

OPTIMUM STRUCTURE AND SIZE
OF ROAD HAULAGE FIRMS -
POSITIVE AND NEGATIVE EFFECTS
OF SPECIALIZATION

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INTRODUCTION

"The present highly-developed road haulage industry is the direct descendant of the carrier's cart of the horse transport era. The carrier was an individualist; his radius of activity was in large measure limited to the distance over which a horse could make the return journey in one day; he knew his local customers and kept to his regular routes but in the nature of things he could not go very far and he was usually in a small way of business". (1)

The growth of motor freight transport has from the very beginning been considered a mixed blessing, requiring some kind of public control to achieve an orderly pattern of development. Hence, very early the road haulage industry became a regulated industry and the objective of regulation was to limit competition on the one hand between road and rail and on the other within the road haulage industry.

We are still living, in most countries, with basically the same regulatory system as was introduced thirty or forty years ago. At that time the structure and organization of road freight transport was a question that caused some public concern. So it is also today, clear evidence being the fact that the ECMT is devoting a Round Table to the subject "Optimum structure and size of road haulage firms". It is, thus, worth pointing out that this subject is not of mere "academic interest"; it has to do, also, with the problem of finding guidelines for governmental policy. This being the background, the aim of this paper is :

1. to present the general patterns of the structure and organization of the road haulage industry,
2. to analyze the factors affecting the size distribution of firms, and
3. to discuss whether there exists an "optimum" size of a road haulage firm.

The first main section of this paper starts with a brief description of "the traditional view" of the structure and performance of the industry and then follows an analysis of the actual market structure on the supply side.

1) Henman, P.S., "The Economics of Goods Transport by Road", Institute of Transport Journal, Vol. 29, N° 9 (March 1962), p. 260.

The second section is devoted to some of the empirical studies that have been made to investigate whether there are economies of scale within the road haulage industry. The focus will be on the conceptual and analytical problems connected with studies of this type, for example the problems of measuring size and of the effects of regulation on the actual size distribution of firms.

In the third section the influence of demand on the road haulage industry's structure and operations will be discussed. The empirical studies investigating whether there are economies of large-scale operations have in general been focused on the cost side, and that is the main reason why a separate section here is devoted to the demand conditions. This is a very complex matter to deal with and only a few of the relevant problems will be examined.

I. THE STRUCTURE OF THE ROAD HAULAGE INDUSTRY

THE TRADITIONAL VIEW

The road haulage industry has often been taken as an example of a typical small-scale industry. In all European countries the industry is characterized by a very large number of firms with a small average size; in some countries as much as 70 to 80 per cent of the firms have only one lorry. There are also medium-sized and large firms - some with several hundreds of lorries - but large fleets of vehicles are often looked upon as an exception to the rule : the small-scale operator.

The existence and predominance of the small firm has traditionally been explained by the absence of economies in large-scale operations. A relatively small amount of capital is needed to start a road haulage firm, and operating costs per unit of output do not seem to be lower for a large fleet of vehicles than for a small one. The economic structure of the motor carrier industry is said to create a "highly competitive industry" with tendencies towards "overcapacity", "destructive and wasteful competition" and "instability".

This description of the structure and performance of the industry appeared first during the interwar period. To avoid "the evils of overcrowding and unbridled competition in the transport industry" - to quote a famous remark from the British Salter Conference in 1932 (1) - governments have intervened in the transport sector. Entry and capacity controls have been the most commonly used forms of regulation "to stabilize the market".

This traditional view of the road haulage industry - a small-scale industry with no inherent advantages of large-scale operations - has remained today in academic circles as well as within the trade and among transport politicians. Is the conventional wisdom right ? What do the statistics show ? Let us first have a look at the present size distribution of firms in some countries.

1) Report of the Conference on Rail and Road Transports, (London : HMSO, 1932), p. 32.

THE PRESENT MARKET STRUCTURE

The data presented in Table 1 (p. 11) seem to verify the traditional view. The small firm - a carrier with one to five vehicles - is obviously the most common type of operator. According to data from the United Kingdom 85 per cent of the firms had only 1 to 5 vehicles in 1963, and in Sweden the corresponding figure was as high as 95 per cent in 1972. The figures for Germany in Table 1 cover only firms operating in long-distance traffic. If also the short-distance carriers were included, the dominance of the small firm would be even more pronounced.

It is, however, to some degree misleading to look at the industry in terms of the size distribution of firms. The importance of the small carrier is overstressed by the figures in Table 1. Table 2 (p. 11), on the other hand, shows the distribution of vehicles according to size of firm, and looked upon in this way the dominance of the small firm is considerably reduced. The large firms are few in number, but as a consequence of their big fleets of vehicles, their share of the market is quite substantial. In Sweden, for instance, only 2 per cent of the firms had more than 10 vehicles each, but these firms had 23 per cent of all public haulage vehicles in 1972. In the United Kingdom 7 per cent of the operators had more than 10 vehicles in 1963, but this group owned 52 per cent of the total vehicle fleet.

Are these statistics (Tables 1 and 2) adequate to describe the actual market structure on the supply side ? At least in the case of Sweden they are only of limited use as 1) they give only national data whereas the relevant market may be much smaller, and 2) co-operative arrangements between firms are not revealed in the statistics.

In Sweden, as well as in many other countries, there is no national market for road haulage firms. All firms do not- and cannot legally - compete with each other. The market is divided geographically or compartmentalized by other regulatory measures, for instance by commodity or shipper restrictions attached to a license.

