TRANSPORT RESEARCH LABORATORY

The accident liability of company car drivers

Prepared for Road Safety Division, Department of the Environment, Transport and the Regions

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Executive Summary

A driver's accident liability is defined as the expected number of accidents that he/she will experience during a given period of time - usually one year. This report is concerned with the accident liability of company car drivers defined as drivers of company owned or company financed cars who drive regularly for business purposes. There are reasons to believe that company car drivers may have higher accident liabilities than drivers of private cars because they usually drive very high mileages and are often required to drive under the time pressures imposed by tight business schedules. In addition, because the cars they drive are not their own, it is possible that they are less concerned about their cars than drivers of privately owed vehicles. It is sometimes claimed that companies can prevent many of these accidents by sending their drivers on 'advanced driving' courses or by offering other safety rewards or inducements.

In order to explore these issues, the Transport Research Laboratory has investigated the accident liability of company car drivers using a postal questionnaire technique used successfully in earlier studies. The use of the same methods in the present study of company car drivers enables the accident liabilities of these drivers to be compared to the accident liabilities of the sample of 'ordinary' drivers obtained in one of the earlier studies.

The survey was carried out by Social and Community Planning Research (SCPR) using questionnaires which were mailed to a sample of drivers in May 1989. The aim of the sampling was to achieve a reasonably random sample of all drivers in Great Britain (GB) who drove a company owned or company financed car or van (up to 30 cwt) as a necessary and frequent part of their job.

The driver sample was obtained by means of a two-stage sampling process: in the first stage companies were sampled, and in the second, the eligible drivers within these companies were identified. The sample of companies was taken from Key British Enterprises 1988, which includes the 25,000 largest businesses in the UK. Each sampled company was then asked whether they owned or leased any cars or vans (up to 30 cwt) which were driven by employees as a necessary part of their job, and if they did, they were asked if they would make the list available for this survey. All the drivers whose names were supplied as a result of this procedure were included in the sample, except in cases where the company had supplied more than 80 names, in which case a random selection of 80 names was made. The response rates were 46% for companies and 68% for drivers; this implies an overall response of about 32% for those drivers who could have been included in the sample.

The questionnaire was in six parts, including questions on the following topics: (i) driving as part of the job, (ii) non-work driving, (iii) time and location of trips, (iv) training, (v) accidents, and (vi) job and personal details. After checking that drivers did drive as part of their job, drivers were asked to estimate how many miles they had driven on public roads for their current employer both in the last three years, and in the last year only; if their current employment had been for less than these periods, they were asked to estimate the mileage they had driven since the start of their current employment. Drivers were then asked to provide similar estimates for the mileages they had driven for non-work purposes, to give details of any driver training courses they had taken since passing their car driving test. They were also asked to report on any reward schemes their company may currently offer to encourage accident free driving. Finally, drivers were asked to give their age, gender, and the year they passed their driving test.

Drivers were asked to report the number of accidents in which they had been involved while driving a car or van in the last 3 years. An accident was defined as, 'any incident, however small, that involved damage to your vehicle or another vehicle, damage to any property, or injury to any person including yourself'. Accidents not on public roads, outside Great Britain, or whilst travelling as a passenger were not to be included. The questionnaire then asked for a number of details of the 3 most recent accidents.

In total, the respondents to the survey had been involved in 2,156 accidents over the last 3 years - an average of 0.56 accidents per respondent. The univariate associations between the accident frequencies of drivers (the number of accidents per year) and variables such as age, gender, driving experience, the total number of miles driven, the types of road driven on, the effect of training and the nature of work driving, were explored for both total accidents, work accidents and non-work accidents by tabulating the data in various ways.

The reported total accident frequencies of the company car drivers were compared with those reported by an earlier sample of 'ordinary' drivers using an approach based on multivariate statistical modelling. This approach allowed the 'difference' (actually, the ratio) in the accident liabilities of the company car drivers to be compared directly with those of the ordinary drivers in a way which allowed for the large differences in those variables - such as annual mileage - which affect accident liability. A similar approach was used to examine the effect on accident liability of a range of variables within the company car driver sample. The aspects examined in this way were: whether the driver had received training or not, whether he or she received any rewards for remaining accident free, how many cars the driver usually drives, whether hours of work or the type of firm influences accident liability, whether the driver regards himself or herself as a 'professional driver', and to what extent the drivers have a supervisory or managerial role in the company.

The main findings were as follows:

1 Company car drivers covered over twice as many miles as did those drivers included in the ordinary driver survey. The average annual mileage for company car drivers while driving as part of the job was 20,200; the average annual mileage driven while engaged in non-work driving was 7,000.

2 The overall accident frequency (f_T) experienced by these drivers was 0.19 accidents per driver per year. The overall frequency of accidents while driving for work (f_W) was 0.10 accidents per year, and the overall frequency of accidents during non-work driving (f_{NW}) was 0.08 accidents per year.

3 Younger, less experienced drivers have a much greater accident liability than older experienced drivers.

4 Accident frequency increases with annual mileage, but it does not increase in proportion to mileage.

5 Company car drivers have about 50% more accidents than 'ordinary' drivers, when differences in demographic and exposure variables have been allowed for.

6 11% of the drivers had taken a course of car driver training since first passing their driving test. Drivers who had received such training had an accident liability which was 8% lower than those who had not, though this difference was not statistically significant.

7 Only 4% of drivers claimed that their company offered them some kind of reward for not having accidents. The vast majority were being offered rewards with a financial value of £60 per year or less - often much less. Those being offered rewards had about 21% fewer accidents than those who were not - a reduction which was not significant at the 5% level, though it was significant at the 10% level.

8 8% of drivers drove more than one car or van as part of their job. These drivers had an accident liability - corrected for exposure and driving experience effects - which was about 41% lower than those that did not. This result is significant at the 0.01% level, but examination of the data did not suggest a reason for this large difference.

9 There was no evidence that accident liability is affected by the type of firm worked for, whether the person is employed mainly as a professional driver or not, and the extent to which the driver has a supervisory role in the company.

10 The association between accident liability and the number of hours worked per week was positive, but not statistically significant. This finding relates to the sample of drivers included in this survey, most of whom are working regular hours; it should not be taken to apply to shift workers or those working excessively long hours at unsocial times of day.

1 Introduction

A driver's accident liability is defined as the expected number of accidents that he/she will experience during a given period of time - usually one year. This report is concerned with the accident liability of company car drivers who in the present context are defined as drivers of company owned or company financed cars who drive regularly for business purposes. There are reasons to believe that such drivers may have higher accident liabilities than drivers of private cars - for example, company car drivers usually drive very high mileages, and are often required to drive under the time pressures imposed by tight business schedules. In addition, because the cars they drive are not their own, it is possible that they are less concerned about their cars than drivers of privately owed vehicles, and have a higher number of accidents as a result. It is sometimes claimed that companies can prevent many of these accidents by sending their drivers on 'advanced driving' courses or by offering other safety inducements.

In order to explore these issues, the Transport Research Laboratory has investigated the accident liability of company car drivers using a postal questionnaire technique used successfully in earlier studies (Lynn 1990; Taylor and Lockwood 1990; Maycock, Lockwood and Lester 1991). The use of the same methods in the present study of company car drivers enables the accident liabilities of these drivers to be compared to the accident liabilities of the sample of 'ordinary' drivers obtained in one of the earlier studies (Maycock, Lockwood and Lester, 1991).

In comparing company car drivers with ordinary drivers, it is essential to allow for the key differences between the groups - in particular the much higher mileages driven by the company car drivers. In the present analysis, this will be done using multivariate analysis (section 4); section 4 also explores the effects of training and other variables on a driver's accident liability. However, before presenting the multivariate modelling, section 2 describes the survey methodology, and section 3 presents a number of basic data tabulations. The analyses presented in the main report are supported by detailed tabulations of the characteristics of the sample of company car drivers in Appendix A and of their accidents in Appendix B. Appendix C discusses briefly the statistical methodology used, and Appendix D provides some additional details of the comparison between company car and ordinary drivers.

2 The survey

2.1 The sampling strategy

2.1.1 Introduction

The survey was carried out by Social and Community Planning Research (SCPR) using a self-report questionnaire which was mailed out to drivers in May 1989. A pilot study involving a sample of 60 companies and 200 drivers had been carried out in the previous February, and the questionnaire had been subsequently modified as a result.

Details of the sampling strategy are given in Lynn (1991), of which the following is a summary. The aim of the sampling was to achieve a reasonably random sample of all drivers in Great Britain (GB) who drove a company owned or company financed car or van (up to 30 cwt) as a necessary and frequent part of their job (sometimes called 'need' car drivers). Frequent was defined as involving driving at least once a week, and driving to or from work was not counted as a part of the job. The survey did not therefore cover drivers who did not drive during working time, even if their company provided them with a company 'perk' car.

One administratively simple way of obtaining a sample of *vehicles* fitting the required definition and registered at a company address would have been to sample from the Driver and Vehicle Licencing Agency's (DVLA) vehicle licensing files. This approach was rejected because it would have excluded eligible drivers whose vehicle was not registered at a company address, and because of the difficulties associated with cases in which one vehicle was used by several drivers.

Therefore, it was considered preferable to draw a sample of company car drivers more directly. The most efficient way of doing this was to first sample companies and then identify the eligible drivers within each sampled company.

2.1.2 The sample of companies

The sample of companies was taken from Key British Enterprises 1988 (KBE), a sub-section of Dun and Bradstreet's Business Database. KBE includes the 25,000 largest businesses in the UK defined in terms of turnover. It is not restricted to commercial organisations, as its terms of reference require it to include any organisation offering a service likely to be of use to other businesses. Thus for example, KBE includes publicly-owned utilities, but does not include organisations entirely within the public sector, such as local and central government, education authorities, health authorities and registered charities. Obviously, because eligibility for inclusion in KBE is defined by turnover, it also excludes very small businesses. Such businesses are likely to account for a very small proportion of the population of company drivers.

All companies whose registered addresses were in Northern Ireland or the Channel Islands were excluded. The companies listed in KBE were sorted into four strata defined by the number of employees in the company. Different proportions of companies were sampled in each of the four strata, so that larger companies had a greater probability of selection. This was done in the belief that companies with a large number of employees were more likely to have a large number of company drivers. This structured sampling approach was adopted in order to improve:

i Cost efficiency - because it increases numbers of eligible drivers per sampled company, and increases the numbers of sampled companies with any eligible drivers, and,

ii Statistical efficiency. No more than 80 drivers were selected from any one company; this could lead to drivers in large companies being under-represented, but this was to some extent balanced by the large companies' greater probability of inclusion.

