

Road Freight Transport in Ireland

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(Read before the Society on March 31st, 1967)

INTRODUCTION

This paper describes a Sample Survey of Road Freight Transport which was carried out by the Central Statistics Office during 1964. Preliminary data have already been issued in the official publication 'Sample Survey of Road Freight Transport, 1964—Preliminary Results'.¹ The scope of the survey covered the activity of all goods vehicles² licensed in the State at that time, both those belonging to concerns operating for hire or reward (including C.I.E.) and vehicles belonging to own account operators, i.e. operators who use their vehicles for carrying their own goods.

The main objective of the survey was to provide estimates, at the national level, of such important economic indicators as the total tonnage of goods moved by road, the ton-mileage performed, vehicle miles travelled, etc. It was also the intention of course, from the outset, to provide the information in considerable detail, e.g. by unladen weight of vehicle, by region, by length of haul, etc. The absence of information of this kind has long been a major gap in the national statistics. Up to the time of the survey the only published information relating to road freight in this country consisted of the annual vehicle counts carried out by the Department of Local Government and global figures for the activity of vehicles belonging to C.I.E.³ and the other licensed hauliers.⁴ Of the work done by Own Account operators, who are responsible for the vast bulk of road freight activity, nothing was known.

It is also worth mentioning that the information available, though limited in scope, was sufficient to give an indication of the major changes which have taken place in road freight working in recent years. The following table shows the Department of Local Government Census Counts of the numbers of goods vehicles under current licence on the 10th August of each year from 1960 to 1965.

¹The final report 'Sample Survey of Road Freight Transport, 1964' (Pr. 9572) has now been published (*Editor*).

²Certain kind of goods vehicles exempt from Road Tax were excluded from the Survey. These were mainly Government owned (e.g., Post Office vehicles, Army vehicles, etc.).

³C.I.E. Annual Report.

⁴Irish Statistical Bulletin.

TABLE 1
GOODS VEHICLE POPULATION 1960-65

Unladen Weight	1960	1961	1962	1963	1964	1965
1 ton and under ...	27,611	25,233	24,835	24,386	24,835	25,008
1 to 2 tons ...	4,016	5,750	6,203	6,494	7,167	7,641
2 to 3 tons ...	5,078	4,472	4,331	4,239	4,161	4,215
3 to 5 tons ...	5,400	6,687	7,372	7,923	8,251	8,615
Over 5 tons ...	1,046	1,292	1,506	1,701	1,763	1,951
Total ...	43,151	43,434	44,301	46,743	46,177	47,430

Thus while the total number of goods vehicles did not increase very much in this period (43,200 to 47,400), significant changes occurred in the internal structure of the fleet. The smallest vehicles (under 1 ton) and the vehicles in the 2 to 3 ton unladen weight class declined in number while the numbers of vehicles in the 1 to 2 ton and over 3 tons weight classes increased substantially; the heaviest vehicles (over 5 tons) almost doubled in number. Thus, since we can reasonably assume that heavier vehicles do a greater volume of work measured in terms of tons carried, etc., these trends, which in effect represent a movement towards heavier vehicles at both ends of the unladen weight scale, show that the volume of road freight work done, measured in terms of tonnage and ton-mileage, must have increased considerably between 1960 and 1965.

METHOD OF SURVEY

The following paragraphs are merely a synopsis of the basic methodology of the survey. A fuller account is given in Appendix I which describes in detail the method of sample selection and grossing procedures.

The survey, which lasted from 6th January, 1964 to 3rd January, 1965 was carried out on a sample basis some 15,600 goods vehicles out of the total population of 46,000 being included. The owner of each sample vehicle was sent a questionnaire asking for a description of his vehicle and a record of its activity during a specified week. Thus even though the overall sampling fraction in terms of vehicle numbers was relatively large, about one-third of the total fleet, in terms of the proportion of total activity covered it was quite small, details of only 1/52 of the annual activity of each vehicle were recorded. The questionnaire provided for a separate line for each journey performed by the vehicle during the specified week, the owner being asked to state the origin and destination, the tonnage moved, the loaded and empty mileage for the journey as well as a description of the type of commodity carried. He was also asked for details of the vehicle itself (e.g. unladen weight, type of fuel used, etc.) and to give a description of the general type of work in which it was engaged during the week (e.g. retail delivery, carriage of materials to and from building sites, etc.). Finally he was asked to give a description of his own type of business (e.g. manufacturer, haulier for reward, etc.).

The sampling of goods vehicles was carried out separately in each of the 30 Local Authority Motor Taxation offices. This insured that goods traffic in each area of the country received proper representation. In each office the sample was stratified by unladen weight of vehicle, four weight classes being used. The sampling fractions applied are shown below. They were selected to yield the greatest sampling accuracy for the overall sample size involved.

Unladen weight	fraction Sampling
Not over 1 ton	1/20
Over 1 ton but not over 2 tons ...	1/5
Over 2 tons but not over 3 tons ...	1/2
Over 3 tons	1/1

Thus while all vehicles of over 3 tons unladen weight were included lesser proportions of the smaller vehicles were sampled, the fraction reducing to 1 in 20 for the lowest unladen weight class of 1 ton and under.

These sample vehicles were then allocated over the 52 weeks of 1964, approximately equal numbers being included in each week. The allocation was carried out within unladen weight classes and where a particular industry or trade was dominated by a few large concerns with many vehicles the sample vehicles for such an activity were spread as evenly as possible through the year.

Response

Of the total of some 15,600 vehicles included in the sample returns were received in respect of 10,700, i.e. an overall response rate of about 68 per cent. However, there was considerable variation in the response for the different unladen weight classes as the following table shows.

TABLE 2
RESPONSE RATES

Category	Unladen Weight					All Vehicles
	1 ton and under	1 to 2 tons	2 to 3 tons	3 to 5 tons	Over 5 tons	
Total number of vehicles in sample	1,536	1,476	2,304	8,598	1,679	15,593
Number of vehicles for which returns were re- ceived	950	960	1,579	5,819	1,358	10,666
Percentage Response ...	61·8	65·0	68·5	67·7	81·3	68·4

The rate of response increased generally with increasing unladen weight of vehicle from 62 per cent for vehicles not exceeding 1 ton to 81 per cent for vehicles over 5 tons.

There remained, however, a substantial number of 'non-respondent' vehicles, comprising approx. 30 per cent of the original sample, about which nothing was known. The danger in non-response lies in the fact that it may give rise to an element of bias in the final sample. For instance it could have been possible that a disproportionately large number of vehicles belonging to non-respondents might have been idle during the specified survey week (e.g. in the event the owner thinking that it was not necessary to return the form). Since the final figures were obtained by grossing up the sample results this could result in an over-estimate of the volume of activity for the entire fleet.

A special survey of non-respondent vehicles was carried out to investigate whether or not their activity differed significantly from that of the respondent vehicles. A random sub-sample of some 600 non-respondent vehicles was selected and a simplified form was issued to owners asking whether the vehicle in question had been scrapped before the relevant survey week and if not, whether it was used for carrying goods in that week. The results did not reveal any significant difference between the respondents and the non-respondents in the proportion of vehicles which were scrapped, idle or working and consequently the final sample of 10,666 returns was taken as being representative in all respects.

Grossing

The results obtained from the sample were expanded to form estimates of the work done by the entire goods vehicle fleet during the whole of 1964. The grossing, which was done separately for each quarter and also within each of the unladen weight classes specified in Table 2, was carried out on a 'vehicle weeks' basis. For a particular size group the procedure was as follows: the total number of vehicle weeks in a quarter was first determined from the information available on total fleet numbers. This total was then divided by the number of vehicle weeks covered by the sample in the same quarter to give the required grossing factor.

SOME TERMS AND DEFINITIONS USED

In the course of the survey two basic categories of journey were distinguished, 'end-to-end' journeys and 'intermediate' journeys.

A loaded 'end-to-end' journey was defined as a direct trip on which the entire load was carried from origin to destination with no collection or delivery points en route. When there were empty runs from drop-off point back to base or from base to pick-up point these were treated as separate 'empty' end-to-end journeys.