Sweden, to give one example, is divided into some 20 "traffic areas". A road haulage firm is allowed to carry goods within or to or from the area within which it has its base. Traffic between two points outside the traffic area is not allowed.

With these and similar constraints on the individual carrier's freedom of action, national data on the size distribution of firms are not enough to tell if this is an unconcentrated industry or not. Even if a carrier is small measured in the traditional way, i.e. has few vehicles, he may be fairly large in relation to the market available to him. Meyer et al. have emphasized this with reference to United States conditions : "The market, however, must be defined by the number of carriers operating between two geographic points ...

Table 1
DISTRIBUTION OF ROAD HAULAGE FIRMS ACCORDING TO SIZE OF FIRM
(Percentages)

No. of vehicles per firm	Sweden 1972	Norway 1967	U.K. 1963	New Zealand 1969	Germany (long-distance) 1970
1	71.5	88.5	50	50.7	39.2
2-5	23.5	10.9	35	33.7	2-6: 51.4
6-10	3.0	0.5	8	8.7	7-10: 5.8
11-15	1.0	} 0.1	3	2.9	} 3.6
16-	1.0		4	4.0	
Total	100.0	100.0	100	100.0	100.0

Table 2
DISTRIBUTION OF PUBLIC HAULAGE VEHICLES ACCORDING TO SIZE OF FIRM
(Percentage)

No. of vehicles per firm	Sweden 1972	Norway 1967	U.K. 1963	New Zealand 1969	Germany (long-distance) 1970
1	35.0	73.6	11	13.1	12.8
2-5	30.6	21.1	23	25.5	2-6: 50.7
6-10	11.1	2.7	14	16.6	7-10: 15.5
11-15	5.8	0.8	9	9.6	} 21.3
16-	17.6	1.8	43	35.2	
Total	100.0	100.0	100	100.0	100.0

Sources : Sweden : The Swedish Road Haulage Association.
 Norway : Sønstegård, Ø, Leiebilnaeringen (Transport-økonomisk institutt, 1970).
 U.K. : Public Haulage Operators : Analysis by Size of Fleet 1963 (Ministry of Transport, 1964).
 New-Zealand : King, M.A., The Structure and Ownership of the New Zealand Licensed Road Goods Transport Industry (Doctoral dissertation, Victoria University of Wellington, 1971), Table A.1.2.
 Germany: Verkehrswirtschaftliche Zahlen 1972 (Bundesverband des Deutschen Güterfernverkehrs).

Here the number of significant competitors may sometimes place a trucking transportation market in the small-numbers of oligopolistic category of structure ... (1)

The number of road haulage firms is not necessarily the same as the number of sellers in a given market. If for instance subcontracting is permanently of some importance, this reduces the number of sellers of transport services. Another factor of great importance as to the supply structure of road haulage markets is various forms of cooperative arrangements between firms.

The "lorry centrals" in Sweden can be taken as an interesting example of cooperation between firms. There were about 19,700 road haulage firms in Sweden in 1972. About 10,300 (52%) of these were united in 296 lorry centrals - regional or local cooperatives with in many cases far-reaching authority vis-à-vis their member firms.

Some lorry centrals function only as order centrals or clearing houses, others also make out the invoices. In the about 200 "wholly centralized" cooperatives, some of which are run in the legal form of limited companies, the individual hauliers are not allowed to solicit traffic without consent of the central. In this case the lorry central, and not the individual haulier, is the seller of transport services.

It is mainly the small operators that are members of these cooperatives, which is shown by the following figures :

Number of vehicles per firm	Share of firms belonging to a lorry central
1 - 5	53 %
6 - 10	40 %
11 - 15	27 %
16 -	16 %

The total number of lorries in Sweden owned by firms belonging to a lorry central is between 17,000 and 18,000 (45 per cent of the whole public haulage fleet). This means that the average number of lorries per central is about 60, but this figure is to some degree misleading as the size varies from 10 to 800 vehicles per central.

Considering the existence of the lorry centrals, the actual supply structure of the Swedish road freight transport markets is quite different from the figures given in Table 1; the number of sellers is radically reduced.

Besides the 296 lorry centrals, there were 312 independent firms in 1972 with more than 10 vehicles per firm. These 608 "selling units"

1) Meyer, J.R., et al., The Economics of Competition in the Transportation Industries, Cambridge, Massachusetts, 1956, p. 212.

together with two large forwarding agencies - about 5 per cent of the total number of sellers of road freight transport services in Sweden - had altogether at their command about 70 per cent of the total number of lorries licensed for public haulage. This means that the industry is in practice far more concentrated than appears from the figures in Tables 1 and 2. The Swedish development may be unique, but in any case it shows the importance of analyzing more in detail the supply structure in road freight transport.

The discussion so far on the size distribution of firms can be summarized as follows. The industry is still built up mainly of a large number of small operators, but it should be remembered that there is a whole spectrum of sizes of firms, from small to very large. The importance of small-scale operations seems to be somewhat over-estimated in national data on size distribution of firms for three reasons. First, a small number of large firms have a large share of the market. Secondly, a national market does not always exist. Thirdly, the number of firms is not equal to the number of sellers in the market. Through subcontracting and co-operative arrangements, many small operators may appear in the market as one seller.