The sampling strategy was designed to result in pre-determined target numbers of companies in each strata of the sampling scheme as shown in Table 1.

Table 1 The number of companies sampled in companies of different sizes

Number of company employees	*Number of companies on KBE*	*Sampling interval*	*Number of companies sampled*
1000 or more	2016	1 in 10.1	200
500-999	2464	1 in 16.4	150
100-499	8792	1 in 35.2	250
Under 100	11728	0	0
Total	25,000		600

2.1.3 The sample of drivers

Each sampled company was then sent a self-completion form. This asked whether they owned or leased any cars or vans (up to 30 cwt) which were driven by employees as a necessary part of their job, and how many of their employees drove such vehicles as a necessary part of their job. Companies with a central list of drivers were asked if they would make the list available to SCPR. In cases where the company did not have a central list, the form asked for contact names and addresses of people who held lists for the different component parts of the company, and each of those people were sent a form asking if they would be willing to supply a list of their drivers for this study. In all cases extensive use was made of telephone reminders and follow-ups to maximise response.

All the drivers whose names were supplied as a result of this procedure were included in the sample, except in cases where the company had supplied more than 80 names, in which case a random selection of 80 names was made.

2.2 Survey response

Response figures are presented in Tables 2 and 3. As is always the case with postal surveys the response rates presented are in fact minimum rates, as some of the non-respondents will in fact have been ineligibles. The response rates of 46% for companies and 68% for drivers, implies an overall response of about 32% from those drivers who could potentially have been included in the sample.

2.3 Data processing

A team of coders at SCPR carried out a manual edit of each questionnaire received. This edit checked that skip instructions had been correctly followed, and that codes were available for every valid response to all questions. The response data was then key-entered, and a comprehensive computer edit of the data subsequently carried out. Checks were made on the overall structure of the data, the fulfilment of filter and skip conditions, and the absence of non-permissible responses. At this stage it was also possible to compare each respondent's responses to two or more related questions, and hence introduce a series of 'plausibility' checks. Where any of the checks failed, the relevant questionnaire was re-examined and amendments made to the response data on the best evidence available. Corrections were resubmitted to edited database until the dataset was 'clean'.

Table 2 Response by Companies

		Number of companies	*%*
List of drivers supplied		212[1]	46
List arrived too late		2	
Refusal		130	28
No response		116[2]	25
Sub total		460	100
Ineligible	- No cars/vans	69	
	- Other reasons	71	
Total companies sampled		600	

[1] Includes 9 companies where only partial lists were supplied because there was no central list and only some of the divisions of the company supplied a list.

[2] Includes 5 companies who had no central list of drivers, and supplied a list of company divisions but none of the divisions supplied a list of drivers.

Table 3 Response by drivers

	Number of drivers	*%*
Productive Questionnaire	4479	68
Refusal by individual	51	1
Refusal by company	14	
Arrived too late	1	
No response	1998	31
Sub total	6543	100
Company folded	186	
Driver left company	74	
Driver never worked for company	25	
Duplicate	49	
Total questionnaires mailed	6877	

2.4 The questionnaire

2.4.1 The topics covered

The questionnaire was in six parts, including questions on the following topics: (i) driving as part of the job, (ii) non-work driving, (iii) when and where you drive, (iv) training, (v) accidents, and (vi) job and personal details.

In the section relating to driving as part of the job, the first few questions checked that drivers did drive as part of their job, and obtained some summary information about the purposes for which they made work related trips (e.g. carrying goods, or driving to meetings, or as a sales representative). Drivers were also asked how long they had been driving as part of their current job, and how many miles they had driven on public roads for their current employer both in the last three years, and in the last year only; if their current employment had been for less than these periods, they were asked to estimate the mileage they had driven since the start of their current employment. Drivers were then asked to provide similar estimates for the mileages they had driven for non-work purposes in any vehicle. Non-work driving was defined to include driving for personal purposes and driving to and from work (i.e. commuting).

In the section of the questionnaire relating to ‘when and where you drive’, drivers were asked to estimate for both work and non-work driving the proportion of time they spent driving in the dark, driving on motorways and driving in built-up areas in quartile categories. They were asked to give details of any driver training courses they had taken since passing their car driving test (up to a maximum of three); if there had been a test associated with the course, respondents were asked to report whether or not they passed the test.

After giving details of the accidents they had experienced, drivers were asked for some information about the nature of their job and the firm they work for - in particular, their job title, the kind of the work they do, the size of the company they work for and the company’s main product or function. Finally, drivers were asked to give their age, gender, and the year they passed their driving test.

2.4.2 Accident data

In the section of the questionnaire relating to accidents, drivers were asked whether they had been involved in any accidents while driving a car or van in the last 3 years. An accident was defined as, ‘any incident, however small, that involved damage to your vehicle or another vehicle, damage to any property, or injury to any person including yourself’. Accidents not on public roads, outside Great Britain, or whilst travelling as a passenger were not to be included. The questionnaire then asked for a number of details of the 3 most recent accidents (if they had taken place within the last 3 years) including the date of the accident, whether the accident took place during daylight or in the dark, what other road user or object was involved, the severity of any injury suffered, and the amount of damage incurred. Crucially (as it turned out) drivers were also asked for each accident whether at the time of the accident they were driving a car owned or leased by their employer and whether they were driving for their job.

It was intended to identify the number of accidents each driver had had while driving as part of his job, by following the general question: ‘How many accidents have you been involved in while driving a car of van in the past 3 years?’ by: ‘How many *of these* accidents took place when you were driving for your current employer?’. However, the responses to this were incompatible with the later question which asked in relation to the three most recent accidents, whether the respondent was driving for his/her job at the time of that accident. One would expect the number of accidents while driving for the job would be slightly larger than the number while driving for the current employer (because of previous jobs and second jobs), but in fact it was very much smaller. The most likely explanation is that many respondents interpreted the earlier question as asking about *all* accidents since the respondent started driving for their current employer. Unfortunately, this inconsistency had not been evident in the pilot study. Consequently, the statistics for accidents during driving for work are based on the later question which was specifically related to the accident experience of the drivers. (Accidents that occurred whilst driving for a previous job were eliminated by relating the date of the accident to the date at which the driver’s current employment had started). Because the accident specific questions only asked about the 3 most recent accidents, and a few respondents had had more than 3 accidents in the last 3 years, the number of work accidents could be under-estimated slightly (less than 2%).

3 Factors affecting accident frequency

3.1 Introduction

In total, the respondents to the survey had been involved in 2,156 accidents over the last 3 years - an average of 0.56 accidents per respondent. This section explores how the number of accidents in which the respondent was involved was influenced by a variety of factors including average annual mileages. Three separate annual accident frequencies and annual mileages are used - one which refers to all accidents (referred to as f_T), one which refers only to accidents while driving for current employer (f_W), and one which refers to accidents that did not occur during work (f_{NW}). Their definitions are as follows:

f_T Annual Accident Frequency (all accidents). The observed annual accident frequency for an individual driver is simply the number of accidents the driver has had over the last three years (or since they started driving) divided by the number of years he or she had been driving.

Most respondents (99%) had been driving for at least 3 years. However, taking account of those who had not, the average annual accident frequency for a group of drivers (F_T) is given by:

$$F_T = \frac{\sum_{i=1}^{N} A_i}{\sum_{i=1}^{N} T_i}$$

where N is the number of respondents, A_i is the number of accidents reported by the ith respondent in the T_i years to which those accidents refer.

f_W Annual Accident Frequency (Current job). The annual frequencies of accidents while driving as part of current job (f_W) are estimated in essentially the same way as for f_T. However, in this case, the relevant accident period was less than 3 years for 34% of these drivers (see M_w below).

f_{NW} Annual Accident Frequency (Non-work driving). Estimated in essentially the same as for f_T and f_W. f_{NW} could not be calculated for the 3% of respondents who had not done any non-work driving in the last 3 years. The time period was 3 years for 94% of the remainder of the respondents, and equalled the length of time that they had been doing non-work driving for the 6% who have been doing so for less than 3 years.

Since the three accident frequency estimates are based on different time periods, f_W and f_{NW} will not necessarily add up to f_T. In fact, the total accident frequency (f_T) was 0.19 accidents per driver per year, the overall value of f_W was 0.10 and of f_{NW} was 0.08 accidents per driver per year. The distribution of accidents for drivers who had been driving for at least 3 years was as follows: 61% of drivers reported no accidents in the last three years, 26% reported one accident, 9% reported two accidents and 3% reported three or more.

The three mileage estimates calculated for each driver were as follows:

M_W Work-related mileage. This is an estimate of each driver's annual mileage while driving for their current job over the last 3 years, or since they started driving for their current job, whichever period was the shorter. The period was 3 years in 66% of cases, between 1 and 3 years in 20% of cases, and under a year in 14% of cases. The estimates of M_W and f_W were based on the same time period for each respondent.

M_{NW} Mileage for non-work driving. Non-work driving includes driving for personal purposes and driving to and from work. M_{NW} is an estimate of the annual mileage each driver covered during the course of non-work driving over the last year, or since they started doing non-work driving, whichever period was the shorter. The period was 1 year in 98% of cases, and under a year in 2% of cases. M_{NW} and f_{NW} are based on different time periods for most respondents.

M_T The overall mileage $M_T = M_W + M_{NW}$ for each driver. M_T and f_T are based on different time periods for most respondents.

A check on the level of agreement between the question which asked about miles driven for work over 3 years and the question which asked about miles driven for work over 1 year was undertaken by comparing the mean value of each, for the subset of respondents who have been driving for their current job for at least 3 years. The mean of the former was 58,613 - very close to 3 times the mean of the latter (19,701). Thus, in aggregate terms at least, the two estimates are in reasonable agreement.

3.2 Age and experience

Table 4 shows the average accident frequencies (accidents per year), and the annual mileages for total accidents and for work and non-work accidents by age of the driver. It is clear from the Table that accident frequency is strongly related to the driver's age. Overall, the average accident frequency f_T experienced by the under-30s (0.32) is more than twice that for those aged 40 or more (0.14), while the frequency for the intermediate age group is about half way between these two figures. Over half the drivers under 30 (57%) had been involved in at least one accident during the last three years, compared to only a third (32%) of those aged 40 or more. While the youngest age group experienced higher accident frequencies than others age groups for all three sets of accidents (total, work and non-work), the difference was somewhat more marked for work related accidents (f_W) than for non-work accidents (f_{NW}).