An 'intermediate' journey was defined as one which involved depositing or collecting part of the load at one or more intermediate points. For each such journey the total mileage was divided into 'loaded' and 'empty' the loaded mileage being defined as that distance over which the vehicle travelled with all or part of its load on board.

Ton-mileage

For a loaded end-to-end journey the calculation for obtaining ton-

mileage is a simple exercise involving merely the product of the tonnage conveyed by the length of the journey. For intermediate journeys, however, to calculate the exact ton-mileage one would require to know the magnitude of the load delivered or collected at every stopping point and the distances between the stopping points. It would have been optimistic, to say the least, to expect vehicle owners to provide information on individual journeys in such detail. Instead, in this instance, owners were asked to give the loaded and empty mileage for the journey and to state a total which comprised the load at the beginning of the journey (if any) plus the weight of any additional loads picked up en route. The ton-mileage for the journey was then estimated by taking the product of the total tonnage and half of the total journey mileage (loaded plus empty). This method assumes a uniform rate of collection and/or delivery throughout the journey. A prior investigation, based on the detailed records of the Transport Departments of a number of private concerns, had shown that this formula gave satisfactory results when large numbers of intermediate journeys were involved.

SAMPLING ACCURACY

Since the data on road freight activity compiled were based on returns from only a sample of vehicles and not on a complete enumeration it is necessary to examine the survey estimates from the point of view of sampling variability. Estimates of these errors which are technically termed 'sampling errors' have been calculated for the ton-mileage figures only; separate assessments were made of the sampling error for each of the quarterly estimates. The following table sets out all the relevant information.

TABLE 3
SAMPLING ERRORS

Period	Standard Deviation of Grossed Estimate of Ton/Mileage (S)	Total Ton/Mileage (T)	Percentage Error of Grossed Estimate (2S/T)
	millions	millions	%
1st Quarter ...	6.24	232.75	5.4
2nd Quarter ...	6.61	264.75	5.0
3rd Quarter ...	6.61	256.76	5.1
4th Quarter ...	7.27	294.34	4.9
Year	13.38	1,048.60	2.6

The first column shows the estimated standard deviations of the grossed quarterly estimates and of the annual estimate using weekly ton-mileage per vehicle as a base unit. The final column contains the estimates of the percentage error for each period—the ratio of twice the standard deviation to the grossed estimate of ton-mileage for the period in question. Since

we have taken twice the standard deviation these 'confidence' percentages are based on a probability of 0.95, i.e. in the case of the first quarter the probability is 0.95 that the true population ton-mileage (i.e. the ton-mileage that would be obtained in a complete enumeration) lies between the points 232.75 million \pm 5.4 per cent, i.e. between 220.18 million and 245.32 million ton-miles. The estimate of error so defined for each of the four quarters is about 5 per cent while the error involved in the overall annual estimate is approximately $2\frac{1}{2}$ per cent. The smaller error for the annual figure is a consequence of the larger sample size involved.

The assessments of error given above relate to global estimates. One must, however, be prepared for somewhat larger errors in individual cells when detailed tables involving various cross classifications are involved. It is not possible to assess the accuracy of every cross classification compiled from the survey, but the following table, which gives estimates of the percentage error for different unladen weight classes for the first quarter of 1964, gives some idea of the extent to which accuracy in individual categories may decrease when information is given in greater detail.

TABLE 4
SAMPLING ERRORS FOR THE FIRST QUARTER OF 1964

Unladen Weight	Standard Deviation of Grossed Estimate of Ton/Mileage (S)	Total Ton/Mileage (T)	Percentage Error of Grossed Estimate (2S/T)
	millions	millions	%
1 ton and under	0.82	4.57	35.9
1 to 2 tons ...	0.67	6.95	19.3
2 to 3 tons ...	1.42	19.69	14.4
3 to 5 tons ...	4.12	128.99	6.4
Over 5 tons ...	4.31	72.54	11.9
All vehicles ...	6.24	232.75	5.4

Thus while the error of the overall estimate of ton-mileage is only 5.4 per cent it can be as high as 36 per cent for activity relating to vehicles under 1 ton unladen weight. However, it must be kept in mind that for this category the sampling fraction was the smallest used and also the proportion of total activity accounted for by vehicles of this size is extremely small, about 2 per cent of total ton-mileage. This is why it has so little effect on the overall percentage error. It will be noticed that the estimate of error for vehicles in the 3 to 5 ton weight class, which account for the bulk of road freight activity, still assumes reasonable proportions, about $6\frac{1}{2}$ per cent.

The percentage errors of annual activity for each unladen weight class would be approximately one-half of those shown in the above table.

Apart from errors due to sampling, there are other sources which could give rise to inaccuracy in the data. The calculation of ton-mileage for an intermediate journey was, in fact, an estimate in itself involving multiplication by a factor of one-half. However, it has already been pointed out that this procedure gave satisfactory results when a large number of journeys were involved and consequently any errors due to this in the overall grossed estimates are likely to be small. The fact that ton-mileage relating to intermediate journeys forms only about one-quarter of total ton-mileage further reduces the overall effect of this approximation.

It must also be remembered that many of the figures returned on the questionnaire were the vehicle operator's own estimates of tonnage, mileage, etc. However, a number of consistency checks were carried out on the returns and remarkably few discrepancies were discovered. The evidence was that in the cases where the operator did not know the exact tonnage or mileage his estimates were usually good ones and there was no tendency to bias. Thus any error attributable to this source is probably very small.

THE RESULTS

Before embarking on a detailed analysis of the results of the survey I wish first to set out some broad global estimates in order to specify the overall magnitude and extent of road freight activity. The following table shows, for each unladen weight class, estimates of the total activity of the goods vehicle fleet during 1964 measured in terms of tons carried, vehicle miles travelled, ton-miles performed and the number of loaded journeys undertaken.

TABLE 5
TOTAL TRANSPORT ACTIVITY CLASSIFIED BY UNLADEN WEIGHT OF VEHICLE

Unladen Weight	Tons	Vehicle Miles			Ton/Miles	Number of Loaded Journeys
		Loaded	Empty	Total		
millions						
1 ton and under...	1.84	69.32	25.64	94.96	22.84	5.08
1 to 2 tons ...	2.04	52.27	12.88	65.15	32.64	2.18
2 to 3 tons ...	4.42	38.08	11.41	49.49	81.72	1.45
3 to 5 tons ...	35.46	97.77	60.82	158.59	616.36	5.01
Over 5 tons ...	10.83	28.62	14.73	43.35	295.05	0.98
Total	54.59	286.06	130.47	416.54	1,048.60	14.69

Thus some 55 million tons of goods were moved by road during 1964, about 417 million vehicle miles travelled, 1,048 million ton-miles performed and 14½ million loaded journeys undertaken in the course of this work.

One important feature which emerges from this table is the preponderant importance of the heavier vehicles. Vehicles over 3 tons unladen

weight, even though they constitute only 22 per cent of the entire goods vehicles population, accounted for 85 per cent of the tons carried and 87 per cent of the ton-miles performed. The heavy vehicles were not responsible for such high proportions of work if activity is measured in terms of mileage or numbers of loaded journeys (50 per cent and 41 per cent respectively). The ton-mileage figures are particularly important, however, since they give the most comprehensive assessment of road freight activity taking into account both the magnitude of the loads and the distances over which they are carried. This information assumes even greater significance if we recall the trends evident in Table 1, i.e. the rapid growth in the number of heavy vehicles in the last six years. In fact it confirms the statement that even though the size of the goods vehicle fleet has remained fairly constant in recent years the volume of road freight activity has increased substantially.

Having outlined the overall magnitude of road freight activity in terms of the working characteristics tons, ton-miles, etc., the remainder of this paper will take the form of four distinct analyses covering (1) road freight transport for hire or reward and on own account, (2) road freight transport associated with different areas of the country; the third analysis, (3) is a comparison between road and rail freight working while the final part, (4) makes certain comparisons between road freight transport in Ireland and in Britain.