II. ECONOMIES OR DISECONOMIES OF SCALE ?

SOME EMPIRICAL EVIDENCE

The small-scale structure of the road haulage industry has aroused the interest of many scholars, and some studies have been carried out to investigate the presence of economies or diseconomies of scale. The aim has often been to find out whether an optimum size of firm exists or not.

Most of the surveys undertaken have had a common approach : to study how the costs vary between firms of different size, the underlying assumption being that economies of scale exist if small firms have high costs and large firms low costs per unit of output.

In a report from 1956 on the New England road freight transport industry Robert A. Nelson concludes that "size of firm bears little relation to operating costs. Consequently, it can hardly be maintained that there are economies of large scale available in the industry, or a tendency toward monopoly stemming from that cause". (1)

Roberts, studying the costs of 114 Class I carriers of general commodities operating primarily over regular routes and within a specific geographical area in the United States, came to the same general conclusion : "The evidence adduced for the firms studied establishes the absence of economies of scale in this industry". (2)

Chisholm summarized his study, which dealt with off-farm milk collection in England and Wales, in this way : "We have, thus, clear evidence that economies of scale are absent, or of minor importance, in the collection of milk from farms, and that certain dis-economies exist". (3)

- 1) Nelson, Robert A., Motor Freight Transport for New England (A Report to the New England Governors' Conference on Public Transportation, October 1956), p. 34.
- 2) Roberts, Merrill, J., "Some Aspects of Motor Carrier Costs : Firm Size, Efficiency and Financial Health", Land Economics, Vol. 32, N° 3 (August 1956), p. 238.
- 3) Chisholm, M., "Economies of Scale in Road Goods Transport ? Off-Farm Milk Collection in England and Wales", Oxford Economic Papers, Vol. 11, N° 3 (October 1959), p. 290.

These studies did not pass unnoticed and conflicting views have been expressed. The commentators have not been wholly convinced by the sample size and the methodology used. It has been said that the problem requires much more investigation and analysis before any final conclusions could be drawn as to the matter of economies of scale within this industry. (1)

In contrast to the studies mentioned above, the results from a later American survey suggest the existence of economies of scale. Burstein et al. studied a sample of 72 Class I common carriers engaged mainly in inter-state traffic. Data for each firm were collected and analyzed for each of the years 1955 through 1960. From the conclusions the following can be quoted : "... the interpretation of the empirical results concerning economies of scale should be tempered by the fact that a different approach might have resulted in different conclusions. This is unavoidable in an industry where the conclusions turn on such small differences. With that qualification, the results clearly suggested economies of scale". (2)

The results of the above mentioned studies must be used with some caution for two reasons. First, they deal with special markets (long-distance traffic and milk collection) and not with general haulage. Secondly, in the case of the American studies they deal with firms which from an European viewpoint are very large. For instance the study of Burstein et al. had a sample of firms with average revenues of about 3 million dollars, average haul of 230 miles and an average weight per shipment of about 0.86 tons. The "middle-sized" firms in Roberts' study had annual revenues of 1.0 to 3.5 million dollars (in 1952).

The most comprehensive and sophisticated study done so far on the cost structure in the road haulage industry was carried out recently in Great Britain by Bayliss and Edwards. (3) This study covered the operating costs of 2,150 public haulage fleets, and also included a separate analysis of the operating costs of 4,000 specific public

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- 1) See for example : Smykay, E.W., "An Appraisal of the Economies of Scale in the Motor Carrier Industry", Land Economics, Vol. 34, N° 2 (May 1958); Walters, A.A., "Economies of Scale in Road Haulage. A Comment", Oxford Economic Papers, Vol. 13, N° 1 (February 1961). For an early review article on the subject, see Harrison, A.J., "Economies of Scale and the Structure of the Road Haulage Industry", Oxford Economic Papers, Vol. 15, N° 3 (November 1963). See also Dicer, G.N., "Economies of Scale and Motor Carrier Optimum Size" The Quarterly Review of Economics and Business, Vol. 11, N° 1 (Spring 1971).
 - 2) Burstein, M.L. et al., The Cost of Trucking : Econometric Analysis (The Transportation Center at Northwestern University), W.C. Brown Company Publishers, Dubuque, Iowa, 1965, p. 40.
 - 3) Bayliss, B.T. and Edwards, S.L., Operating Costs in Road Freight Transport (London : Department of the Environment, 1971).

haulage vehicles. The large sample size, compared to the earlier surveys, is worth pointing out.

Bayliss and Edwards make the assumption that three types of economies of scale are possible : first, there are economies of scale in overheads so that as a firm grows its costs grow at a smaller relative rate. Secondly, there are scale economies in variable costs, e.g. through bulk buying of fuels, tyres, etc. Thirdly, there is the possibility of better fleet capacity utilization through serving a larger market.

These hypotheses were tested, and the model indicated constant returns to scale. "With the exception of fleets up to 5 vehicles the analysis, so far, therefore, has given no indication of any type of scale economy". (1) The authors found that total annual mileage run was the most important factor determining fleet costs, which is in accordance with the results from the American studies referred to above.

Bayliss' and Edwards' survey is deficient in one respect : it does not take into account the possibility that small and large firms may be operating in different markets. Their results show that :

- a) larger operators - in this case more than 20 vehicles per fleet - have a higher proportion of large vehicles than smaller operators;
- b) average tonnage carried per vehicle is higher for small operators than for larger fleets, and
- c) mileage per vehicle is greater for big fleets than for small operators.