Table 4 Average accident frequencies by age

		Age			
		Under 30	*30-39*	*40-49*	*50+*
Total	f_T	0.32	0.23	0.15	0.14
	M_T	29600	27900	26800	25200
Work	f_W	0.24	0.11	0.07	0.08
	M_W	22200	20600	19900	18800
Non-work	f_{NW}	0.12	0.11	0.07	0.06
	M_{NW}	7400	7400	6800	6400
Number of drivers		529	1025	1270	1010

A variable likely to be strongly correlated with the driver's age, but which warrants separate investigation, is driving experience. Driving experience is defined as the total number of years a driver has been driving since he or she passed his/her car driving test. The relationship between accident frequency and driving experience is shown in Table 5; it is very similar to that between accident frequency and age, in that the number of accidents decreases rapidly with increasing experience. The average annual accident frequency (f_T) shows a steady decline from 0.51 for those with less than 5 years' experience, to 0.13 for those with 30 years' or more experience.

Table 5 Company car drivers: average annual accident frequencies by driving experience

		Driving experience (years)				
		Less than 5	*5-9*	*10-19*	*20-29*	*30+*
Total	f_T	0.51	0.30	0.23	0.15	0.13
	M_T	28600	28700	27400	27100	25600
Work	f_W	0.36	0.20	0.13	0.08	0.07
	M_W	20700	20600	20400	20000	19400
Non-work	f_{NW}	0.24	0.14	0.09	0.06	0.05
	M_{NW}	7900	8100	7000	7000	6200
Number of drivers		110	352	1071	1453	852

These statistics may be compared to those for ordinary drivers by reference to Table 6, which shows the accident frequencies from an all-driver survey (Maycock, Lockwood and Lester, 1991). In this Table, the least experienced group has about 5 times as many accidents as the most experienced group. This trend is similar to the trend for company car-drivers in Table 5. However, close inspection suggests a difference of detail. The all-driver data (Table 6) suggests a rapid improvement during the first five years of driving but only a modest improvement thereafter. The company car-driver data suggests that there is a substantial improvement after the first five years. Thus, whilst both surveys suggest the same broad relationship between experience and accidents, in the case of the company car drivers, the effect is more spread out over the range of experience than was the case for the earlier sample of 'ordinary' drivers. This was also apparent (and statistically significant) in the multivariate modelling (see Appendix D).

Table 6 All driver sample: average annual accident frequencies by driving experience

	Driving experience (years)				
	< 1	*1-4*	*5-9*	*10-19*	*20+*
Accidents per year	0.336	0.162	0.091	0.078	0.063
Number of drivers	3632	2418	2885	1979	2605

Because age and driving experience are highly correlated, some of the apparent reduction in accident frequency with increasing age (Table 4) will actually have resulted from an increase in experience. The separate effects of age and experience can be investigated by multivariate analysis providing that age and experience are not too highly correlated. The analysis of the all-driver survey data (Maycock et al, 1991) - which was a structured sample drawn specifically to examine effects of both age and experience - suggested that even after allowing for the effect of experience, there was a significant age effect, and this result was confirmed in an analysis of drivers in their first three years of driving (Forsyth et al, 1995). In the case of the company car drivers however, multivariate analysis showed that once driving experience was included in the model, it was not necessary to include age (section 4.2), though there was no positive evidence that the age effect for company car-drivers is less than that for all-drivers. So it is not possible to come to any definite conclusion about the individual effects of age and experience in this particular sample of company car driver's accidents because of the high correlation between age and experience.

3.3 Exposure

Table 7 shows average accident frequencies (the number of accidents per year) and average annual mileages, for sub-groups of the driver population classified by the proportion of driving time spent in the dark, on motorways, and in built-up areas.

Drivers who estimated that they did over 25% of their driving for their current job in the dark had a slightly higher frequency of accidents while driving for the current job than those that did not (0.12 compared with 0.10), but they also drove greater mileages. The same drivers also had somewhat higher accident frequencies during non-work driving, but again drove rather higher non-work

Table 7 Average annual accident frequencies, and average annual mileages by driver sub-group

Characteristics of mileage	f_W	M_W	*Number of drivers*	f_{NW}	M_{NW}	*Number of drivers*
In the dark						
<25%	0.10	19,100	2,984	0.07	6,400	2,439
>25%	0.12	24,300	846	0.10	8,600	1,300
On motorways						
<25%	0.09	15,300	1,038	0.07	6,200	2,319
25% - 50%	0.11	20,300	1,090	0.10	8,100	1,008
50% - 75%	0.11	22,300	1,214	0.11	10,300	307
>75%	0.11	25,900	481	0.11	12,500	102
In built-up areas						
<25%	0.07	19,800	1,131	0.07	7,700	1,026
25% - 50%	0.10	21,400	1,327	0.09	7,800	1,203
50% - 75%	0.12	20,200	924	0.07	6,700	865
>75%	0.15	17,500	451	0.10	5,800	674

mileages. A similar pattern is evident when the drivers are grouped by their estimates of the proportion of time spent driving on motorways. Those drivers who spent a higher proportion of their time driving on a motorway, drove higher overall annual mileages (not surprisingly) and experienced higher job related accident frequencies; a similar pattern applies for this grouping of drivers in relation to non-work mileages and accidents.

By contrast, grouping drivers by the estimated proportion of time they spend driving on built-up roads (usually, the complement of motorway mileages) presents a rather different picture. The trend in annual mileages as a function of the proportion of time spent driving in built-up areas is less clear cut than was the case for motorway driving. There is however, a relatively strong association between the frequency of accidents while driving for the current job and the proportion of driving for the current job that takes place in built-up areas. As the proportion of time spent driving in built-up areas increases, so the accident frequency increases - from 0.07 for those who do less than a quarter of their current job mileage driving in built-up areas, to 0.15 for those who do over three quarters of their current job mileage in built-up areas. For non-work driving too, the proportion of driving in built-up areas has a significant effect on accident frequency: those who drive more in built-up areas have higher accident frequencies, despite doing lower mileages. These results seem likely to be a reflection of the higher accident rates per mile on urban roads compared to rural roads and motorways.

A number of other features of the results shown in Table 7 are of interest. It is noteworthy that in terms of the average work and non-work mileages shown in the Table, drivers who drive high mileages for their jobs, also drive high non-work mileages. In terms of the relationship between accident frequencies and total annual mileage, Table 7 suggests that accident frequencies are not proportional to total annual mileage - either for work mileage or non-work mileages. Consider for example the section of the Table relating to motorway driving. For work driving, the annual mileages of the driver grouping used in this section of the Table increase from 15,300 to

25,900 - an increase of 70% - whilst the annual accident frequencies for the same groups of drivers increase from 0.09 to 0.11 - an increase of only 22%. This effect is at least partly due to the fact that in the case of the higher mileage drivers a greater proportion of their mileage is driven on motorways, which are safer per mile that other roads, but there may also be other factors involved.

The other feature of interest in Table 7 is that a comparison of work and non-work accidents in relation to annual mileage suggests that the average accident frequencies experienced by drivers whilst engaged in non-work driving are very similar to those for the same group of drivers engaged in driving for the job, even though the mileages covered in the two situations are very different. On the face of it, Table 7 suggests that the accident rates per mile for drivers driving for work is rather less than a half of the accident rate per mile for the same drivers driving for non-work purposes. If these mileage effects are to be interpreted satisfactorily, a more detailed examination of the relationship between accident frequencies and annual mileage will be required.

Figure 1a shows accidents experienced during work driving, driving outside work (non-work) and the total, plotted against the relevant annual mileages - to give satisfactory estimates of accident frequencies, the data has been grouped into suitable mileage bands. Focusing first on the upper plot - points representing the total accident frequency (f_T) - it will be seen that accident frequency increases only slightly with total mileage (M_T); total accident frequency is certainly not proportional to total annual mileage, implying that accident rates (per mile) are much lower for the drivers who cover large mileages than for those who cover relatively small mileages. It is a fact, that for total accidents, the mileage estimates were not based on the same time period as were the accident frequencies inasmuch as accident frequencies are accidents in the last 3 years of driving, whereas the mileage figures are based on more recent periods (see definitions in 3.1 above). If therefore, drivers of company cars experience large variations in their overall annual mileage from one year to the next, then the mileage estimates used in Figure 1 would not be an accurate reflection of the average mileage driven in the last three years. Nevertheless, it seems unlikely that any systematic trend in the *average* annual mileages over the last three years would exist, so that the general picture revealed by Figure 1a should be reasonably reliable.

In Figure 1a the relationship between frequency of accidents while driving for the current job (work accidents (f_W)) and annual mileage while driving for the current job (M_W) are estimates are based on the same time period for each respondent. Reflecting the comparison of accident/ mileage relationships for work and non-work trips commented on in connection with Table 7, Figure 1a shows that the non-work accident frequencies lie roughly in the same range as those occurring during work mileages (0.05 - 0.15 accidents per year), but correspond to much lower annual mileages. As a result, the non-work curve in Figure 1a lies above the work curve and is confined to the lower half of the annual mileage scale. The total accident-mileage relation lies above both these curves, since in this plot the accident frequencies incurred during the two types of mileage are added - creating a marked increase in the accident frequency (almost double for the 10-20,000 mileage range), with a rather less marked increase in the corresponding total mileages.

It is a fact that all these accident mileage relationships are well represented by power functions. Figure 1b plots the same data as Figure 1a but uses log-log axes. It will be seen that all three sets of data lie on straight lines in this form of plot. A simple regression estimate of the relationships is shown in the Figure, from which it will be seen that the work accidents are proportional to work mileage raised to the 0.61, non-work accidents are proportional to non-work mileage raised to the 0.35 and the total accident relationship is best represented as being proportional to total mileage raised to the 0.22.