(1) Road Freight activity for Hire or Reward and on Own Account

As pointed out in the Introduction the survey made it possible to assess for the first time the volume of road freight activity accounted for by concerns who operate vehicles for carrying their own goods. This section consists mainly of comparisons between the activity of such Own Account operators and the activity of the two main groups who operate road freight vehicles for hire or reward in this country, namely C.I.E. and Other Licensed Hauliers. In the following discussion the category 'Other Licensed Hauliers' covers the activity of vehicles belonging to persons holding road merchandise transport licences. All other vehicles, except of course C.I.E. vehicles, have been classified as Own Account. Some holders of road transport merchandise licences are not full-time operators, i.e. they have other means of income besides carrying goods for reward. As a consequence their vehicles are used to some extent for work on own account. As it was not feasible to distinguish such work in the survey it has been included here under the Licensed Hauliers heading. On the other hand a certain amount of haulage for hire or reward is carried out by persons who do not hold road merchandise transport licences but who are restricted in their operations to certain areas and to certain commodities. The bulk of this type of activity is confined to the cities of Dublin, Cork, Limerick, Waterford and Galway where any operator can convey goods for reward without a licence within prescribed distances of the city centres (15 miles for Dublin and Cork, 10 miles for the other cities). During the course of the survey it became apparent that many of these operators were also part-timers and the indications were that much of their work was on

own account; for this reason they have been included with Own Account in the results.

The following table shows total road freight transport activity distinguishing separately the figures for Own Account, C.I.E., and Other Licensed Hauliers.

TABLE 6
TRANSPORT ACTIVITY BY TYPE OF OWNER OF VEHICLE

Type of Owner	Tons	Vehicle Miles			Ton/ Miles	Number of Loaded Journeys
		Loaded	Empty	Total		
		millions				
Own account ...	43.91	260.94	113.83	374.77	869.10	13.32
C.I.E. ...	4.24	10.17	5.65	15.81	63.34	0.57
Other Licensed Hauliers ...	6.44	14.46	11.00	25.96	116.16	0.81
Total ...	54.59	286.06	130.47	416.54	1,048.60	14.69

The most striking point which emerges from this analysis is the overwhelming proportion of activity which is accounted for by Own Account vehicles, at least 80 per cent for all characteristics of measurement. The figures show that Own Account vehicles were responsible for 80 per cent of the total tonnage carried; the contributions from C.I.E. and the Other Licensed Hauliers amounted to only 8 per cent and 12 per cent respectively. It can be argued, of course, that global comparisons of this kind are not strictly speaking valid on account of the basic differences in the type of transport activity of the three types of operator involved. It is true that much of the work done on Own Account is not of a type that could alternatively be carried out on a profitable basis by C.I.E. or the Licensed Hauliers (such as short distance delivery work). Further C.I.E. operates scheduled freight services and a collection and delivery service linked with its rail service, types of work which are not carried out by other operators. It must also be kept in mind that many Licensed Hauliers are subject to legal restrictions both as regards the size of the vehicle which they may operate and the area to which they are obliged to confine their activities. In view of these basic differences it is essential to set out the information in more detail before meaningful comparisons can be made. In the following paragraphs comparisons are made between the three types of owner in question when total work done is classified by (i) length of haul and (ii) type of journey, i.e. end-to-end journeys and intermediate journeys. It is reasonable to assume that these two characteristics should have some effect on the distribution of activity between Own Account operators and carriers who work for hire or reward.

The length of haul analysis, which is set out in the following table, gives in addition to the absolute figures, the percentage distribution of the volume

of activity between the three types of owner for each of the length of haul categories distinguished.

TABLE 7
TONNAGE CARRIED CLASSIFIED BY LENGTH OF HAUL AND
TYPE OF OWNER

Length of Haul	Own Account	C.I.E.	Other Licensed Hauliers	Total	Own Account	C.I.E.	Other Licensed Hauliers	Total
	Tons carried in millions				Percentages			
5 miles and under ...	16.62	2.35	2.78	20.74	75.3	11.3	13.4	100.0
5 to 10 miles	7.92	0.48	1.06	9.47	83.7	5.1	11.2	100.0
10 to 15 miles	5.03	0.22	0.57	5.81	86.4	3.8	9.8	100.0
15 to 30 miles	7.19	0.41	0.91	8.51	84.5	4.8	10.7	100.0
30 to 50 miles	3.66	0.47	0.56	4.70	78.0	10.0	12.0	100.0
50 to 100 miles	3.20	0.24	0.33	3.78	84.0	6.3	8.8	100.0
Over 100 miles	1.28	0.07	0.22	1.58	81.5	4.7	13.8	100.0
Total ...	43.91	4.24	6.44	54.59	80.4	7.8	11.8	100.0

* The percentages have been calculated with unrounded data

The results of this analysis are surprising in so far as they show haulage for reward to account for the highest share of activity when the distances travelled are shortest. C.I.E. and the Licensed Hauliers accounted for up to 25 per cent of work done on journeys of less than 5 miles but with the exception of the 30 to 50 mile cell they were responsible for substantially less in the longer length of haul categories. One might have expected haulage for hire or reward to have a larger share of long distance work since one would have thought that this kind of traffic would be the most suitable (and profitable) for carriers operating for reward to engage in. It is interesting at this stage to make a broad comparison with road freight transport in Britain. Later on in this paper a more extensive comparison between certain aspects of road freight transport in Ireland and Britain will be made but for the present I wish to confine the comparison to haulage for hire or reward and length of haul. The following table shows the estimated percentages of total tonnage carried by hauliers operating for reward in the two countries distinguishing four lengths of haul classes. The British figures relate to the year 1962.

The table shows the British percentages to be substantially higher in all length of haul classes particularly for journeys of over 100 miles where haulage for reward in Britain is responsible for 68 per cent of road freight work as against only 19 per cent in Ireland. It would be interesting to have information on the distribution of activity for very short distance work (i.e. less than 5 miles) in Britain but the shortest journeys distinguished in the 1962 British survey were those of less than 25 miles in length.

TABLE 8

PERCENTAGE OF TONNAGE CARRIED FOR HIRE OR REWARD IN IRELAND AND BRITAIN IN DIFFERENT LENGTH OF HAUL CLASSES

Length of Haul	Ireland (1964)	Britain (1962)
Under 25 miles	20%	37%
25 to 50 miles	20%	42%
50 to 100 miles	15%	52%
Over 100 miles	19%	68%
Total	19%	49%

The results of these analyses raise some interesting questions: why does haulage for reward account for such a small proportion of total road freight traffic, in Ireland, particularly in the case of long distance work? There are several possible explanations. C.I.E. who account for a very small proportion of long haul work (6 per cent for hauls of over 50 miles) may not be inclined to develop such traffic, especially on certain routes, since they may consider it to be in direct competition with the railways. The restrictions imposed on Licensed Hauliers have already been mentioned. These undoubtedly have the effect of limiting the amount of long distance work carried out by these operators. In fact if the tonnage figures in Table 5 are looked at from the point of view of the distribution of activity among the length of haul categories within each type of owner it appears that the motivation is for both C.I.E. and the Licensed Hauliers to concentrate very much on short haul work. Almost 55 per cent of tonnage carried by C.I.E. goes over distances of less than 5 miles with 43 per cent for Licensed Hauliers but only 32 per cent for Own Account. Much of the short distance work carried out for hire or reward was in fact work connected with road-works, involving heavy loads being carried over very short distances. The question to ask here is that if *all* concerns operating for hire or reward were allowed more freedom of action would they be able to organise their systems to provide road freight transport cheap enough to attract some of the 44 million tons carried on Own Account which at present comprises 80 per cent of the total volume of road freight activity. The above figures do in fact show that in the spheres where restrictions are few (i.e. short distance work) carriers operating for hire or reward already have a sizeable share of the total work available.

The second characteristic of road freight transport discussed in relation to the types of owner under consideration concerns type of journey, i.e. the extent to which the work done by Own Account operators, C.I.E. and Licensed Hauliers was performed on end-to-end journeys or intermediate journeys. The following table sets out the distribution of activity between the two kinds of journey for each type of owner using tonnage and number of loaded journeys as measures of activity.