These findings indicate that small and large firms may be doing different types of work. In a later report, Bayliss tried to differentiate between markets and he found that "a higher proportion of the large operators than of the small ones concentrate on long distance work ... Also the small operators, and particularly the one vehicle operators, concentrate on Tipping and Building and Construction ...". (2) However, although there is some specialization in different markets by firms of different sizes, it is worth pointing out that Bayliss' report shows that all sizes of operators operate in all markets.

SOME CONCEPTUAL AND ANALYTICAL PROBLEMS

Even if the cost studies referred to above seem to nearly unanimously indicate absence of economies of scale, the matter cannot be

1) Bayliss and Edwards, op. cit., p. 63.

2) Bayliss, B.T., The Road Haulage Industry Since 1968, (London : HMSO, 1973), p. 22-23.

said to be wholly settled. In view of the statistics and comments made earlier in this paper as to the actual supply structure in road freight transport (especially in Sweden), and the criticism made by reviewers of the cost studies, it may be appropriate to point out some of the conceptual and analytical problems connected with studies of this kind. The following will be discussed :

1. How to measure size ?
2. How to measure output ?
3. Cross-section versus time-series analysis.
4. The effects of regulation.

How to measure size ?

The scale of operation can be expressed in two basically different ways : by measuring either volume of production or assets.

Total revenues belong to the first category and must be deemed a quite satisfactory scale indicator with the advantage of expressing in a "homogeneous" unit different kinds of operation and work performed. This measure has been used in several studies, i.e. by Nelson and by Roberts (although Roberts also used assets). The number of employees (total staff and not only drivers) is normally highly correlated with total revenues, but this measure does not seem to have been used in any studies.

In the cost studies assets have sometimes been measured by fleet size expressed in number of vehicles. Bayliss and Edwards used this measure as scale indicator, but it must be remembered that it has some weaknesses. A small and a large lorry is given the same weight, and if a vehicle is used in one-shift work or 24 hours per day does not affect firm size measured by number of vehicles. These disadvantages do not seem to affect the general conclusions which can be drawn from the study referred to. It is, however, worth noting that average mileage per vehicle varies from 20,000 to 30,000 miles between different fleet sizes. (1)

Fleet size can also be measured by carrying capacity in tons, which is a better scale indicator than number of vehicles. Terminal facilities are sometimes of great importance for road haulage operations and they must therefore be included when assets are measured. This can be done for instance by measuring the value of vehicles and terminal facilities.

How to measure output ?

The product of road freight transport is normally measured in ton-miles, a measure which incorporates both the weight of the load

1) Bayliss and Edwards, op. cit., p. 117.

and the distance. In studies on the relationship between firm size and cost per unit of output, the ton-mile has often been used as output measure. In some studies vehicle-miles have been used instead or as a supplement, but as this measure leaves out the load carried it is definitely inferior to ton-miles.

As is familiar to every transport student : "a ton-mile is not a ton-mile" ! The cost of moving one ton 100 miles is not the same as that of 100 tons moved one mile, but the output figure is the same - 100 ton-miles. The problem is even more complex, and as Wilson, among others, has pointed out : "One truck journey may be vastly different from another on account of the specific qualitative factors, such as speed, dependability, safety and responsibility. These create vast potentialities for 'product differentiation'...". (1)

It is obvious that if such qualitative factors are positively correlated with firm size, inter-firm comparisons of costs per ton-mile mean that we are comparing costs for non-homogeneous products. "By lumping all firms together, even in the fairly narrow range of regulated common carriers, there may be a merging of several distinct production functions into one conglomerate that will be all but valueless, if not misleading, in determining the existence of economies of scale and the optimum size of the firm". (2)

The solution to this problem of comparability is probably to analyze separately different sectors or markets of road freight transport when investigating the presence of scale economies. This suggestion, however, raises new problems concerning the question of how to define an individual market.

Cross-section versus time-series analysis

The findings in most of the cost studies suggest that the average operating costs are more or less constant in relation to firm size. At the same time the present size structure of the industry reveals firms of every size, from the one-vehicle firm to operators with hundreds of vehicles. Furthermore, in most countries the development of the road haulage industry is characterized by an increased market share for larger firms. Tables 3, 4 and 5 with data from Sweden, Germany and the Netherlands illustrate the last point.

Bayliss has studied the influence of size upon rates of growth for a sample of operators in the South East of England for the period 1953 to 1965. Size was in this case measured by unladen weight of the

- 1) Wilson, G.W., "The Nature of Competition in the Motor Transport Industry", Land Economics, Vol. 36, N° 4 (November 1960), p. 388.
- 2) Dicer, G.N., "Economies of Scale and Motor Carrier Optimum Size", The Quarterly Review of Economics and Business, Vol. 11, N° 1 (Spring 1971), p. 34.

Table 3
DISTRIBUTION OF PUBLIC HAULAGE VEHICLES ACCORDING
TO SIZE OF FIRM IN SWEDEN

Number of vehicles per firm	(Percentages)		
	1953	1964	1972
1	41.0	34.4	35.0
2-5	43.3	36.9	30.6
6-10	6.3	10.8	11.1
11-15	2.9	4.0	5.8
16-	6.5	13.9	17.6
Total	100.0	100.0	100.0

Source : The Swedish Road Haulage Association.