The significant feature of a power function - such as those illustrated in Figure 1b - is that the exponent of the function is equal to [dA/A]/[dM/M]. Thus for example for work mileages, the proportional increase in accidents is 0.61 times the proportional change in mileage. For non-

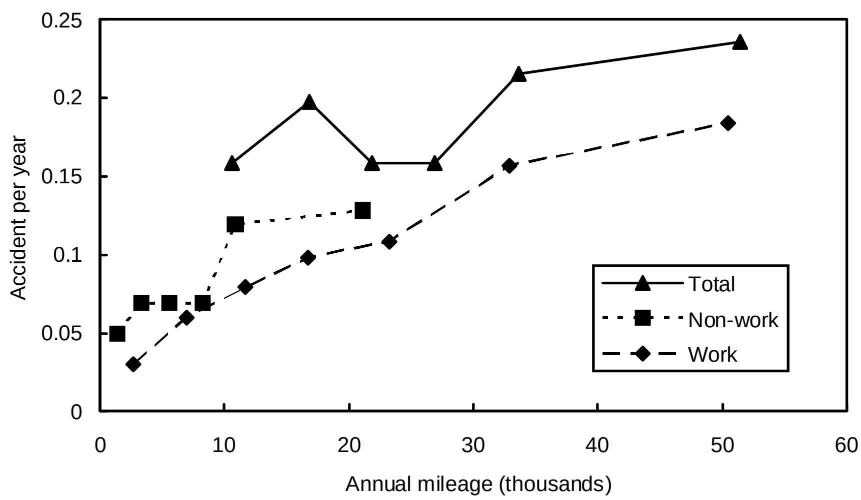

Figure 1a Accident frequencies as a function of annual mileage for work, non-work and total accidents

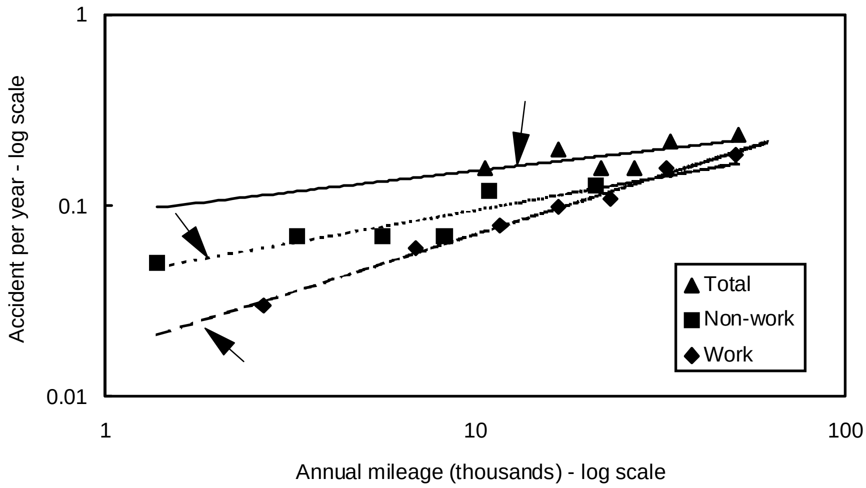

Figure 1b Accident frequencies as a function of annual mileage for work, non-work and total accidents

work accidents this ratio is 0.35 and for all accidents - in which the curve shown in Figure 1a is relatively 'flat' - the proportional change in accidents is only 0.22 times the proportional change in total mileage. These differing 'elasticities' are not easy to explain in precise quantitative terms, but is seems likely that they result from the way that the characteristics of the trips made by drivers who drive higher mileages change with increasing mileage.

It is already clear from Table 7 that the type of road used by drivers driving different annual distances has an effect on the accident frequency. Greater mileages on built-up roads will increase expected accident frequencies in relation to mileage, whereas greater mileages on motorways will reduce accidents in relation to mileage. In addition, more recent studies of accident frequencies in relation to trip characteristics have shown (see for example, Forsyth et al, 1995) that how often trips are made (every day, once a week etc.) is a significant predictor of accidents. This suggests that over and above the road type effect, a driver whose annual mileage is made up of frequent short trips will have a higher accident rate than one whose covers the same mileage in fewer longer trips - i.e. accident frequencies are dependent on trip length. These aspects of the relationship between accidents and exposure are not well understood, but almost certainly contribute to the different elasticities illustrated in Figure 1b.

For the purpose of comparing company car drivers with ordinary drivers, only the total accident-mileage relationship will be used. It turns out (fortunately) that when the full multivariate analysis of accidents is undertaken, the mileage exponent for company car driver total accidents is not statistically different from that of the ordinary drivers. This aspect of the analysis will be dealt with in greater detail in section 4 below and in Appendix D.

3.4 Gender

Table 8 shows that there are differences in the accident frequencies reported by men and women, but that the differences are not so large as those associated with experience or mileage. The estimated average annual accident frequency (f_T) was 0.25 for women and 0.19 for men. However, care must be taken in assessing the significance of these differences due to the relatively small number of women in the sample. In any case, the differences are likely to be at least partly due to age effects: the women are younger than the men (see Appendix A), and younger people have higher accident frequencies (see 3.2).

Table 8 Average annual accident frequencies, by gender

		Male	*Female*	*Total*
Total	f_T	0.19	0.25	0.19
	M_T	27,300	24,600	27,100
Work	f_W	0.10	0.19	0.10
	M_W	20,300	17,900	20,200
Non-work	f_{NW}	0.08	0.11	0.08
	M_{NW}	7,000	6,700	7,000
Number of drivers		3,585	255	3,841

The gender difference in average annual frequency of accidents while driving for the current job (f_W) is even greater than the difference in total accident frequency - a difference which implies an even greater difference in accident *rate* (per mile), since the women drivers drove lower mileages than the men. Again, some caution is needed in interpreting these figures because of the small number of women drivers in this sample and the small number of accidents involved.

The all-driver survey (Maycock et al, 1991) found that men had a higher accident liability than women, especially if they were young and inexperienced. This is the opposite of what is implied by Table 8. Multivariate analysis (Appendix D) also indicates that there was a statistically significant difference between the all-driver and company car driver data so far as gender differences are concerned. However, when developing the multivariate model described in section 4.2, the excess accident frequency of female company car drivers (compared with male company car drivers) was found to be too small to be statistically significant.

3.5 Driver training

Respondents were asked whether they had taken any course of driver training since passing the car driving test. The availability of this information does not enable comparisons of individual respondents' accident liabilities to be made before and after taking a course, it simply enables the accident frequencies of those who had taken a course to be compared to those who had not, and in this context it needs to be remembered that some of the drivers had taken the course a number of years before the survey.

Table 9 shows that those who had taken some sort of course had a slightly lower overall accident frequency than others, 0.16 compared to 0.19. This difference is not caused by differences in either annual mileage or age: the average age of the two groups is very similar, and those who had taken a course had actually done greater mileages than others. There was a less pronounced difference between the two groups in the frequency of accidents while driving for the current job, and the frequency of accidents while doing non-work driving.

Table 9 Average annual accident frequencies, by whether any course of driver training was taken

		Ever taken course of driver training since first passing car driving test?	
		Yes	*No*
Total	f_T	0.16	0.19
	M_T	29,300	26,800
Work	f_W	0.09	0.10
	M_W	22,100	19,800
Non-work	f_{NW}	0.07	0.08
	M_{NW}	7,200	6,900
Mean age		42.3	41.5
Number of drivers		520	3,323

The multivariate analysis described in section 4.2 found no evidence that 'trained' drivers have a significantly lower accident liability than 'untrained' ones.

It is possible that the selection of drivers for training is non-random. For example, drivers may be selected for training if they have a poor accident record, or, it may be the case that drivers who are more safety conscious than average put themselves forward for training. For this reason, the figures in this section (and in section 4.2.2) have to be interpreted with caution.

3.6 The nature of work driving

Table 10 shows the work accident frequencies and corresponding annual mileages for drivers categorised by the main functions exercised whilst driving for work. Those who said they were employed mainly as professional drivers had an average annual frequency of accidents while driving for the current job (f_W) which, at 0.14, was slightly higher than that others (0.10), but this is based on only 165 professional drivers. The multivariate analysis, described later, did not find any statistically significant difference between the professional drivers and the others.

Table 10 Average annual frequency of accidents while driving for current job, by main things done while driving for job

Main functions of driving for job	f_w	M_w	*Mean age*	*Number of drivers*
Carry passengers	0.08	19,700	44.7	329
Visit other parts of organisation	0.11	19,700	40.2	552
Carry goods	0.09	18,900	42.1	2,431
Provide a service	0.11	21,000	41.4	1,316
Make sales	0.11	22,700	41.3	1,893
See suppliers	0.08	18,200	42.9	876

Table 10 shows that the value of f_W varied only slightly across the different categories of functions being exercised by respondents while driving for the current job. Those who carried passengers, and those who drove to see suppliers, had the lowest frequencies but these drivers also were slightly older on average.

4 Multivariate analysis

4.1 Company car drivers compared to 'all drivers'

The reported accident frequencies (total) of the company car drivers were compared with a sample of 'ordinary' drivers which had been obtained by means of a postal questionnaire survey of a sample of drivers obtained from the Driver and Vehicle Licencing Agency (DVLA). In this postal survey, about 20,000 questionnaires were completed and returned, and more than 5,000 accidents were reported. The all-driver sample was not a simple random sample - for instance, it was arranged to include a substantial proportion of inexperienced drivers and included over-sampling of both young and older drivers; additional details are given in Maycock et al (1991). Maycock et al derive the following statistical model for describing the accident liabilities of these drivers:

$$A/T = 0.00633 \exp(s+g)\,(1+1.6p_d)\,(p_b+0.65p_r+0.88p_m)\,M^{0.279} \exp\{\, b_1/Ag + b_2/(X+2.6) \,\} \quad \text{Model 1}$$

where

A is the number of accidents a driver might be expected to be involved in over a period of T years; i.e. A/T is the driver's accident liability in accidents per year,

M is the distance driven annually (miles),

Ag is the drivers age in years,

X is the number of years the driver has been driving since passing the driving test,

b_1 = 13, g = 0 for drivers in occupation groups A and B (senior managerial, administrative and professional occupations) and C1 (junior managerial, administrative or professional, together with supervisory and clerical occupations),

b_1 = 23, g = -0.72 for drivers in occupational groups C2 (skilled manual workers), D and E (semi-skilled and unskilled workers pensioners, casual workers and the unemployed),

b_2 = 3.5, s = 0 for males

b_2 = 2.3, s = -0.02 for females

p_b, p_r, p_m are the proportion of driving in built-up areas, rural areas and on motorways respectively ($p_b + p_r + p_m = 1$)

p_d is the proportion of driving during the dark

On average, company car drivers have a much higher annual mileage than ordinary drivers, and this feature of their driving must be taken into account when comparing the accident liabilities of the two groups. This can be done as part of the modelling process. The company car-drivers and all-drivers data were combined into a single set of data, and the following model, based on 17,023 drivers, was fitted:

$A/T = 0.00199 \exp(s+g)\, M^{0.30} \exp\{ (p_b + 0.54p_r + 0.76p_m)+0.75p_d+b_1/Ag+b_2/(X+3)+F\}$ Model 2

where the majority of variables are as for Model 1, and:

b_1 = 16, g = 0 for drivers in occupational groups A, B and C1,

b_1 = 21, g = -0.46 for drivers in occupational groups C2, D and E,

b_2 = 4.1, s = 0 for males

b_2 = 2.7, s = 0.04 for females

F = 0 for those in the all-drivers sample, and 0.40 for those in the company car-drivers sample.