TABLE 9
 TRANSPORT ACTIVITY CLASSIFIED BY TYPE OF OWNER AND TYPE
 OF JOURNEY

Type of Owner	Type of Journey	Tons	Number of Loaded Journeys	Average Load per Journey
		millions	millions	
Own Account	End-to-end journeys ...	35.02	7.83	4.5
	Intermediate journeys ...	8.89	5.49	1.6
	All journeys	43.91	13.32	3.3
C.I.E.	End-to-end journeys ...	3.68	0.45	8.2
	Intermediate journeys ...	0.57	0.12	4.7
	All journeys	4.24	0.57	7.4
Other Licensed Hauliers	End-to-end journeys ...	6.11	0.76	8.0
	Intermediate journeys ...	0.33	0.06	5.5
	All journeys	6.44	0.81	7.9
Total	End-to-end journeys ...	44.81	9.03	5.0
	Intermediate journeys ...	9.78	5.66	1.7
	All journeys	54.59	14.69	3.7

The tonnage figures show that 80 per cent of Own Account work was done on end-to-end journeys. The corresponding proportions for C.I.E. and the Licensed Hauliers were 87 per cent and 95 per cent respectively. It is relevant to point out here that the scheduled services were responsible for nearly all of the 0.6 million tons carried on intermediate journeys by C.I.E. vehicles. These services, of course, by their very nature fall under the intermediate type journey heading.

It is of interest in this analysis to examine the average load per journey obtained by dividing the tonnage by the number of loaded journeys for each corresponding pair of cells. These averages are shown in the final column. The figures for Own Account are understandably lower than those for the other two categories as the Own Account fleet contains a large number of light vehicles. The average is particularly small in the case of intermediate journeys as delivery runs by light vehicles, which were very numerous, fall in this category. Since there were, effectively, no vehicles of under two tons unladen weight belonging to C.I.E. or to the Other Licensed Hauliers (indeed nearly all their vehicles weighed more than 3 tons) comparisons between these two types of owner are more meaningful. The average load carried on end-to-end journeys for both types of haulier was about the same, roughly 8 tons. The averages for intermediate journeys are considerably less, the C.I.E. figure being the smaller of the two. The latter feature is not entirely unexpected since vehicles engaged on schedule road freight services have to travel, even when only very small loads are available. The overall averages, incorporating both types of

journey, show relatively little difference between the two hauliers, 7.4 tons for C.I.E. as against 7.9 tons for the licensed hauliers.

(2) *Road Freight Transport in different areas of the country*

A further aspect of road freight transport covered by the survey concerned the volume of transport activity associated with different areas of the State. This information was compiled on the basis of the answers which the owner of each sample vehicle gave for the origin and destination of each journey recorded in the questionnaire. For this particular analysis the State was divided into eleven regions which consisted of counties or groups of counties. Northern Ireland has been shown as a further region but it must be kept in mind when interpreting the figures that vehicles registered in Northern Ireland were not included in the survey.

Table A of the Appendix contains an origin-destination matrix showing the flow of tonnage within and between the specified regions. The figures on the main diagonal are estimates of the tonnage carried on 'internal' journeys, i.e. journeys originating and terminating within the same region and it is seen that for every region (except of course Northern Ireland) the bulk of the tonnage is carried on such journeys, especially in the larger regions such as Cork-Kerry where 93 per cent of the traffic falls in this category. It is only in the case of the Dublin Region that there is evidence of substantial flows to and from distant regions.

The volume of transport activity associated with a region depends on many factors: population, area, the level of industrialisation, to mention a few. The figures in the last column of Table A of the Appendix mentioned above, which are in fact the total tonnages originating in each region, show clearly the extent of the inter-regional variation involved; the figures vary from 2.06 million tons for Donegal up to 10.32 million tons for Dublin. In order to make inter-regional comparisons more realistic it is clearly necessary to take other relevant factors into consideration.

The following analysis links for each region the volume of road freight activity with (i) the total population and (ii) the population at work in sectors of the economy which could generally be regarded as generating goods transport activity.* The latter category consists mainly of persons engaged in agriculture, manufacturing industries, distribution and transport but for brevity we shall refer to it as the 'agricultural and industrial population'.

This study consists essentially of an analysis of the average volume of transport activity per head of population for each of the different regions. The following table gives the originating tonnage (Column 1) and the total population (Column 2) and the agricultural and industrial population* (Column 3) for each region. Both sets of population figures relate to the 1961 Census of Population. The last two columns contain derived figures, column 4 showing the average originating tonnages per head of total population while column 5 gives similar averages but using the agricultural and industrial populations* in each region as divisors.

* See definition Table 10.

TABLE 10

ROAD FREIGHT TRANSPORT AND POPULATION FOR EACH REGION

Region	Originating tonnage (1)	Total Population (1961) (2)	Agricultural and Industrial Population* (3)	Average Originating tonnage per head of Total Population (4)	Average Originating tonnage per head of Agricultural and Industrial Population (5)
Dublin ...	10.32	718	191	14.4	54.0
Cork-Kerry ...	10.25	447	133	22.9	77.1
Limerick-Tipperary-Clare	6.94	331	98	21.0	70.8
Wicklow-Kildare-Laois-Offaly ...	6.37	219	65	29.0	98.0
Kilkenny-Waterford-Wexford-Carlow	5.32	250	73	21.3	72.9
Mayo-Sligo-Leitrim ...	2.89	210	71	13.8	40.7
Louth-Meath ...	2.84	132	41	21.4	69.3
Roscommon-Longford-Westmeath ...	2.64	143	46	18.5	57.4
Galway ...	2.47	150	48	16.5	51.5
Cavan-Monaghan	2.32	104	36	22.3	64.4
Donegal ...	2.06	114	35	18.1	50.9
Total ...	54.42	2,818	837	19.3	65.0

* Total working population aged 14 years and over *excluding* those at work in Entertainment, and Sport, Personal Service, Professions, Public Administration and Defence, Insurance, Banking and Finance.

Observing first the averages relating to total population we see that a considerable amount of the inter-regional variation as shown by the basic tonnage figures has been eliminated. The averages vary from 13.8 tons per head for Mayo-Sligo-Leitrim to 29 tons per head for Wicklow-Kildare-Laois-Offaly. In general the figures for the regions in the west of the country are lower than the averages for other regions, Dublin, however, being a notable exception with a very low figure of 14.4 tons per head. The later feature is explained by the fact that Dublin is the administrative centre of the country and contains, in addition to the Government departments, the headquarters of many semi-state and private concerns thus providing employment for a large body of administrative, clerical and professional salary earners who do not contribute directly to the production or transportation of goods. The small tonnage of goods moved in the west of Ireland is probably due to the low level of industrial activity and the general structure of the agricultural sector in this area. With regard to

agriculture, the majority of farms in the west are small (nearly 60 per cent under 30 acres in Connacht) and in comparison with other areas a larger proportion of the produce is consumed on the farm and less is sold in the form of transportable goods.

The figures in the final column of the table are the regional averages for originating tonnage per head of agricultural and industrial population.* The inter-regional patterns are similar to those shown by the averages involving total population except that the Dublin region now has a larger tonnage per head in relation to the other regions. The reason for this, of course, has been amply explained above. The agricultural and industrial population* as defined in the table excludes persons employed in the public service, banks, insurance companies, etc. and this has had the effect of substantially increasing the average for the Dublin region and bringing it more into line with the figures for the other regions.

The above inter-regional comparison based on the ratio of transport activity to population is clearly a somewhat crude approach but it was intended merely as a first attempt and it did reduce substantially the inter-regional variation and indicated major differences between regions. It could obviously be improved upon. One refinement that comes to mind would be to relate, for each region, the volume of road freight transport activity (or indeed road and rail freight activity) with the level of agricultural and industrial output. This would, of course, involve an amount of work compiling separate output data for each region.

(3) *Comparisons between road and rail freight transport*

Another new and interesting feature which arises from the Road Freight Survey is that for the first time it provides the means of making comparisons between road and rail freight working. During the year ended the 31st March, 1965, some 2.46 million tons of goods were carried on C.I.E.'s rail network. Combining this with the estimate of 54.59 million for the tonnage of goods moved by road during the calendar year 1964, an estimate of 57.05 million is obtained for the total tonnage of freight transported in the State during 1964, only 4.3 per cent went by rail. The corresponding figures for ton-mileage were 1048.6 million for road and 214.3 million for rail freight activity. Thus rail freight working accounted for 17 per cent of the total of 1262.9 million ton-miles performed during 1964.