Table 4
DISTRIBUTION OF PUBLIC HAULAGE VEHICLES IN LONG-DISTANCE
ROAD TRANSPORT ACCORDING TO SIZE OF FIRM IN GERMANY

Number of vehicles per firm	(Percentages)		
	1960	1964	1970
1	22.7	19.2	12.8
2-3	33.6	32.2	28.1
4-6	20.9	22.2	22.6
7-10	11.0	13.1	15.2
11 -	11.8	13.3	21.3
Total	100.0	100.0	100.0

Source : Verkehrswirtschaftliche Zahlen 1972 (Bundesverband des Deutschen Güterfernverkehrs).

Table 5
THE STRUCTURE OF ROAD TRANSPORT FOR HIRE OR REWARD
IN THE NETHERLANDS 1958-1968

Leading capacity per company in tons	1958		1963		1968		Increase in % 1968/1958
	number of companies						
	abs.	%	abs.	%	abs.	%	
0 - 10	5,338	53	5,172	45	4,248	36	- 20
10 - 25	3,203	30	3,244	28	3,326	28	+ 4
25 - 50	1,221	12	1,762	15	2,031	17	+ 66
50 - 100	444	4	903	8	1,263	11	+184
100 - 200	150	1	377	3	648	5	+332
200 - 500	44	0	151	1	298	2	+464
500 and more	7	0	26	0	79	1	+1,029
Total number of companies	10,407	100	11,635	100	11,993	100	+ 15

Source : Central Bureau of Statistics, The Hague. Quoted by H.J. Noortman in "Economic Criteria for Determining the Capacity of Goods Transport by Road", Report of the eleventh ECMT Round Table on Transport Economics, Paris, 1971, p. 14.

fleet. He found that growth rates "to a very considerable extent" were influenced by original starting size. (1)

The actual development of firms raises the question whether cross-section industry data, indicating no economies of scale, are contradictory to the pronounced trend towards larger firms. Can the shape of the cost curve for the individual firm be adduced from cross-section industry data, or are there any artificial restraints on entry or expansion or contraction which may influence the size distribution of hauliers. (2)

As argued by Walters, cross-section industry data do not show how an individual firm's costs vary as its output changes. (3) The actual behaviour of firms over time should produce clearer evidence on economies of scale than inter-firm comparisons for one year. If small firms which grow in size do not last very long, this would indicate that there are disadvantages connected with increasing scale of operations for instance disadvantages arising through managerial inadequacies. If, on the other hand, middle-sized and large firms

1) Bayliss, B.T., The Small Firm in the Road Haulage Industry, (London : HMSO, 1971), p. 30-32.

2) Walters, A.A., Integration in Freight Transport, London, 1968, p. 29.

3) Walters, op. cit., p. 29-31.

tend to increase their share of the market this might give evidence of their efficiency and competitiveness.

As is well known, surveys analyzing the development of individual firms over time are difficult to carry out. But such studies would add considerably to our knowledge of the factors which affect the structural changes within the road haulage industry.

Finally, it has often been overlooked that the various cost studies do not indicate any significant diseconomies of scale; constant returns to scale seem to prevail. If this is the case, the optimum size of a firm is indeterminate and the market structure of the industry cannot be derived from the cost side only. (1) So the contradictory results - there seem to be no economies of scale, but firms are becoming larger over time - may be reconciled. This will be discussed further in the section on the structure of demand.

The effects of regulation

Since the 1930's the road haulage industry in most countries has been subject to entry and capacity controls, often coupled with rate regulation. Have these kinds of governmental intervention in any way "distorted" the size structure of the industry ?

The regulatory systems of different countries may be very much alike as to intention and general outline, but in details each country's licensing system is in many ways unique. Furthermore, legislation as well as the licensing authorities, interpretations and practices may have changed over time. All this means that it is a very complicated task to analyze the effects of regulation on the market structure. Only some general observations and remarks on the subject will be made here.

Several American authors have emphasized that restrictive entry control in United States interstate carriage has had a large impact on the size distribution of firms. Meyer et al. said that "The present market structure ... is largely a consequence of ICC policy", and went on: "Without control of entry by the ICC, it is likely that the trucking industry would be even more unconcentrated". (2) Nelson contends that "in motor trucking, government entry control has limited the number of firms and encouraged large firms in spite of the small fixed investments and the negligible evidence that large firms were more efficient than small or medium-sized firms". (3).

1) Wilson, G.W., op. cit., p. 389.

2) Meyer et al., op. cit., p. 213.

3) Nelson, James C., "The Effects of Entry Control in Surface Transport", (in Transportation Economics, New York and London, 1965), p. 420.

However, state intervention in the road haulage industry does not necessarily mean that the established firms have been favoured.

Entry and capacity controls have also been used with the aim of avoiding concentration. As to the development in Norway, Hiorth has pointed out that public regulation of the road haulage industry has resulted in a market structure with many and small operators, as the official policy for a long time was "one man - one lorry". (1)

One of the guidelines in the Swedish regulatory system has been that only individuals, and not corporations, could be holders of public haulage licenses. When licenses have been granted to a haulage firm run as a limited company, this has been looked upon as an exception to the rule, and such licenses have been granted only for periods of about three years at a time; for individuals no time limit has been set. It has not always been easier for an established operator in Sweden to increase his capacity than for a newcomer to enter the market. The licensing authorities had to see to it that a "reasonable" share of new licenses went to new-comers.

These conditions indicate that government and licensing authorities seem to have considered the small firm as the "natural" unit in the road haulage industry. This philosophy may have retarded the pronounced trend towards larger firms in Sweden. (See Table 3). On the other hand, it is worth mentioning that regulation has not been a hindrance to the development of the system with lorry centrals, which has meant "seller concentration".