The modelling procedure is described in Appendix C. When drivers are asked to state the number of accidents they had in the last 3 years, they will forget (or omit) a proportion of them; this ‘memory loss’ effect has been allowed for in the multivariate models. The memory correcting factor is described in Appendix D.

Model 2 has the same form as model 1, but with the difference that the term F has been added to the equation within the exponential brackets. (There are also some minor differences of detail - in particular, p_b, p_r, p_m and p_d have been placed within the argument of the exponential for ease of fitting the model. This does not materially affect the form of the model).

The fitted value of the term F is by convention set at zero for the ordinary drivers. For those in the company car driver sample, its estimated value was 0.40 ± 0.05. This indicates that on average, the expected number of accidents per year for company car drivers is equal to exp{0.40} = 1.49 times that expected of the ordinary drivers - i.e. a company car driver is 49% more likely to be involved in an accident than an ordinary driver, even after allowing for differences in mileage, age, and the other factors in the model (but see comment in Appendix D).

In fact, the ordinary driver sample includes some company car drivers, since it is a sample of all drivers. Hence the difference in accident liability between company car drivers and non-company car drivers is likely to be a little greater than 50%. The model differences are shown in Figure 2. The company car-driver curve in Figure 2 is not shown below an annual mileage of 10,000 because only 5% of company car-drivers drove less than this. Similarly, only 5% of those in the ordinary driver survey exceeded 22,000 miles per year and the curve for these drivers is appropriately truncated above this figure.

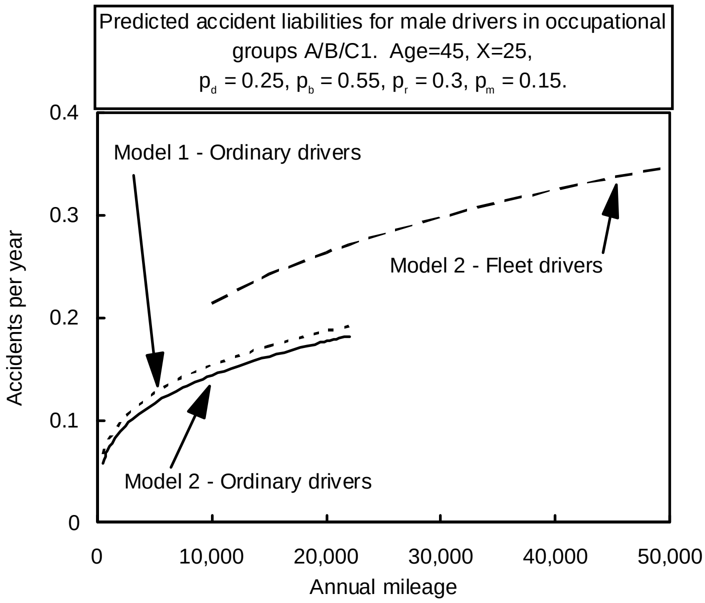

Figure 2 Illustrating the model predictions

Although *on average* a company car driver is 49% more likely to have an accident than an ordinary driver, there is some evidence that this figure varies with other parameters in the model; for instance, the difference is greater for drivers in social grades C2-D-E and for women drivers. These variations are detailed in Appendix D.

A result from a follow-up to the original postal questionnaire survey is of relevance here. During 1990/91 those who took part in the original all-driver survey were sent a further questionnaire, to which 8,617 drivers responded. This survey, unlike the earlier one, asked drivers if the car they drove most was company owned (Maycock et al, 1996). An analysis of the data showed that 22% of men and 8% of women in this sample drove a company car, and those that did drive a company car drove on average nearly twice the mileage of those that did not. A multivariate analysis of this data suggested that for this sample of drivers company car drivers had 29% more accidents than private car drivers. This result is rather less than that estimated by the factor F above obtained by comparing a separate set of company car drivers with the original survey results. However, is seems quite reasonable to expect there to be a difference in the population of drivers sampled using the methods described in 2.1 above which focused specifically on drivers driving as part of their job, and a random sample of drivers from the general driving population some of whom may well not have driven their company vehicles on business.

4.2 Effect of certain variables on accident frequency

4.2.1 Introduction and method

The company car driver questionnaire contained a number of questions that had not appeared in the earlier 'ordinary' driver questionnaire. These questions are examined in this section. Naturally, the analyses in this section are based on the company car driver data only.

Again a multivariate model was used so as to allow for the effect on accident liability of differences in mileage, experience, etc. between the sub-groups of drivers being examined. Thus, a preliminary step was to fit a model which included these basic demographic and exposure variables. To achieve this, a model of the same form as model 1 in the previous section was fitted to the company car driver data, and terms that were not significant at the 5% level were then omitted (See Appendix C for a discussion of the model fitting process). The 'reduced' model used for this part of the analysis was:

$$A/T = 0.00489\ M_T^{0.33} \exp(-0.62p_c + 45/(X+20) + c_iV_i)$$

Model 3

where

A is the number of accidents a driver might be expected to be involved in over a period of T years; i.e. A/T is the driver's accident liability in accidents per year,

M_T is the overall annual mileage,

p_c is the proportion of driving outside built up areas,

X is the number of years the driver has been driving since passing the driving test,

V_i represents the category variables which are being investigated, and c_i (with its standard errors) are the corresponding coefficients.

It is perhaps worth noting, that although model 3 is simpler than models 1 and 2 in the previous section, it is likely that most of these simplifications are not due to genuine differences between the company car drivers and all drivers, but occur merely because the company car driver sample is smaller, and thus unable to show up the smaller effects as being statistically significant. It is particularly noticeable that age has not been included in model 3 as a predictor variable. This is because age and experience are highly correlated, and that in the model derived from the smaller data set only one of these terms could be included; this being the case, the 'experience' term in model 3 should be regarded as representing the effect on accidents of age and experience combined. Model 3 is thus a concise description of how the key variables mileage, experience (and age) and type of road, affect company car drivers' accidents so that these variables can be allowed for when looking for the effect on accidents of the other variables of interest.

Each category variable of interest (the V_i in model 3) was evaluated by adding it to the base model, and seeing if it produced a statistically significant improvement in the fit of the model (Appendix C). The value of the coefficient c_i - or more precisely $\exp(c_i)$ - then represents the factor by which the accident liability of the levels of the category variable of interest differ. Of course, if the coefficient c_i is not statistically significant, then a value of twice the standard error of c_i (exponentiated) gives a rough indication of the magnitude of the effect which would be detectable with a sample of this size.

4.2.2 Driver training

About 11% of the drivers in the sample had received car or HGV driver training (Appendix A gives some additional details). Including a 2-level category variable indicating whether the drivers had received training or not showed that having had training was not associated with a statistically significant difference in accident liability. In fact, those drivers who had received such training had an accident liability which was 8% lower than those who had not, though this difference was not statistically significant; the 95% confidence interval appropriate to this result was between -23% and 11%.

There were no significant 'interactions' between training and the other variables (such as memory loss, mileage, type-of-road, or experience). Moreover, the value of the training variable did not vary significantly depending on whether an employer had provided the training or whether training had been provided by another organisation. Nor did it depend significantly on whether the course included some kind of driving test or not, or on who ran the training courses.

4.2.3 Rewards

Only 4% of drivers received rewards for not having accidents (Appendix A gives further details). Those drivers who were offered rewards had fewer accidents than those who had not, though the difference was not significant at the 5% level. The value of the coefficient corresponding to drivers who had received rewards was -0.23 ± 0.14 ($p=0.09$). The fact that this result is significant at just under the 10% level provides an indication that rewards for safe driving may be effective, though a larger sample of such drivers would be required before a reliable estimate of the effect could be obtained. The best estimate of the potential reduction from the present study is that drivers receiving rewards have 21% fewer accidents ($e^{-0.23} = 0.79$) than those who have not been rewarded.

The rewards offered were usually under £60 per year. It might seem surprising that such small rewards have any effect at all. However, it is possible that the lower accident rates of 'rewarded drivers' is reflecting not merely the perceived benefit of the cash value of the reward, but is reflecting in addition, some non-financial aspect of the scheme - for example the status of being officially recognised as a 'good driver'.

The data suggests that firms which provide driver training for their employees were more likely to give rewards; 16% of the drivers who had received training were also offered rewards. Nevertheless, most of the drivers receiving rewards had received no driver training.

There was no evidence of an interaction between reward and the other variables (ie mileage, type-of-road and experience).

It is possible that the effect on accidents of receiving a reward is an artefact of the data. Drivers receiving rewards, in addition to simply forgetting accidents, might deliberately conceal them (from their employers and in the survey) in order not to jeopardise their rewards. This seems unlikely to have happened extensively however. If, in order to conceal an accident from his employers a driver had to pay for repairs out of his own pocket, given the low value of the rewards, the proportion of accidents where he would gain money by concealing the accident could be quite small. The result might also arise from a survey response bias. However, little would be gained from concealing accidents from the survey analysts since the questionnaire was confidential, was not marked with the respondent's name or company, and was returned direct to SCPR rather than to the company.

4.2.4 Driving more than one car

Respondents were asked if they drove more than one car or van as a usual part of their job; 8% did so. The accident liabilities of these drivers were significantly different (at the 0.01% level) from the other drivers in the sample. The relevant term in the model had a value of -0.53 ± 0.14, indicating that those who drive more than one vehicle had an accident liability - corrected for exposure and driving experience effects - which was about 41% lower than those that did not ($e^{-0.53}$=0.59). Examination of the data did not suggest a reason for this large difference and there was no evidence that this effect varied with mileage, type of road or experience.