Here again these overall comparisons can hardly be regarded as realistic on account of the basic differences that exist between road and rail freight transport. In fact the higher percentage of 17 shown for the proportion of total ton-mileage accounted for by the railways reflects the major difference between the two modes of transport, namely length of haul. The vast bulk of rail freight is conveyed over long distances (the average length of haul per ton is about 90 miles) while we have seen already that a large volume of road freight activity is short haul work which could not alternatively be carried out on the railway system, e.g. work related to distribution and to the building industry. Thus the first distinction which one is motivated to make in a comparison of this kind concerns length of

haul and this is done in the following table which shows road and rail tonnages classified by seven different length of haul categories.

TABLE 11
ROAD AND RAIL TONNAGE BY LENGTH OF HAUL, 1964

Mode of Transport	Length of haul							Total
	5 miles under	5 to 10 miles	10 to 15 miles	15 to 30 miles	30 to 50 miles	50 to 100 miles	Over 100 miles	
	Tons (millions)							
Road	20.740	9.470	5.810	8.510	4.700	3.780	1.580	54.590
Rail*	0.003	0.018	0.018	0.280	0.355	0.826	0.960	2.460
Total	20.743	9.488	5.828	8.790	5.055	4.606	2.540	57.050
% Rail to Total	—	—	—	3.2	7.0	17.9	37.8	4.3

* Source C.I.E.

Thus the railways contribution is minimal for loads carried less than 50 miles but increases considerably for distances greater than this; the railways are responsible for 38 per cent of tonnage moved over distances of more than 100 miles.

The above figures relate to the entire State and as there are certain areas of the country which are not served at all by the rail network it can still be argued that in this comparison the road and rail systems are not represented from comparable standpoints. This element of unfairness is eliminated and a more penetrating analysis is obtained if certain routes are isolated and direct comparisons made between the road and rail freight traffic operating over them. The Road Freight Survey provided the kind of information necessary for an analysis of this kind as one of the aspects of transport covered was the flow of goods between twelve major cities and towns in the country. C.I.E. carried out a similar analysis for rail traffic in respect of the year ending the 31st March, 1962, as part of their report on Internal Public Transport (Operation Pacemaker); since the overall volume of rail freight traffic has remained virtually unchanged over the past six years (see Table 13) a comparison of road and rail traffic over specified routes using 1961-62 rail and 1964 road data is unlikely to contain serious inconsistencies from the point of view of the time lag involved. The following table specifies 10 routes, radiating from Dublin, to the major cities and towns in the State and shows for each route annual road and rail tonnages carried in both directions, i.e. to and from Dublin. The towns are shown in order of increasing distance from Dublin.

TABLE 12
ROAD AND RAIL TRAFFIC ON CERTAIN ROUTES RADIATING FROM
DUBLIN

Town	Originating in Dublin				Terminating in Dublin			
	Road	Rail*	Total	% Rail	Road	Rail*	Total	% Rail
	Thousands of Tons				Thousands of Tons			
Drogheda ...	81.0	18.0	99.0	18	130.9	113.9	244.8	47
Kilkenny ...	30.7	12.9	43.6	30	13.8	0.3	14.1	2
Athlone ...	41.3	9.7	51.0	19	2.4	0.2	2.6	8
Wexford ...	35.1	9.6	44.7	22	21.4	7.0	28.4	25
Waterford ...	34.6	27.4	62.0	44	21.0	5.9	26.9	22
Limerick ...	41.7	48.9	89.9	54	21.6	20.6	42.2	49
Galway ...	38.4	43.6	82.0	53	8.4	2.4	10.8	22
Sligo ...	23.9	62.5	91.4	74	13.8	1.1	14.9	7
Cork ...	75.5	58.4	133.9	44	45.9	23.8	69.7	34
Tralee ...	6.0	16.6	22.6	74	3.2	0.6	3.8	16
	408.2	311.9	720.1	43	282.4	175.8	458.2	38

* Source C.I.E.

Examining first the traffic originating in Dublin, the table shows that the railways were responsible for 43 per cent of the total tonnage carried on the specified routes but this proportion varies considerably for individual routes, from 18 per cent for traffic with destination Drogheda to 74 per cent for traffic terminating in Sligo and Tralee. The trends are what one would expect in an analysis of this kind; in general the railways account for the greater share of tonnage to destinations which are furthest from Dublin.

It is somewhat surprising to find that the railway had a smaller share of total traffic on the Dublin-Cork route (44 per cent) than in the case of either Dublin-Limerick (54 per cent) or Dublin-Galway (53 per cent). The public highways from Dublin to the three cities in question are comparable and since Cork is further from Dublin than either Limerick or Galway one might have expected a greater share of traffic on this route to go by rail.

The corresponding return traffic to Dublin from the centres in question was smaller in volume than the originating traffic for both modes of transport and a smaller proportion of it went by rail. Unlike the data for traffic originating in Dublin, no clear cut pattern is evident here. Limerick and Drogheda show the highest proportions of rail traffic to Dublin, 49 per cent and 47 per cent respectively. For the traffic under discussion nearly all of the 176 thousand tons carried by rail to Dublin came from Drogheda, Cork and Limerick. The flows by rail from the other centres were very small in volume.

Trends in Road and Rail Freight Traffic since 1960

The only reliable comparisons that can reasonably be made in this context, i.e. between road and rail freight activity over a period of time, relate to total traffic. While exact data are available for the volume of activity on the railways each year, road freight work for past years has to be estimated using the 1964 data as a base and projecting backwards on the basis of the annual vehicle accounts carried out by the Department of Local Government. I have already adverted to the inconsistencies involved in making global comparisons between road and rail freight working but even allowing for this the following analysis shows that some useful information can be obtained from a study of this kind.

Before analysing the results of this exercise I wish first to explain in more detail the method of estimating road freight activity for previous years. The method consisted of (i) estimating from the survey results the annual average vehicle performance for 1964 (in terms of tons carried per vehicle per annum, etc.) for each unladen weight class distinguished in Table 1 and (ii) assuming that vehicle performance, measured in this way, does not vary from year to year, one can estimate any past year's activity for each unladen weight class by simply multiplying the relevant derived average by the number of vehicles in that class for that year. The reason for making separate estimates for each unladen weight class was to provide for internal changes in the structure of the goods vehicle fleet. The estimates of total activity were then obtained by aggregating the figures for the different unladen weight classes.

The following table shows for each year from 1960 to 1965 the volume of rail freight activity and estimates of the volume of road freight work obtained by the method outlined above. Even though the figures for rail working relate to 12 month periods ending the 31st March, while the estimates of road freight relate to calendar years, since the periods overlap by 9 months this is unlikely to upset the comparisons to any significant degree.

TABLE 13
ROAD AND RAIL TRAFFIC, 1960-65

Year	Tons				Ton/Miles			
	Rail	Road	Total	% Rail	Rail	Road	Total	% Rail
	Millions				Millions			
1965	2.52	57.51	60.03	4.20	221.38	1,110.64	1,332.02	16.62
1964	2.46	54.59	57.05	4.31	212.16	1,048.60	1,260.76	16.83
1963	2.60	52.66	55.26	4.70	221.23	1,011.78	1,233.01	17.94
1962	2.59	49.47	52.06	4.98	218.57	947.92	1,166.49	18.74
1961	2.56	44.93	47.49	5.39	220.34	852.97	1,073.31	20.53
1960	2.69	38.22	40.91	6.58	223.18	721.85	945.03	23.62

Thus while rail freight traffic has remained relatively constant over this period, road freight activity, measured both in terms of tons and ton-miles has increased by about 50 per cent. This has resulted in a decline in the railway's share of total goods traffic: 6.6 per cent to 4.2 per cent in the case of tonnage and 23.6 to 16.6 in the case of ton-mileage.