In a recent research report, commissioned by the Committee of Inquiry on Small Firms in the United Kingdom, Bayliss has studied the influence of licensing upon the growth and structure of the British road haulage industry. (2) The licensing system introduced by the 1933 Road and Rail Traffic Act made entrance into the road haulage industry much more difficult than earlier, as a newcomer had to prove that there was a "need" for his haulage work and that suitable services did not already exist. If an existing haulier wanted to add vehicles to his fleet, he had to prove an increase in the size of business. Bayliss concludes that "As this was a much easier task than that required of new entrants, this explains, to some extent, the growth in the size of operating units". (3) This statement applied to the situation before World War II.

1) Hiorth, O. Ch., Innenlandske transporter, Oslo 1970, p. 39.

2) Bayliss, B.T., The Small Firm in the Road Haulage Industry, London : HMSO, 1971).

3) Bayliss, op. cit., p. 35.

The modification in the licensing system made by the 1953 Transport Act made it easier for newcomers to enter the market. However, even during the 1950's and 1960's large operators increased their share of the market. According to Bayliss this can be partly explained by the advantage larger firms had in presenting their cases in appeals to the Tribunal and by larger firms' better financial position to make purchases of other haulage firms. (1)

An interesting trait in the British development since the passing of the 1953 Transport Act is the tendency among the licensing authorities to control in detail the nature of the work carried out by a haulier. The number of 'A' licenses granted increased only moderately from 1953 to 1968. Instead a large increase occurred in the 'A Contract' and 'B' license classes. The latter license categories offered a much more restricted freedom of operation than an 'A' license. The strict operating conditions often specified in detail the customers to be served, the commodities to be carried or the area of operation. This practice of limiting the potential use of a vehicle or a fleet of vehicles ("compartmentalization of the market") has probably resulted in a larger number of small firms than would have been the case without these constraints on operating rights.

A general impression is that Germany and France have had stricter entry and capacity controls than the United Kingdom, The Netherlands, on the other hand, have probably had more "liberal" regulations than the United Kingdom. It is interesting to note, however, that all these three countries have a larger proportion of small road haulage firms than Great Britain. (2)

The discussion on the effects of regulation on the size distribution of firms can be summarized as follows. Over the years a trend towards concentration can be recognized in many countries. The relevant question is whether regulation has accelerated or retarded this trend. Have the licensing authorities' decisions had the effect of maintaining more firms than would have been the case without entry and capacity controls, or have the larger firms been favoured by the regulatory bureaucracy ?

There is no clear-cut answer to these questions. Every country seems to be unique in some respects. When existing licensed carriers have applied for increased capacity, they have in general been in a better position than a newcomer who wanted to enter the market. This would suggest a trend towards larger firms. On the other hand, in some countries, like Sweden and Norway, the licensing authorities for many years made certain that a "reasonable" share of newcomers could have access to the market. This seems to have worked in the other direction as to the size distribution of firms, i.e. towards smaller firms.

1) Bayliss, op. cit., p. 39.

2) Bayliss, op. cit., p. 41.

The Swedish development before and after 1964 is of some interest in this connection. From 1964 to 1972 entry and capacity controls were not applied as strictly as earlier and the pronounced policy was to have a "liberal" licensing system. A large increase in the number of one-vehicle firms took place from 1964 to 1968, but this was only a temporary phenomenon; the following years the number of new entrants was back to "normal" again. As seen from Table 3, firms with more than five vehicles continued to increase their market share also during the "liberal" years, 1964 to 1972, when it was easier than before to enter the market or to add vehicles to existing fleets.

The British experiences after the 1968 Transport Act is to some degree of the same character. (1) This leads to the conclusion that the effects of regulation on the size distribution of firms should not be overstressed. Other factors, such as the structure of demand, seem to be of greater importance in shaping the size distribution of sellers in the road freight transport markets. The influence of demand will be dealt with in the next section.

Are the conclusions regarding economies of scale sensitive to the methods used in the cost studies? In the preceding section of this paper we have briefly discussed this problem. The outcome of the discussion is to some degree inconclusive.

As to scale indicators used (how to measure size?), none seems to have any serious disadvantage which could have severely influenced the results. However, the size of firm seems to be better reflected by measuring the volume of production (for instance by revenues) than by measuring assets by number of vehicles.

The road haulage industry's output cannot be measured simply in ton-miles as "a ton-mile is not a ton-mile". One of the problems confronting the cost studies is to select homogeneous products for inter-firm comparisons. The authors have in general been aware of this problem, but in practice it has not been possible to eliminate it completely. This may have affected the results in such a way that possible economies of scale have not appeared in the material.

It is difficult to isolate the effects of entry and capacity controls from other factors affecting the size structure of the industry. There is evidence available that state intervention has caused smaller firms than would have been the case without regulation. The opposite can also be shown - it all depends on which country is being studied. A general impression is, however, that regulation in the form of commodity, customer or area restrictions has retarded the trend towards larger firms.

1) Bayliss, B.T., The Road Haulage Industry Since 1968, (London : HMSO, 1973).

Finally, there is no real conflict between the results from the cost studies and the fact that firms are becoming larger. As the cost studies do not show any diseconomies of scale, there seems to be no single optimum size of a haulage firm, and the demand conditions seem to play an important role in determining the actual size structure of the industry.