4.2.5 Hours of work

There was no evidence that hours of work affected accidents significantly. Two ways of including this variable in the model were tried - as a continuous variable (that is, assuming that the frequency of accidents varies *steadily* with hours of work), or as a category variable (dividing the drivers into two groups). Neither approach revealed a statistically significant effect. Treating hours of work as a continuous variable, showed that an increase in the working week of 10 hours was associated with a change in accident liability of at most about 9% (the upper 95% confidence interval of the coefficient). The alternative method in which the drivers were divided into two groups, those who worked at least 46 hours a week, and those who worked less (the mean values for the two groups was 41 hours and 55 hours respectively) showed that accident liability of the group working longer hours was at most 16% (95% upper confidence interval) higher than that of the group working shorter hours.

There was no evidence that hours of work interacted with the effects of mileage, type of road, or experience.

4.2.6 Type of firm

There was no evidence that the type of firm employing the driver affected the accident liability of the drivers. Table 12 shows the accident liabilities of drivers by type-of-firm in which the manufacturing sector (SIC 20-49) is taken as the reference group. A more detailed definition of Standard Industrial Classification (SIC) can be found in OPCS (1980). Since the variations from the reference group are not statistically significant, the standard errors of the estimates are more important than the estimates themselves. Judged by these standard errors (or more precisely the corresponding 95% confidence limits) it would require an effect size of about 100($e^{0.2}$-1) = 22% to be detectable in a sample of this size. The largest effect shown in Table 12 is that drivers included in the 'other' category had average accident liability which was 16% less than the manufacturing sector.

Table 12 Estimates of how accident liability varies with Standard Industrial Classification (type of firm)

SIC	*Description*	*Estimate of coefficient*	*Relative accident liability*
20-49	Manufacturing	0	1
50	Construction	-0.06 ± 0.11	0.94
60-67	Consumer services	-0.03 ± 0.07	0.97
80-85	Banking, etc	0.12 ± 0.09	1.13
1-19, 71-79, 91-99	Other (inc. farms, energy, transport)	-0.17 ± 0.11	0.84

4.2.7 Professional drivers

Respondents were asked if they were mainly employed as a professional driver; 5% said they were. There was no evidence that this affected accident liability significantly. The standard error of the estimate for the term representing professional drivers was ±0.14. This implies that the difference in the accident liability would have to exceed 30% (100($e^{0.28}$-1)) to be detectable in a sample of this size.

4.2.8 Supervisors

Drivers were divided into three categories: Those that supervised no-one, those that supervised 1-9 people, and those that supervised 10 or more people. There were about the same number of drivers in each category. The relative accident liabilities of the groups could be determined with a 95% confidence limit of about 14%. Within these limits, there was no evidence that accident liability varied with the number of people supervised.

5 Summary

This report describes a study of the accident liability of drivers of company owned (or company financed) cars and vans (up to 30 cwt), based upon questionnaire data obtained from a national sample of 4479 drivers of such vehicles (company car drivers). The objectives of the study were to estimate accident frequencies for these drivers, to compare these frequencies with those obtained from an earlier study of a population of 'ordinary' car drivers, and to assess whether the accident frequencies of company car drivers had been influenced by a range of factors including formal driver training or incentive schemes.

The main findings were as follows:

1 Company car drivers covered more than twice as many miles as drivers in the ordinary driver survey. The average annual mileage for these drivers while driving as part of the job was 20,200; the average annual mileage doing non-work driving was 7,000.

2 Nearly two-thirds of respondents said that one of the main things they did when driving as part of the job was to drive to meetings in other parts of their organisation or to see other people working for the organisation. Half the respondents drove to make sales or get business, and over a third drove as a part of providing a service for clients or customers. Relatively few carried or delivered goods (15%) or carried passengers (9%).

3 The overall accident frequency (f_T) experienced by these drivers was 0.19 accidents per driver per year. The overall frequency of accidents while driving for work (f_W) was 0.10 accidents per year, and the overall frequency of accidents during non-work driving (f_{NW}) was 0.08 accidents per year. (These figures are uncorrected for memory loss).

4 Tabulations of accident frequency (section 3) showed that:

i Younger, less experienced drivers have a much greater accident liability than older experienced drivers. Tabulated against age, the youngest group of drivers had just over twice as many accidents per year as the oldest group. Tabulated against experience, the least experienced group had just over four times as many accidents as the most experienced group. Age and experience are strongly correlated.

ii Accident frequency increases with annual mileage, but it does not increase in proportion to mileage. Hence accident rate (per mile) *decreases* as annual mileage increases.

5 A multivariate analysis based on total accidents suggests that company car drivers have 49% more accidents than ‘ordinary’ drivers, even after allowing for differences in demographic and exposure variables.

6 11% of the drivers had taken a course of car driver training since first passing their driving test. Drivers who had received such training had an accident liability which was 8% lower than those who had not, though this difference was not statistically significant.

7 Only 4% of drivers claimed that their company offered them some kind of reward for not having accidents. The vast majority were being offered rewards with a financial value of £60 per year or less - often much less. Those being offered rewards had 21% fewer accidents than those who were not, though this difference was not significant at the 5% level (p=0.09).

8 8% of drivers drove more than one car or van as part of their job. These drivers had an accident liability - corrected for exposure and driving experience effects - which was about 41% lower than those that did not. This result is significant at the 0.01% level, but examination of the data did not suggest a reason for this large difference.

9 There was no evidence that accident liability is significantly affected by the type of firm worked for, whether the driver is a supervisor or not, or whether the person is employed mainly as a professional driver or not.

10 The association between accident liability and the number of hours worked per week was positive, but not statistically significant. This finding relates to the sample of drivers included in this survey, most of whom are working regular hours; it should not be taken to apply to shift workers or those working excessively long hours at unsocial times of day.

6 Acknowledgements

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Appendix A: Characteristics of the drivers and their driving

A1 Personal characteristics

Table A1 shows the distribution of drivers in the sample by age and sex. Of the 3,929 respondents who considered that they drove a car or van as a necessary and frequent part of their job, the majority (93%) were men. The women drivers in the sample tended to be younger than the men - nearly half of the women were under 30, compared with only 12 per cent of the men.

Table A1 Age and sex of those who drive as a necessary and frequent part of job

	Percentage in population		
Age group	*Male*	*Female*	*Total*
Up to 24	3	23	5
25-29	9	24	10
30-34	13	20	13
35-39	14	12	14
40-54	46	18	45
55 and over	14	3	13
Number of drivers	3,667	256	3,929

Table A2 shows that drivers were, in the main, very experienced. Well over half had at least 20 years' driving experience, and only 12 per cent had less than 10 years' experience. The women drivers had less driving experience than the males, which corresponds to their younger age profile.

Table A3 shows that nearly two thirds of the drivers came from the professional and managerial occupational group. Only 1% were either semi-skilled or unskilled manual workers. This distribution is very different from the national average. Overall, less than 1 in 5 of the active labour force is classed as professional or managerial. Only a very small part of the difference is accounted for by the male dominance of the sample of drivers: even when considering only economically active men, just 1 in 4 are professional or managerial, a figure well exceeded by the 63% figure in the present study.

Table A2 Driving experience of those who drive as a necessary and frequent part of job

	Percentage in population		
Years since passing the driving test	*Male*	*Female*	*Total*
Under 5	2	17	3
5-9	8	27	9
10-19	27	39	28
20-29	40	13	38
30 and over	22	3	21
Number of drivers	3,613	223	3,836

Table A3 Occupational group of those who drive as a necessary and frequent part of job

		Percentage in population		
Occupational group		*Drivers - current survey*	*All economically active in GB*[1]	*All economically active men in GB*[1]
A/B	Professional and managerial	63	18	26
C1	Other non-manual	23	36	16
C2	Skilled manual	12	24	39
D	Semi-skilled manual	1	17	14
E	Unskilled manual		5	4
	Number of drivers	3,881	11,747	6,803

[1]Based on all economically active men aged 16-64 and all economically active women aged 16-59 in GB: data from GHS 1986 (OPCS, 1989).

For the analysis described in the main text, only two occupational groups were used, one combining the first two occupational groups shown in Table A3 - in effect, non-manual workers - and the other, the remaining groups - in effect, manual workers.

A2 Types of job and types of driving

The drivers were almost exclusively in full-time, rather than part-time, work. Only 1% worked less than 30 hours a week, and 88% worked 40 hours or more. From the information supplied by respondents their workplace was classified according to the 1981 census Standard Industrial Classification (SIC). (A detailed definition of SIC appears in Appendix D of OPCS, 1980). Table A4 shows the distribution of drivers by SIC.

Only 5% of the drivers said that they were mainly employed as a professional driver, while the rest were mainly employed to do something else.

The drivers were asked what the main things are that they do when they drive as part of their job. They were

Table A4 Distribution of respondent's workplaces

Standard Industrial Classification	*Percentage of drivers*
Agriculture, forestry & fishing	1
Energy and water supply	4
Metals, mineral products & chemicals	7
Metal goods, engineering & vehicles	14
Other manufacturing industries	15
Construction	13
Distribution, hotels & catering, & repairs	22
Transport & communication	3
Banking, finance, insurance, business services & leasing	13
Other services	2
Unable to classify	7
Number of drivers	3,929

offered six alternative answers, plus the choice of writing in something different, and asked to tick all that applied. The proportion of drivers ticking each answer is shown in Figure A1. The purpose mentioned most frequently was driving to do work or go to meetings in other parts of their organisation (or to see other people working for their organisation). The relatively small numbers who carry passengers, or carry goods or deliver things, correspond with the finding that very few are mainly employed as professional drivers.

When asked what kind of vehicle they drove as part of their current job, nearly all the drivers (91%) said they drove a car. Of these, 3% also drove a van. Less than 1 in 10 (9%) only drove a van. The proportion driving a van was over a third (38%) for those who carried goods as a main part of their driving for their job, and is nearly as high (30%) for those who carried passengers, but was only 2% for those driving to make sales or get business.

The drivers were asked whether, when driving as part of their current job, they always drove a vehicle owned (or leased) by their employer, always drove their own vehicle, or sometimes their employer's and sometimes their own. The great majority (93%) always drove their employer's vehicle, and only a very small number (well under 1%) always drove their own. 6% sometimes drove their employer's vehicle and sometimes their own. In interpreting these results, however, it is important to remember that the sample was designed to consist mainly of people who drove company owned (or company leased) vehicles, and consequently will have excluded most people who drive exclusively their own vehicle as part of their job. The sample is therefore not representative of all people who drive as part of their job. Only 8% of drivers said that they usually drove more than one car or van as part of their job.