From the above data it is possible to obtain estimates of the volume of total freight transport activity in future years. Considering the tonnage figures only, the calculation for the mean annual percentage increase in total tonnage over the period 1960 to 1965 yields a figure of 8.4 per cent. It is possible, however, that this estimate is overstated as it is affected considerably by an exceptional increase of 16 per cent in total activity between 1960 and 1961. A corresponding calculation for the period 1961 to 1965 yields a mean percentage increase of 6.0 per cent. If we regard the latter as a more realistic (if somewhat conservative) figure a projected total tonnage for 1970 is given by

$$57.05 \times (1.06)^6 = 80.95 \text{ million tons}$$

and for 1975 by

$$57.05 \times (1.06)^{11} = 108.30 \text{ million tons}$$

Thus if the general trends evident in recent years are maintained the volume of total freight traffic in 1975 will be almost twice the 1964 level. A point to note about the omission of the 1960-61 percentage increase from the above calculation: the period 1960-61 was a period of economic boom generally, the entire economy was expanding rapidly. If further periods of rapid economic expansion occur it is very likely that they will again be accompanied by sharp increases in the volume of freight traffic. For this reason the above projections (based on the lower mean increase of 6.4 per cent) may well be in a conservative direction, especially the latter estimate for 1975.

If the railways do not exceed their present level of activity (which has remained steady for many years, involving the carriage of about 2½ million tons of goods a year) then by 1970 the rail network will account for 3 per cent of total tonnage and only 2½ per cent by 1975. However, it must be kept in mind that the estimates of road freight transport are global ones covering all activities. The inconsistencies involved in comparing total figures of this kind with rail freight data have already been mentioned. A more efficient method of comparing road and rail activity over a period of time would be to use road freight data covering long distance work only, say, on journeys of over 50 miles. It is not possible to do this with the available information.

(4) *Comparisons with road freight transport in Britain*

Surveys of road goods transport were carried out by the Ministry of Transport in Britain in 1952, 1958 and 1962. In terms of scope and objectives these inquiries were very similar to the 1964 Irish survey. While differences between the magnitude of the transport industry in Britain and Ireland obviously rule out the feasibility of comparisons in absolute terms, some interesting comparisons may be made, especially in connection with average vehicle performance. Table 14 below shows estimates of average annual vehicle performance for Ireland (1964) and Britain (1962) distin-

guishing separately the figures for Own Account and Hauliers operating for hire or reward. For Ireland the 'Hauliers' category includes vehicles belonging to C.I.E. and the Licensed Hauliers while the British figures relate to vehicles operated under the 'A' type haulage licence. Before proceeding further I will explain briefly the British system of vehicle licensing for owners who wish to use their vehicles for haulage for hire or reward. Persons concerned in road freight haulage may license their vehicles in one of three ways: (i) under the A-licence mentioned above in which case the vehicle is used full-time for the usual type of haulage for reward, (ii) under the 'contract-A' licence in which case the vehicle is under contract to carry only one concern's goods for reward for a period of at least a year, or (iii) the owner may register his vehicle under the B-type licence. In this case the vehicle may be used for carrying the operator's own goods or for carrying goods for reward. Most of the vehicles in this class probably belong to part-time hauliers.

As no licences similar to the 'contract-A' and 'B' licences are in existence in Ireland it is reasonable to assume that the activity of 'A-class' vehicles (which are the most numerous) is likely to most resemble work done for hire or reward in this country and in all the following comparisons the figures for haulage for reward in Britain relate to these vehicles only. It is relevant to point that vehicles belonging to British Road Services and British Railways (C.I.E.'s counterparts), though not distinguished separately, were included in the British survey thus making the comparisons more realistic since C.I.E. vehicles are covered in the Irish data.

TABLE 14
AVERAGE ANNUAL VEHICLE PERFORMANCE IN IRELAND AND BRITAIN

Type of Owner	Unladen Weight	Total Miles		Tons		Ton/Miles	
		Ireland	Britain	Ireland	Britain	Ireland	Britain
Own Account	1 ton and under ...	5,400	7,000	100	90	1,200	1,500
	1 to 2 tons	10,500	8,400	330	230	5,200	3,900
	2 to 3 tons	11,900	10,400	1,050	960	19,500	17,300
	3 to 5 tons	18,500	16,400	3,940	2,460	70,600	50,900
	Over 5 tons	28,000	22,600	6,250	3,980	186,100	132,200
Hauliers carrying for reward	2 to 3 tons	11,200	12,600	1,300	1,440	20,600	31,600
	3 to 5 tons	20,200	26,100	5,670	2,640	84,500	124,700
	Over 5 tons	23,000	34,200	5,520	3,630	109,300	293,000

For Own Account work, for all three characteristics, miles, tons and ton-miles, it appears that Irish vehicles are more heavily utilised than British vehicles. The difference is particularly striking for the largest size group, especially in terms of tonnage where the figures show that on the average Irish vehicles carried over 50 per cent more goods in the year. In the case of haulage for hire or reward the position is the opposite. For

miles travelled and ton-miles, the figures show the British vehicles to be used more, but in terms of tonnage the averages for Irish vehicles are again higher.

Higher costs are one reason which can be put forward to explain the patterns in the Own Account data. Road Tax charges and the capital cost of vehicles have always been higher in Ireland than in Britain and the higher costs may have motivated concerns in this country to economise on transport activity relative to their British counterparts, i.e. use fewer vehicles but with a greater work load per vehicle. The reasons why vehicles belonging to concerns operating for reward in Ireland carry more tonnage in the year, but are less utilised in terms of mileage and ton-mileage, lie in the trends observed in the length of haul analysis given earlier, i.e. the relatively large volume of work done by Irish hauliers on very short journeys. A vehicle can carry a greater amount of tonnage in a fixed period of time if, on the average, the journeys travelled are shorter, assuming of course that it is not idle for longer periods than usual and that the weight of the individual loads carried is up to average.

Another interesting comparison that can be made between road freight transport in Ireland and Britain relates to the amount of empty mileage travelled by goods vehicles. Table B of the Appendix gives a detailed analysis of this aspect showing figures for the percentage of empty to total miles distinguishing the different type of owner, unladen weight classes and the two types of journey. If the sub-division by type of journey is ignored for the present and the total figures at the right of the table are observed it is seen that in all cells the proportion of empty mileage is greater in Ireland than in Britain, particularly in the case of haulage for hire or reward. This undermines to a certain extent the statements made previously about Own Account vehicle performance, namely that for this category Irish vehicles are more fully 'utilised' than British vehicles. British vehicles may be used less, but on the average they appear to be used more effectively. For haulage for hire or reward the differences are quite striking, for the heavier vehicles the percentage of empty mileage in Ireland is almost twice what it is in Britain. If, however, one deliberates for a moment on the difference in the types of work engaged in by hauliers in Britain, some of these discrepancies are not entirely unexpected. In this country it has been shown that the work is generally short-haul (much of it on road-works) where it is unlikely that return loads would be picked up; in Britain where a much higher proportion of haulage for reward is over medium and long distances it is reasonable to assume that the hauliers have their systems organised so that return loads are available on many trips.

Observing the figures for end-to-end and intermediate journeys separately, for Own Account activity the percentages of empty mileage on intermediate journeys are in fact slightly greater for the British data. However, the majority of journeys performed in both countries are of the end-to-end type, and these differences, favourable to Ireland, do not affect the overall situation to a substantial degree.

The final comparison made between the two countries relates to average

length of journey. Table C of the Appendix gives an analysis of this kind for loaded end-to-end journeys and intermediate journeys. In the case of end-to-end journeys the British figures are slightly higher for Own Account activity and very much higher for Haulage for Hire or Reward. The reasons behind the latter have been amply explained above. For intermediate journeys the figures for length of journey in Ireland are consistently higher. The reason for this probably lies in the difference in population density between the two countries. In Ireland, where the population density is lower than in Britain, it is reasonable to expect that on the average a vehicle on a delivery run would have to travel a greater distance than a vehicle on a comparable run in Britain to reach the same number of customers. In the British survey all journeys relating to vehicles in the smallest unladen weight class were automatically taken as being intermediate and it was further assumed that they were all less than 25 miles in length. This obviously gives rise to an under-statement of the average length of intermediate journey for this class and indeed also for the overall average since this particular weight class accounted for a very large proportion of journeys.

APPENDIX 1

Method of Survey

The basic methodology has already been outlined in the text of the paper. The following paragraphs give a more detailed account of the sampling procedure and the compilation of the grossing factors.