III. THE INFLUENCE OF DEMAND

In the following we will turn to the demand side with the aim of considering how demand may influence road haulage operations. The following questions seem to be of some relevance in this connection :

1. How does the heterogeneous character of demand affect the supply structure ?
2. What are the service requirements of shippers ?
3. What does specialization mean ?
4. What do we know about market practices ?

The demand for road freight transport within a particular region or country cannot be expressed in a single figure, for instance that so and so many tons need to be transported. We have to know a lot more : kind of commodities, length of haul, origin and destination of shipments, consignment sizes, when the goods should be picked up or delivered, if shipments are regular or occasional, special handling requirements, etc. As has already been pointed out, even the commonly used "ton-mile" as a measure of demand or output for freight transport has severe deficiencies as it does not contain the service elements associated with moving goods from one place to another. The list of special service requirements of shippers also includes such non-quantifiable features as reliability, punctuality, responsibility, safety, flexibility, etc.

Demand for road freight transport is, thus, of a very heterogeneous character. The readiness and ability of road haulage firms to provide this diversity of services may to some extent explain the varied nature of demand.

There are, however, other features of demand which are also worth mentioning. A substantial part of the demand is of a regular character. This is simply explained by the general production and consumption patterns in the industrialized society : food stores and pubs must get daily supplies, assembly plants need continuous inflows of material, petrol stations have to be replenished, pulp mills need regular supplies of pulp wood and the printing industry of paper, and all the rubbish and refuse has to be disposed of, regularly.

This regular character of demand does not exclude weekly, monthly or seasonal variations - and extreme example being transport of

Christmas trees in December - but the point is that this regular demand is fairly well predictable, and that shippers have to take measures that ensure the regularity of shipments. This must give shippers very strong incentives to conclude long-term contracts with carriers (we disregard for the moment the alternative that shippers have their own vehicles).

It is difficult to judge the share of total road freight carried under long-term contracts with a duration of, say, up to twelve months, or carried under more informal agreements of some permanence. Very few studies seem to have been made on transport market practices. That long-term agreements are very common is indicated by the results of a study undertaken by the Economic Bureau of Road and Water Transport in the Netherlands. As to the relationship between road transport companies and their clients, they came to the conclusion that on the average 45 per cent of the total revenues came from one client and on the average 70 per cent from transport for not more than three clients. (1)

What has been said above implies that demand to a large extent is of a rather permanent nature and that the so called "day market" is probably of limited importance for the road haulage industry.

Can we draw any conclusions from these particular features of transport demand - heterogeneity coupled with regularity and permanence - as to optimum size and structure of freight transport firms? Given this structure of demand, there seem to be great potentialities for a carrier to specialize in particular traffics, to supply a "different product" and to find a "niche". But this, per se, does not say anything about the optimum size of firms. Other factors must also be taken into account, but first a few words on the concept of "specialization".

It is not always clear what is meant by specialization in connection with road haulage operations. The opposite to specialization is often termed "general haulage" and in this case specialization means that a haulier has restricted his operations to special commodities like milk, meat or timber, or to car transport or tipping, where vehicles with special bodies or equipment are required (technical specialization).

Specialization can also mean that the haulier serves only one customer, and international haulage and express carriage is often taken as an example of specialization although "general goods" are carried (functional specialization). The term specialization is sometimes used as a synonym for small-scale operations, but in view of what has just been said, this does not seem to be a relevant definition.

1) Quoted by H.J. Noortman in "Economic Criteria for Determining the Capacity of Goods Transport by Road", Report of the eleventh ECMT Round Table on Transport Economics, Paris, 1971, p. 23.

It must be emphasized that specialization as such has nothing to do with size of operation.

The service elements associated with demand for freight transport, which lead to a very heterogeneous demand structure, have been emphasized earlier. But these demand characteristics do not by themselves result in a specific size of firms. Another factor that may be of importance in shaping the size structure is the geographical distribution of total demand. This is largely a function of the distribution of population and the distribution of economic activity, especially manufacturing industry, over the country. The tons generated for transport are roughly proportional to these two variables. (There are obvious and striking exceptions to this rule, which do not have to be exemplified here.)

Most goods movements are over short distances. More than 75 per cent of total tonnage carried by road and rail in Sweden moved over distances less than 50 kilometres (30 miles) in 1970. This means that freight transport markets are for the most part local. If the local market is large in demand terms - industrial concentration and/or a large urban area - this opens up possibilities for large freight transport firms. In "thin" markets, on the other hand, there are less opportunities for large-scale operations. To give one example : in a big city where a lot of building and construction work is going on, there is a market for larger fleets specializing in tipping, opportunities which are not offered in, say, a small village in the countryside. The large differences shown in Table 1 (p. 11) between Norway and the United Kingdom as to the size distribution of firms may be partially explained by differences in the volume of total demand and its geographical distribution.

This way of reasoning may seem too simple - and it is. But the volume of demand in a given geographical area must be of importance for the size and growth of firms, especially when regulation has imposed commodity or area restrictions on road haulage operations. An indication of this is found in statistics showing the market share of large haulage firms in different parts of Sweden. Firms with more than ten vehicles had 27, 36 and 34 per cent of the public haulage fleets in respectively the Stockholm, Göteborg and Malmö conurbations, but only around 5 per cent in the two most northern counties, which are very sparsely populated.