A3 Exposure

It was possible from the data supplied by respondents to provide separate mileage estimates for driving that occurred during the course of work, and for non-work driving (including driving to and from work).

A3.1 Driving as part of the current job

The average annual mileages of various sub-groups of the sampled drivers while driving as part of the current job are shown in Table A5. The Table shows that the overall average mileage was 20,200; males drove a little further than females, and the younger drivers drove slightly higher

Table A5 Average annual mileage while driving as part of current job

Driver subgroup	*Average annual mileage*	*Number of drivers*
Sex		
Male	20,300	3,667
Female	17,900	256
Age		
Under 30	22,200	537
30-39	20,600	1,048
40-49	19,900	1,288
Over 50	18,800	1,041
Mainly employed		
as a professional driver	27,400	172
to do something else	19,800	3,743
All drivers	20,200	3,929

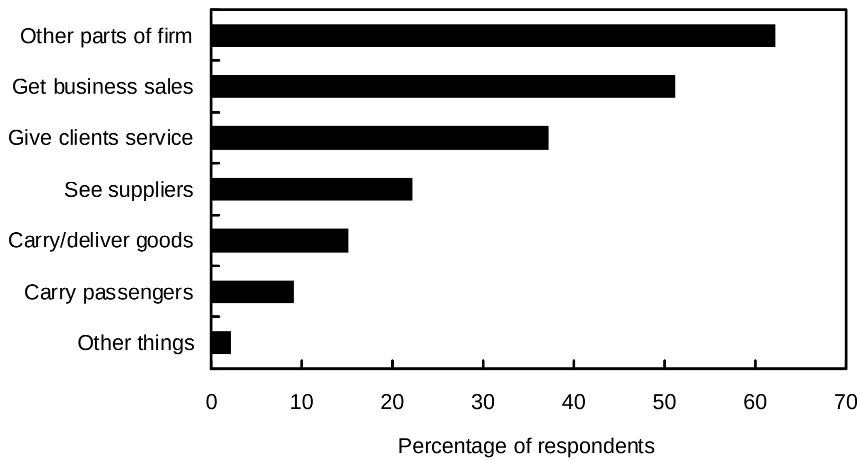

Figure A1 Business trip purpose

annual mileages than the older ones. The respondents mainly employed as professional drivers not surprisingly drove higher mileages as part of their job than others.

Relatively little of the time spent driving for the current job was in the dark: 79% of respondents thought that no more than a quarter was in the dark. Quite a lot of the time spent driving for the current job was on motorways: 42% of respondents said that over a half was on motorways. Table A6 gives the full details.

Table A6 What percentage of time spent driving for the current job was ...

	...in the dark	*...on motorways*	*...in built -up areas*[1]
No more than a quarter	79%	28%	31%
Over a quarter, up to half	20%	29%	33%
Over half, up to three quarters	1%	30%	24%
Over three quarters	-	12%	12%
Number of drivers	3,908	3,918	3,916

[1]*Excluding any driving on motorways.*

A3.2 Non-work driving

Table A7 shows that the average annual mileage driven by respondents while doing non-work driving was 7,000. This did not vary significantly with sex, and varied only slightly with age, the older driver doing slightly fewer miles.

Table A7 Average annual mileage while doing non-work driving

Driver subgroup	*Average annual mileage*	*Number of drivers*
Sex		
Male	7,000	3,667
Female	6,700	256
Age		
Under 30	7,400	537
30-39	7,400	1,048
40-49	6,800	1,288
Over 50	6,400	1,041
All drivers	7,000	3,929

Table A8 shows the proportion of non-work driving undertaken in the dark, on motorways and in built-up areas. By comparing tables A6 and A8, it will be noticed that the proportion of non-work driving that was in the dark was somewhat higher than the proportion of work-driving in the dark. This probably reflects the fact that paid employment is concentrated more in daylight hours than leisure time is. The proportion of non-work driving that was on motorways was much less than the corresponding proportion of driving for the current job. The proportion of non-work driving that was in built-up areas appears very similar to the corresponding proportion of driving for the current job.

Table A8 What percentage of time spent doing non-work driving was ...

	...in the dark	*...on motorways*	*...in built -up areas*[1]
No more than a quarter	65	63	29
Over a quarter, up to half	30	26	32
Over half, up to three quarters	5	8	22
Over three quarters	1	3	17
Number of drivers	3,856	3,827	3,860

[1]*Excluding any driving on motorways.*

A3.3 Overall mileage: comparison with the all-driver survey

Since the company car driver sample is 93% male, in order to compare the company car-driver mileages with the all-driver mileages, Tables A9 and A10 compare company car drivers with male ‘ordinary drivers’. (The all-driver survey found males covering about twice as many miles as females). It also needs to be borne in mind that the all-driver sample itself contains some company car drivers. Tables A9 and A10 show that company car drivers covered more than twice the mileage of males in the all-driver sample. This ratio would be slightly larger if the comparison were between company car drivers and male non-company car drivers.

Table A9 Overall mileages for company car drivers, by age

	Age			
	Under 30	*30-39*	*40-49*	*50+*
Annual mileage	29,600	27,900	26,800	25,200
Number of drivers	529	1,025	1,270	1,010

Table A10 Overall mileages for males in the all-driver sample, by age

	Age			
	23-29	*30-39*	*40-49*	*50-59*
Annual mileage	13140	12770	11760	9500
Number of drivers	963	990	889	944

From: Maycock et al, 1991, Table 5

A4 Training and incentives

A4.1 Driver training

14% of the drivers had taken a course of driver training since first passing their car driving test. The proportion was the same for men and women, and varied only slightly by age, with 11% of those under 30 having taken such a course, compared to 15% of others. The proportion having taken a course was slightly larger among those who drove greater mileages for their job, increasing from 11% of those with an annual mileage of under 5,000 to 18% of those who did over 40,000 miles.

Just over two-thirds (70%) of the courses that respondents had taken had been provided by an employer. A similar proportion (67%) of the courses had resulted in the respondent taking a test of some sort. Nearly all tests taken (95%) had been passed; 3% had been failed, and for 2% of the tests, the results were not yet known.

The 14% of drivers who had taken a course included some who had taken PSV or HGV courses. PSV and HGV courses accounted for 18% of all courses taken. The remaining 82% were courses relevant to cars and vans; mainly IAM, BSM, and RoSPA courses.

A4.2 Incentives

The question was asked, ‘Does your company offer you any kind of reward if you don’t have any accidents?’. Only 4% of drivers replied in the affirmative. Of those being offered rewards for not having accidents, nearly half (45%) had been offered those rewards by their company for at least ten years.

A proportion of the rewarded drivers’ questionnaires were examined to determine the value of the rewards. Some were non-financial (such as RoSPA diplomas), but most were financial, although the respondents did not always state the actual cash value. However, it was evident that drivers who worked for the same firm were part of the same reward scheme (as one would expect), and this made it possible to estimate the cash values that had not been given. The vast majority of drivers were being offered £60 per year or less; some mentioned rewards as small as £5 per year. To give a comparative scale for these rewards, in Great Britain in April 1988, average full-time earnings were £218/week. (CSO 1990, table 6.15).

Appendix B: Characteristics of accidents while driving for the job

B1 Severity of injury

For each accident, respondents were asked the worst injuries that they themselves suffered whilst driving for their job, and the worst injuries suffered by anyone else. Table B1 gives the responses. In the vast majority of accidents (94%), the respondent claimed to have suffered no injury at all. The proportion of accidents that had involved injury to anyone else was the same as the proportion that had involved injury to the respondent - 6% overall. The proportion of accidents while driving for the current job that involved injury to either the respondent or to someone else was 10% (4% involved injury only to the respondent, 4% only to another person (or people), and 2% involved injury to both the respondent and at least one other person).

Table B1 Worst injuries suffered in accidents while driving for the job

	Worst injuries suffered by respondent (%)	*Worst injuries suffered by anyone else (%)*
No injury	94	94
Slight cuts & bruises	5	5
Slight injuries	0	0
Serious injuries	1	1
Fatal injuries	0	0
Number of work accidents	956	921

B2 What else was involved?

Table B2 shows that of all the accidents that the respondents had been involved in while driving for their current job, three-quarters involved other moving vehicle(s), and one-sixth involved stationary or parked vehicles(s). Only 1% of accidents had not involved anything other than the respondent’s vehicle.

Table B2 What else was involved in the accident

	%
Moving vehicle(s)	76
Stationary vehicle(s)	16
Cyclist(s)	1
Pedestrian(s)	0
Roadside object(s)	7
Animal(s)	2
Something else	2
Nothing else	1

B3 Damage to vehicles

Table B3 shows that overall, one-third of the accidents resulted in serious damage to the car or van that the respondent had been driving, including 5% where the vehicle had been a write-off. About 10% of accidents were single vehicle accidents invoking the respondents vehicle only. This explains why in Table B3 a smaller proportion of accidents were reported to have involved damage to other vehicles.

B4 Characteristics of accidents while doing non-work driving

For non-work accidents, the distributions of injuries, of damage, and of ‘what else was involved’ were very similar to those for the accidents that occurred during work.

Table B3 Damage done to vehicles in accidents while driving for the job

	Damage to own vehicle (%)	*Damage to other vehicles (%)*
No damage	5	26
Slight damage	62	50
Serious damage	28	22
Total loss/write off	5	3
Number of accidents while driving for current job	962	946

Appendix C: Multivariate modelling procedure

C1 The form of the models

The sampling error is assumed to be Poisson. For instance, a driver with an expected accident frequency of 0.4 accidents during a certain time period would have a probability of 0.67 of having no accidents during that time period, a probability of 0.27 of having one accident, a probability of 0.05 of having two accidents, and so on, according to the Poisson distribution. This differs from the Normal distribution which is perhaps more commonly used in multivariate analysis. To fit a multivariate model with a Poisson error structure, the GLIM computer package (available from the Numerical Algorithms Group) was used.