Selection of Sample

The population or frame from which the sample was selected consisted of (a) the population of all goods vehicles under current licence on November 1st, 1963 and (b) the population of new goods vehicles registered for the first time between November 1st, 1963 and December 31st, 1964. It was deemed necessary to have the latter category of vehicle represented in the sample as some 6,000 new goods vehicles are registered annually, i.e. a turnover rate of over 12 per cent of the population. To ensure that goods traffic in each area of the country received adequate representation the sampling was carried out separately in each of the 30 Local Authority Motor Taxation Offices.

The sampling procedure used for the vehicles (a) referred to above (and these formed the vast bulk of the overall sample) was as follows: in each Motor Taxation Office the sample was stratified by unladen weight of vehicle, four weight classes being used. The sampling fractions applied are shown in the following table:

<i>Unladen Weight</i>	<i>Sampling Fractions</i>
1 ton and under	1/20 (1/60)
1 to 2 tons	1/5 (1/16)
2 to 3 tons	1/2 (1/3)
Over 3 tons	1/1 (1/1)

The guideline used for determining these sampling fractions was the optimum allocation formula

$$p_i = \frac{n\sigma_i}{\sum N_j\sigma_j}, \quad j = 1, 2, \dots, k \text{ strata}$$

where p_i is the required stratum i sampling fraction, n the sample size and N_i and σ_i the population size and standard deviation of weekly ton/mileage per vehicle for stratum i . The fractions given by this formula are such that the error of the overall estimate of total ton/mileage obtained by aggregating the ton/mileage for each unladen weight stratum is minimum for the given sample size. The N_i the goods vehicle population number for each unladen weight class were available from the annual Department

of Local Government Census Counts but the σ_1 were unknown. It was decided to use the corresponding standard deviation estimates for ton/mileage obtained for Own Account (C licence class) vehicles in the 1958 British Survey of Road Freight Transport. In the British Surveys the samples were stratified by both unladen weight and licence class, i.e. Own Account (C licence) and the different types of hauliers (A, Contract A and B licences) and separate standard deviations were calculated for each stratum. However, in the Irish Survey it was not possible to select separate samples for Own Account and Hauliers' vehicles and in the circumstances, since Own Account vehicles from the vast bulk of the goods vehicle fleet, it was felt that the use of the British standard deviations for Own Account vehicles was a reasonable step.

The initial application of the formula, based on an overall sample size of 10,000 yielded the fractions shown in brackets above; however these initial fractions were increased to the magnitudes given in the text to allow for expected non-response and to provide adequate numbers in the smaller size groups.

With regard to the new vehicles, i.e. those registered after November 1st, 1963, monthly samples were drawn and the sampling fractions given above were progressively reduced each month in proportion to the fraction of a year for which the vehicles would not be contributing to transport activity, e.g. for new vehicles registered for the first time in June, 1964 the sampling fractions used were approximately one-half of those given above.

Grossing

The results obtained from the sample were expanded to form estimates of the work done by the entire goods vehicle fleet during the whole of 1964. Separate grossing factors were used for each of the five unladen weight classes shown in Table 2, the over three ton class used in the original sample selection being divided into 3 to 5 tons and over 5 tons because of the different response rates. In the three larger size groups returns for C.I.E. were grossed separately as full information on the number of C.I.E. vehicles in each unladen weight class was available and the response rates for C.I.E. vehicles were considerably greater than the overall rates. Effectively, there were no C.I.E. vehicles of less than 2 tons unladen weight. Thus there were eight different strata used in the grossing procedure—3 for C.I.E. and 5 for all other operators combined.

For estimates of transport activity (i.e. tons, ton/miles, etc.) the grossing was carried out separately for each quarter in order to provide some indicators of seasonal trends. A quarter was considered to be the shortest period for which reliable total figures could be obtained taking into account the size of the sample. For a particular size group the total possible number of vehicle-weeks in a quarter was determined from (a) the number of vehicles under current licence on November 1st, 1963 and (b) the number of vehicles registered for the first time between November 1st, 1963 and the end of the quarter in question. This total was then divided by the number of vehicle-weeks covered in the sample for the quarter to give the required grossing factor.

TABLE A
TONNAGE CLASSIFIED BY REGION OF ORIGIN AND REGION OF DESTINATION

Region of Origin	Region of Destination												Total
	Dublin	Cork-Kerry	Limerick-Tipperary-Clare	Wicklow-Kildare-Laois-Offaly	Kilkenny-Waterford-Wexford-Carlow	Mayo-Sligo-Leitrim	Louth-Meath	Roscommon-Longford-Westmeath	Galway	Cavan-Monaghan	Donegal	Northern Ireland	
	Millions												
Dublin	7.78	0.14	0.15	0.74	0.36	0.11	0.44	0.20	0.08	0.23	0.03	0.06	10.32
Cork-Kerry	0.10	9.58	0.34	0.01	0.17	0.01	0.00	0.00	0.01	0.00	0.00	0.02	10.25
Limerick-Tipperary-Clare	0.10	0.45	5.98	0.08	0.16	0.02	0.01	0.02	0.10	0.00	0.00	0.01	6.94
Wicklow-Kildare-Laois-Offaly	2.12	0.02	0.27	3.46	0.21	0.02	0.06	0.08	0.09	0.02	0.00	0.00	6.37
Kilkenny-Waterford-Wexford-Carlow	0.24	0.12	0.24	0.18	4.43	0.00	0.01	0.02	0.02	0.01	0.00	0.03	5.32
Mayo-Sligo-Leitrim	0.04	0.00	0.01	0.00	0.00	2.59	0.01	0.10	0.04	0.01	0.07	0.00	2.89
Louth-Meath	0.63	0.01	0.00	0.07	0.02	0.02	1.78	0.06	0.00	0.21	0.01	0.03	2.84
Roscommon-Longford-Westmeath	0.07	0.00	0.01	0.05	0.00	0.13	0.03	2.23	0.04	0.06	0.00	0.00	2.64
Galway	0.03	0.01	0.05	0.02	0.00	0.06	0.02	0.04	2.22	0.02	0.01	0.00	2.47
Cavan-Monaghan... ..	0.14	0.01	0.01	0.00	0.00	0.03	0.14	0.05	0.01	1.87	0.00	0.04	2.32
Donegal	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.01	0.00	1.94	0.07	2.06
Northern Ireland	0.02	0.00	0.00	0.00	—	0.00	0.00	0.00	—	0.02	0.12	0.00	0.16
Total	11.28	10.36	7.07	4.62	5.38	3.03	2.52	2.80	2.63	2.45	2.18	0.27	54.59

TABLE B
EMPTY MILEAGE AS A PERCENTAGE OF TOTAL MILEAGE IN IRELAND AND BRITAIN

Type of Owner	Unladen Weight	End to End Journeys		Intermediate Journeys		All Journeys	
		Ireland	Britain	Ireland	Britain	Ireland	Britain
		% Empty Mileage					
Own Account	1 ton and under ...	45.0	—	16.2	20.7	27.0	20.7
	1 to 2 tons ...	43.7	36.6	11.9	12.1	19.8	18.2
	2 to 3 tons ...	40.8	36.5	13.5	15.6	23.1	21.6
	3 to 5 tons ...	45.9	38.9	18.7	17.5	38.0	30.1
	Over 5 tons ...	44.6	37.4	24.9	28.6	40.5	35.6
	Total ...	44.9	37.7	15.4	17.5	30.4	23.5
Haulage for Hire or Reward*	2 to 3 tons ...	36.5	32.8	9.4	14.5	22.4	21.6
	3 to 5 tons ...	46.0	28.4	17.6	14.5	40.3	25.1
	Over 5 tons ...	47.5	23.4	19.6	16.9	41.6	22.8
	Total ...	46.2	27.2	17.5	15.0	39.9	23.7

* For Ireland this includes C.I.E. and other Licensed Hauliers, for Britain, hauliers operating on 'A Licences' only.

