodity carriage and specialized carriage was basic to a program of regulatory reform. The profile is as follows.

Specialized service (most of the 16,000 certified carriers today provide irregular route, TL specialized service) accounts for about two-thirds of the tonnage and about one-third of the revenue in the regulated trucking industry and is characterized by:

- full truckload movements in single-line service;
- the use of specialized equipment (for example, tank vehicles, refrigerated trailers, flat bed trailers);
- call-on-demand service;
- commodity rates (rates covering only one article or family of articles and often negotiated with one shipper or group of similarly situated shippers);
- operating authorities limited to specific commodities and allowing operations over irregular routes.

General commodity or dry freight service (there are approximately 1,000 Class I and Class II carriers providing general commodity service today) accounts for about one-third of the tonnage and about two-thirds of the revenue earned in the regulated trucking industry, and is characterized by:

- a substantial proportion of traffic moving in less-than-truckload quantities and in joint-line service;

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<sup>1</sup>Daniel O'Neal, Memorandum - Motor Carrier Regulation, (Washington: ICC Deregulation Working Paper, Attachment to Truck Line #134, November 8, 1978).

- the use of standard van-type trailers or shipping containers;
- scheduled service;
- substantial investment in terminals and freight handling equipment;
- class rates ( a system of rates applicable to call traffic and based on the transportation characteristics of the articles shipped) and collective ratemaking;
- operating authorities framed in terms of general commodities, usually with certain exceptions, and limiting service to specified routes.

Based on this profile of the industry O'Neal argues that "the reasons that would normally justify economic regulation do not exist in large measure for the special commodity service". That is, there are assumed to be low barriers to entry and economies of scale. Furthermore, this segment of the industry is most competitive with private carriage and the railroads.<sup>1</sup>

O'Neal argues that the situation is significantly different in the general commodities area. He notes that "some analysts have expressed the belief that deregulation in this area would tend to substantially increase concentration due to advantages of size inherent in this type of service".<sup>2</sup> O'Neal does not expand on the reasons why the situation would be significantly different for general commodity carriers.

One interesting aspect of O'Neal's paper is the attempt to differentiate the enforcibility of the common carrier obligation between special and general commodity carriers. He argues that since special

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<sup>1</sup> Ibid., p.4.

<sup>2</sup> Ibid., p.5.

commodity carrier service is only provided on demand and on an irregular basis, any common carrier obligation is difficult, if not impossible, to enforce. On the other hand, the provision of scheduled service over regular routes and the heavy reliance on class rates fits the generally understood description of common carriage. "It is also amenable to the imposition and enforcement of a common carrier obligation to provide equitable service to all users".<sup>1</sup>

The argument for a measure of reliance on the concept of common carriage is that it allows society to deprive large users of the system of the ability to use their market power to obtain prices and services not available to all users. Why it is not to the benefit of society to prevent abuse of market power on the buyers' side in this case of specialty carriers is not stated.

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<sup>1</sup>Ibid., p. 5.

## APPENDIX B

### A Note on Economies of Scale

Recently, certain economists have put increasing emphasis on the "systems affects" or "systems approach" in discussing economies of scale. One of the first authors to put forward this topic was Michael Lawrence.<sup>1</sup>

Lawrence argued that industry executives charged with the responsibility of running complex LTL operations were convinced that pronounced economies of scale existed in the LTL segment of the market. In addition, this belief was based on the systems approach to motor carrier management.

"It is extremely important to note that 'plant' in a general freight trucking operation is a network of terminals, each supported by its own local operations, and connected with one another through intercity movements of men and equipment. It is equally important to note that 'size of plant' does not refer to the size of the individual movement units nor to the size of individual terminals. Rather, it is the 'meshing' of terminals, men, and movement units that gives rise to economies of scale in the general freight industry".<sup>2</sup>

Lawrence argued that economies of scale could be "rationalized" by closer examination of carrier systems. For example, he argued that increased volume on a single lane could often improve the cost efficiencies of many other lanes in a carrier's system by increasing load

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<sup>1</sup>Michael Lawrence, "Economies of Scale in the General Freight Motor Common Carrier Industry: Additional Evidence", Proceedings - Seventeenth Annual Meeting of the Transportation Research Forum, (Oxford, Indiana: Richard B. Cross, 1976), pp. 169-176.

<sup>2</sup>Ibid., p. 169. It is interesting to note that quite apart from any systems analysis of terminals there has been little research carried out on economies of scale of single terminals.



averages and equipment utilization for segments of lanes into and out of break-bulk facilities. He argued that this same "systems" effect and others also apply to increased volume associated with the opening of new terminals.<sup>1</sup>

In addition, pick-up and delivery operations were subject to economies of scale if the number of shipments increased since the incremental cost of additional shipments per stop is minimal. The probability of multiple shipments per stop increases as the number of terminals to which a carrier offers single line service (extensiveness of coverage) increases.

Though there are marketing advantages associated with the extensiveness of coverage, Lawrence argued that the most important advantages accrued from frequency and consistency of trips on any given lane. He argued that speed and consistency are so conducive to efficient industrial distribution management that shippers were willing to pay substantial premiums to obtain it.<sup>2</sup>

Finally, Lawrence argued that the advantages of size could be extended almost indefinitely. For example, administrative and selling expenses were considered to be lower on a per shipment basis for large carriers than for small carriers. Lawrence suggested that large carriers are subject to economies of scale but have opted to supply a higher quality of service. Hence, the economies of scale would be reflected in profits rather than costs versus size analysis.

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<sup>1</sup>Ibid., p. 170.

<sup>2</sup>Ibid., p. 170.

Wyckoff supports Lawrence's analysis to the extent that he argues control of terminal expenses is crucial to the viability of the firm.<sup>1</sup> He argued that carriers in the \$1 to \$5 million revenue group (probably the majority of Canadian Class I and II carriers would fit into this category) were of an "awkward" size in a management sense. He argued that:

"The increased operating ratios of middle-sized carriers appeared to be the result of the terminal expense ratio increasing faster than the general and administrative expense ratio declined. Once carriers passed this dangerous middle level, they tended to stabilize the terminal expense ratio and gained cost advantage...." <sup>2</sup>

He tested various management formality models and concluded that the "sensitivity of terminal expense/LTL ton to volume substantially decreased with increased formality of management . . . formal managers appeared to be able to accommodate additional terminals without additional costs".<sup>3</sup>

Both of these studies, which are by no means definitive, suggest that there may be increased concentration in the LTL segment of the market in the absence of regulation. Implicit in Lawrence's argument is the probability of system disruption by increased competition on a single lane.

It would seem that the systems approach is a fruitful area of further research. In particular, emphasis must be placed on the terminal management procedures and the effects of changes in systems structure.

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<sup>1</sup>D. Daryl Wyckoff, "Factors Promoting Concentration of Motor Carriers Under De-regulation", Proceedings - Fifteenth Annual Meeting of the Transportation Research Forum, (Oxford, Indiana: Richard B. Cross, 1975), pp. 1-6.

<sup>2</sup>Ibid., p. 3.

<sup>3</sup>Ibid., p. 4.

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