We have already touched upon the service requirements of shippers, but more has to be said about this subject and one may ask : do shippers prefer small or large firms ? The immediate and obvious answer is simply - both. There are, however, circumstances which indicate that large haulage firms have some advantages in comparison with small ones in dealing with customers. Large firms within manufacturing industry, retail trade or in the construction field are also large buyers

of transport services. To buy transport services may involve not only rate negotiations but also agreements on frequency of delivery, trip schedules and other services tailored to the needs of the shipper. In such cases shippers often prefer to deal with one seller on the supply side - this is the tendency at least in Sweden. The notion that "big business likes to deal with big business" should not be looked upon just as a sociological phenomenon. A shipper may save costs for administration, co-ordination and supervision by concluding a contract with one counterpart.

Large shippers have "negotiating strength" over a number of small independent carriers, just by being large. As has already been mentioned, Sweden has seen the growth of lorry centrals, institutions aimed at avoiding the short-comings of small haulage firms. By acting as one of the big sellers in a local or regional market they can exercise "countervailing power" and they have also resources to offer a varied supply of transport services.

The development of the lorry centrals is an interesting example of how the interaction between supply and demand in road freight transport has created a new type of suppliers which is large as a seller but has decentralized ownership and "production".

Shippers' service requirements, however, do not work only in favour of large firms. The small firm is often on equal footing with larger ones when it comes to such things as reliability and flexibility of services. The small man knows that it is of utmost importance to him to maintain the goodwill of his clients, and a small firm may often be in a better position than a large haulage company to exercise personal control and supervision of operations.

The preceding discussion, which has dealt with some aspects of the influence of demand factors on the size distribution of firms, can be summarized as follows. Demand for road freight transport services is of a very heterogeneous character and other characteristics of traffic than weight and length of haul have become more and more important to shippers. This gives opportunities for "product differentiation", which means that carriers can specialize in particular traffics and become experts in specific fields of operation. Both small, medium-sized and large firms can be successful in this respect and the multiplicity of demand does not, as such, lead to one optimum size for haulage firms.

One basic feature of demand that affects the size of firms, is its absolute volume and geographical distribution. "Thin" markets cannot support large firms. The effects of these demand characteristics on the size and structure of firms may be large when regulation has imposed geographical and commodity restrictions on operations. A regulatory system with "narrow" licenses may hold down the average size of firms even when total demand is large. Regulation sometimes causes barriers to expansion.

Demand for freight transport is not only heterogeneous; it is also of a regular nature, which gives shippers incentives to conclude long-term contracts with carriers. If large quantities or complicated shipments are involved, it is both cheaper and easier for a shipper to deal with a single carrier. There is evidence available that "bulk buying" of transport with ancillary services, like storage and distribution, is growing, and large transport firms are definitely at an advantage in providing such services.

IV. SUMMARY AND CONCLUSIONS

The traditional view of the road haulage industry as a small-scale industry is to some extent still valid. Even if there are large differences between countries, it is quite common that 75 per cent or more of the total number of firms consist of operators with no more than one to five vehicles, which is regarded as a small firm in this context.

However, a closer examination of the situation in different countries reveals more complex patterns. The traditional view has to be modified in the following respects :

1. Even if the medium-sized and large firms are few in number, their share of the market is substantial.
2. National data on the size distribution of firms are of limited value when judging the degree of concentration, as a national market is seldom available to the firms.
3. Number of firms is not necessarily equal to number of sellers in a given market; subcontracting, forwarding agencies and cooperative units are sometimes of great importance in shaping the market structure.

Considering these matters, the conclusion is that the industry in practice is far more concentrated than the "official" statistics show.

There are theoretical reasons that speak in favour of the predominance of the small firm. Entry costs are low, as there are no technical economies of scale arising from indivisible factors of production - the smallest production unit being a lorry. The scale of operation is, thus, very flexible; the capacity utilization of a single lorry can be varied or extra vehicles could be added to the fleet. Overheads are small, so much is not gained by having a larger production volume on which they can be spread. As a firm grows, staff for coordination, control and supervision is needed and managerial diseconomies may appear.

Several surveys have been carried out to study whether economies of scale are characteristic of the road haulage industry. The results from most of these empirical studies seem to verify the theoretical assumptions that economies of scale are absent. The results, however,

are not wholly conclusive, as there are conceptual and analytical problems connected with cost studies within this particular field.

One problem is to choose an appropriate scale indicator, another to find the best output measure. Of these two problems the second one is the most intricate, and the way in which output is measured may affect the results. A road haulage firm produces vehicle-miles and ton-miles, but the same number produced by another haulage firm may be of a different nature, because of different quality and service attributes.

A third problem is the effects of regulation. State intervention seems to have resulted in smaller firms than would have been the case without regulation, especially when commodity, area or shipper restrictions have been attached to licenses. On the other hand, there is evidence available that established firms have been favoured by entry and capacity controls.

A fourth problem is how to reconcile the results from the cost studies (no economies of scale) with the fact that firms are becoming large over time. There seems to be no real conflict here, as the cost studies do not show any diseconomies of scale. With constant returns to scale the optimum size of firm is indeterminate and the size structure cannot be explained from the cost side only.

The influence of demand on the structure and organization of the road haulage industry is often neglected. The varied nature of demand implies that there is a place for firms of all sizes. There are, however, some factors which seem to work in favour of larger firms, for instance the trend towards larger units and concentration on the demand side, the increased tendencies among shippers to buy transport in large quantities and on long terms, and to include storage, distribution and other ancillary transport services in contracts with one seller.

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