TABLE C

AVERAGE LENGTH OF LOADED JOURNEY (END TO END) AND AVERAGE LENGTH OF JOURNEY (INTERMEDIATE) FOR IRISH AND BRITISH VEHICLES

Type of Owner	Unladen Weight	Average Length of Loaded End to End Journeys (miles)		Average Length of Intermediate Journey (miles)	
		Ireland	Britain	Ireland	Britain
Own Account	1 ton and under	8.1	—	22.2	11.7
	1 to 2 tons ...	10.8	11.0	36.6	26.1
	2 to 3 tons ...	15.2	13.0	43.2	31.7
	3 to 5 tons ...	15.0	18.5	57.5	45.1
	Over 5 tons ...	28.6	31.4	72.3	66.5
	Overall Own Account ...	13.4	16.6	33.6	18.1
Haulage for Hire or Reward*	2 to 3 tons ...	16.5	15.9	26.8	25.5
	3 to 5 tons ...	13.1	43.9	65.5	57.9
	Over 5 tons ...	19.0	83.0	70.0	75.4
	Overall Haulage for Reward ...	14.5	44.6	50.6	38.2

* For Ireland this includes C.I.E. and other Licensed Hauliers, for Britain, hauliers operating on 'A Licences' only.

DISCUSSION

T. Toner: Mr. Chairman, Ladies and Gentlemen, it gives me pleasure to propose a vote of thanks to Mr. Sexton for his paper on Road Freight Transport in Ireland—particularly so because at an earlier stage in his career he was a colleague in C.I.E. On the evidence presented by this paper his period of employment with us has not in any way impaired his objectivity in regard to transport.

I feel that the paper this evening and the road freight survey on which it is based provides a source of very valuable information for those of us engaged in transport and also for those who are responsible for framing transport policy. I hope that this will not be the last survey and paper on this subject. In too many fields of economic activity here in Ireland the people who have to grapple with the problems are hindered by the absence of general statistical information and data about the particular activity. Certainly a large gap in our knowledge about freight transport has been filled. To keep the information reasonably up to date and to ascertain trends it would be desirable in my opinion to carry out a similar survey at five yearly intervals.

The paper and survey confirm and quantify that road is the dominant method of freight transport and that transport for hire or reward plays a relatively small part in the total picture. If one accepts the assumptions involved—as I do broadly—the paper also shows that although there has been only a slight increase in total vehicle numbers in the 1960-65 period there has in fact been a 50 per cent increase in activity measured in tons and ton miles and that there will be a further doubling of activity in the period up to 1975.

We in C.I.E. are naturally interested and concerned as to how our operations relate to the general picture. On the road side we have no year by year figures for ton miles but the tonnage carried increased by 45 per cent between 1960 and 1965.

In regard to the railway one's first impression is that the railway plays only a minor role. The railway accounts for 4 per cent of the total tonnage carried and 17 per cent of the ton miles. But these are global figures and the railways function is to be a carrier of long distance traffic. The average length of haul for road transport was 10 miles and about 87 for rail in 1964.

In fact when one examines long distance traffic the role of the railway is much more important. The railway carries 25 per cent of the tonnage over 50 miles and accounts in my estimation for about 32 per cent of the total ton miles. For distances of over 100 miles the railway is more important still, accounting for 38 per cent of the tonnage and 45 per cent of the ton miles.

The railway's share of the tonnage moving to and from Dublin and the principal centres listed in Table 12 amounts to 41 per cent.

In assessing the role of the railway it would be most useful to know what the trend was in total long distance traffic since 1960. We don't know the figures for road transport and in this respect a further survey

for say 1969 would be most useful since it would indicate the growth factor for long distance road traffic.

On the rail side total tonnages and ton miles were relatively static for the 1960-65 period but the average length of haul for all traffic increased from 82.4 to 88 miles. This to my mind indicates possibly a change in the traffic pattern. It is not just a question of carrying the same traffic further. What has happened to my mind is a drop in short distance traffic and an increase in long distance traffic.

All in all therefore we are not altogether unhappy about the trend.

There are two points where I feel I must take issue with the author. The first relates to the fact that the great bulk of C.I.E.'s road haulage is in the under 5-mile category and the suggestion arising therefrom that we discourage long distance work. The short road haul is largely accounted for by the railway and town and city C. & D. services which we operate and to a large extent of course these are feeder services to the railway. Our policy in relation to long distance traffic is determined by our experience in costing which shows that in most cases the railway is the most economic form of transport. It is not just a question of favouring the railway—it is a question of straight forward economics.

Secondly, Mr. Sexton suggests on the basis of a comparison of the amount of long distance work performed by 'for reward' road transport in Ireland and Britain that greater freedom here might result in a transfer of traffic from own account to hauliers including C.I.E. because of lower charges. As a mere operator I am not qualified to speak about national transport policy but I feel that it is dangerous to draw conclusions about Ireland based on the situation in Britain, where economic conditions are quite different. It is, of course, conceivable that more freedom would lead to reduced costs for some firms but this must surely be considered in relation to the effect on total transport costs to the country—including the possibility of higher railway deficits.

There are a few points of detail that I would like to comment on. The first is the inclusion under own account of the traffics carried by operators in the free zones around the principal cities. It is my opinion that quite a large number of these people are almost fully engaged in transport for hire and reward and accordingly I feel that it might have been more appropriate to include them under 'other licensed hauliers'.

I must say that I was surprised to find in Table 10 showing the average originating tonnage per head of agricultural and industrial population that Dublin ranked only 8 out of 11 regions and I wonder if the speaker can provide any enlightenment on this finding of the survey.

In the figures shown for road and rail traffic for 1960-65 in Table 13 no comment is made on the possible effect of railway closures on rail carryings. During this period the rail route mileage was reduced by 17 per cent. The effect of this on rail tonnage carried would have been negligible because most of the long distance traffic was retained to the railway and worked to its final destination by road. I have made an effort to estimate the loss in rail ton miles and my calculations show that the loss is around 9 million ton miles in relation to a total of over 200

million, so that the overall effect of closures on rail carryings was slight and the trend given in the Table can be taken as being substantially correct.

Regarding the smaller role of the railway for Dublin/Cork traffic as compared with Limerick or Galway, it appears to me that this may be accounted for by the fact that as Cork is the second largest city in the Republic a number of firms are able to make up full loads for Cork and so provide their own transport. Similarly, firms in Cork who have traffic for Dublin are able to reduce their transport costs by back loading with traffic from Dublin.

These are the only comments that I have to make and I would conclude by again thanking the speaker for a really excellent paper.

J. J. Doyle: The excellent and very comprehensive survey which Mr. Sexton has prepared provides a clear picture of the composition of road freight transport in Ireland, and gives valuable information illustrating trends in private and public transport over the previous five years.

The survey shows large volume (over 80%) of traffic carried by privately-owned transport and it is interesting to note that rail transport only managed to hold its own despite a 50 per cent increase in the total volume of traffic in 5-year period. Almost all of the increase was carried by private transport.

From the national point of view the survey could be regarded as the first step towards establishing the present overall cost of internal transport, which could then be compared with alternative methods of transport. This would provide valuable guide-lines for the formulation of government policy in relation to public transport. Also provide a basis for comparison between distribution costs and total profit or total turnover in industry, which might be related to similar comparisons in the U.S. or Great Britain.

In this connection a recent American publication refers to a comparison between net profit and transport costs in which it has been found that transport costs of a large number of American companies amount to twice the net profits earned by those companies.

Comparisons of this nature appear to be particularly relevant in view of the 100 per cent increase in traffic which Mr. Sexton forecasts by 1975, thus raising the questions of how this additional traffic will be handled and the effect the projected increase may have on government transport policy.

J. MacAirt: I should like to congratulate Mr. Sexton on the amount of work he has put into this most interesting paper, and should like to raise two points about Table 13; I take it that while the estimate for tons and ton-miles of rail freight are exactly accurate, the estimates for road freight are made by extrapolating the 1965 figure backwards through the period 1960-64 on the basis of vehicle registrations for those years; if so, what is the error attached to these estimates and why does he not go back before 1960?

The second point concerns the forecast of total freight transport in the future. Would it be possible for Mr. Sexton to consider the effect of economic variables such as population and national income in making these forecasts, rather than relying on the crude compound-interest method? Does he consider it necessary for a survey of this type to be repeated in five years' time, in order to produce a more realistic forecast of the future year, 1975?