The systematic component of the model (ie, the equation that predicts the value of the dependent variable given the value of the explanatory variables) can in principle take on almost any form. The company car driver models in sections 4 and 5 were modified versions of the all-driver model described in Maycock et al (1991). When introducing a new variable F into the model, the procedure adopted for a continuous variable was to first try

$$\ln(A) = b\,F + \ldots \text{ or } \ln(A) = b\,\ln(F) + \ldots$$

where A is the number of accidents, and b a coefficient. These are relatively simple terms, and sometimes one or the other would give a good fit. However in some cases this was not so and a more complicated term had to be used to produce a good fit (for instance, the experience term took the form $b_1/(\text{Experience} + b_2)$).

If a non-continuous (category) variable was to be introduced into the model, the form tried was ln(A) = logK + G, where K represents the effect on A of all the other terms in the model, and G take a different value - or a series of values - for each category of driver. Arbitrarily, one category would be assigned a value G = 0 and the effect of the other categories would be evaluated relative to this category. Take for example the 'reward' variable described in section 5.3. In this case drivers were divided into just two groups - those who had been offered rewards for not having an accident, and those who had not. For those who had not, G = 0; for those who had, G = - 0.23, so that the ratio of accidents in the two groups would be given by $e^{-0.23} = 0.79$. The main feature to notice about this form of model is that it implies that a reward is associated with the same *percentage* reduction in accidents for every driver. It does not imply that a reward is associated with the same reduction in the *number* of accidents for every driver.

A further way of elaborating the form of the model is to include an interaction between two variables. This may be defined as follows: if a model contains an interaction between two variables Y and Z, then the percentage change in accident risk caused by a given change in Y depends on the value of Z. In both the all-driver study and the company car-driver study, a number of interactions were tried, but most did not give a significant improvement in fit and were therefore unnecessary.

Ideally, the systematic component of the model plus the Poisson error should completely account for all the variation in the reported accident figures. In practice, there may well be residual unexplained variation (error in excess of what can be explained by the Poisson distribution) for a variety of reasons. Relevant explanatory variables may have been omitted, they may have been included but in the wrong mathematical form, or they may have been measured inaccurately (for instance, drivers' estimates of their mileage are usually approximate). Note that the model is designed to cope with error in the measurement of the dependent variable (the accident risk) but it assumes that all the other variables are error free.

Some of the respondents had to be excluded from the modelling because of unanswered questions. The number of such 'missing values' varied according to circumstance. For instance, drivers for whom occupational group was unknown had to be excluded from the models in section 4.1, but they were included in the models in section 4.2 (since these models did not contain occupational group as a variable). Typically, 10% of drivers were excluded during the modelling described in section 4.2. For the all-driver survey (section 4.1), however, the proportion of drivers excluded was considerably higher. 12% of the respondents did not currently drive as a necessary and frequent part of the job, and these were also excluded.

C2 Significance testing

GLIM quantifies how well the model predictions fit the observed values by calculating a statistic called the 'scaled deviance'. This is a statistic analogous to the residual sum-of-squares in a Normal regression. For Poisson errors it is a maximum likelihood ratio statistic, and equal to

$$2\sum\left(y\,1n\left(\frac{y}{\mu}\right)-(y-\mu)\right)$$

where μ are the fitted values (the expected number of accidents) and y are the observed values (the number of accidents reported by each driver).

If a term is added to an existing model, the scaled deviance of the new model is always less than or equal to the scaled deviance of the original model. The statistical significance resulting from adding another term to the model can be assessed from the estimated deviance difference because deviance difference has an approximate chi-squared distribution. If the new model has *d* degrees of freedom less than the original model (i.e. *d* new terms have been added), a chi-squared distribution with *d* degrees of freedom should be used. Thus for example if a single new term is added to the model, the term will be regarded as significant at the 5% level (i.e. there is a 5% probability of obtaining a chi-squared value as high as this by chance) if the deviance difference reaches 3.84.

Appendix D: Details of the comparison between company car and ordinary drivers

D1 Detailed comparison

The development of the accident model began by fitting a model to a dataset containing both company car and ordinary drivers. The model was then modified in various ways so that company car drivers were treated differently from ordinary drivers. A number of modifications were tried. Some did not improve the fit of the model significantly and therefore could be discarded. For instance, a model was fitted in which the company car drivers were permitted to have a different mileage term from the all-driver sample. In this case the mileage term for company car drivers was $M^{0.33}$; the term for all-drivers was $M^{0.29}$. This difference is not statistically significant, so the same mileage term was assumed to apply to both sets of data.

The model presented in the main text (Model 2) which represents the accident liabilities of the data set which combines the company car drivers and the ordinary drivers includes a single factor F to represent the ratio of company car driver accidents to ordinary driver accidents. The average value of F was $e^{0.4}$ - showing that on average company car drivers had 49% more accidents than ordinary drivers when driving similar annual mileages. In fact, this average value of F is a simplification; in practice because the data for company car drivers and ordinary drivers require rather different functional forms to describe the effects of some of the variables, the factor F is a function of these variables. A more precise representation of this ratio factor is as follows:

$$F = \exp(g + s - 1.2d + \ln(18-(\ln X/5)^2) - 2.24)$$

in which:

X is the number of years since the driver passed his or her driving test or 1 (whichever is greater)

d is the proportion of time spent driving in the dark

g = 0 for occupational groups A-B-C1, and 0.48 for occupational groups C2-D-E

s = 0 for males, and 0.25 for females.

All the terms in this formula were statistically significant at the 5% level or better. The experience term, fitted to the data by trial and error, is an inverted U-shaped function; it arises as follows. The all-driver model suggested that, after someone passes their driving test, their accident risk decreases rapidly with increasing experience for a few years but then levels off. In the case of the company car drivers, the data suggests that the initial decrease is less rapid than is the case for the ordinary drivers, but lasts longer. Hence the ratio of the accident liabilities of ordinary and company car drivers peaks at about 5 years experience. Figure D1 illustrates this ratio factor for male drivers driving a quarter of their time in the dark (d=0.25).

In addition to the experience effect, the above equation for F, indicates that the ‘company car effect’ is considerably larger for those in occupational groups C2-D-E (manual workers), for female drivers, and for those who do very little driving in the dark. Conversely, the effect is smaller for male drivers, for those in occupational groups A-B-C1 (professional and managerial workers), and for those who do a great deal of driving in the dark.

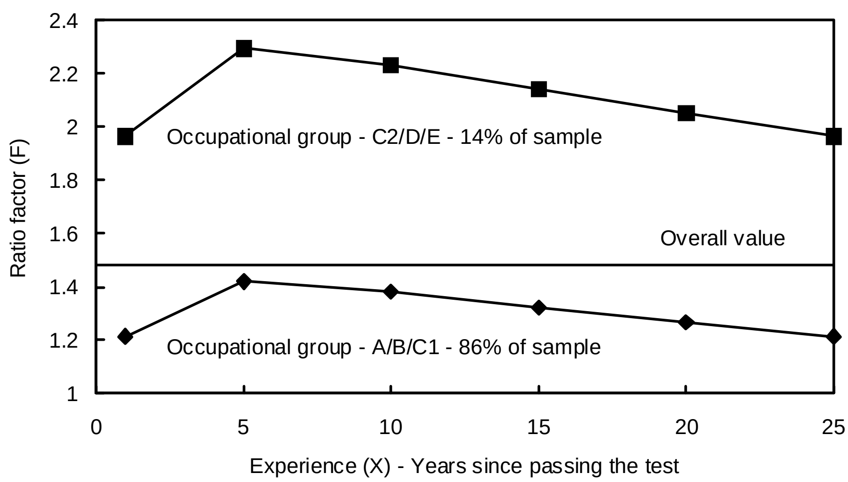

Figure D1 Ratio factor F as a function of experience (X) and occupational group for male drivers (d=0.25)

When interpreting the size of the company car effect (the factor F referred to above), a further aspect of the statistical modelling needs to be borne in mind. Regression analysis of the kind used in the model presented in this report estimates the coefficients of the model terms by minimising deviations in the observed dependent variable (in this case the accident frequencies); it assumes that the explanatory variables are known accurately. However, the comparison of annual mileages by drivers in two successive periods reported in Maycock *et al*., (1996) suggests that there may be considerable inaccuracies in drivers' estimates of annual mileage. The consequence of such inaccuracies in mileage for the modelling described in this report would be to reduce somewhat the estimated size of the factor F - the effect of company cars on accidents. However, in the absence of reliable estimates of the magnitude of the errors in annual mileage for the sample of drivers included in the study, it is not possible to make any reliable prediction of the magnitude of this effect.

D2 Forgotten accidents

When completing the questionnaire asking for details of accidents experienced, a driver may forget that he had an accident some time ago, or he may think it took place further in the past that the 3 year accident period being studied, or with increasing hindsight, he may consider it to have been too trivial to report. Whatever the mechanism involved, the 'memory loss effect' would result in incomplete accident data especially for the earlier years in the accident period.

Maycock et al (1991) in the earlier study examined this phenomenon, and their findings can be summarised as follows. Drivers had been asked to give the date of each accident they had reported, so it was possible to work out how many reported accidents had occurred in the year prior to the survey, how many in the previous year, and how many in the year before *that*. If recall of these accidents had been perfect, one would expect roughly the same number of accidents to occur each year - at least for drivers who had been driving for the full three year period. However, the data showed that more accidents were reported for the more recent years than for the earlier ones. This was attributed to memory problems - the longer ago an accident happened, the more likely the driver was to forget it (or omit it). From this data, it was estimated that the likelihood of reporting an accident that happened t years previously was $e^{-0.36t}$; for example, there was a 58% chance of reporting an accident that happened 18 months previously. A more detailed evaluation of this effect suggested that drivers in occupational groups A-B-C1, and those who drove a lot in the dark, were more likely to forget accidents.

The company car driver data also involves a similar 'memory loss' effect, with an overall loss rate similar to that described in Maycock et al (1991). Company car drivers failed to give a date for only 7% of the accidents. Moreover, the company car data was examined to see if accidents that happened during work were remembered better (or worse) that those outside work. The analysis showed that there was no difference in this effect for the two types of accident. If e^{ut} is the probability of reporting an accident that happened t years ago, a model based on work accidents only gave the value of u as -0.33 ± 0.04, whereas a model fitted to accidents outside work only gave a value of -0.30 ± 0.05. However, unlike the all-driver data, the company car-driver data provided no evidence that memory loss depends on occupational group or driving in the dark.

For simplicity, these correction factors are not explicitly shown in the models given in the main report. The tables of accident frequencies in section 3 have not been corrected to allow for forgotten accidents.

Abstract

A postal survey of company car drivers was carried out to compare the accident liability of these drivers with data from an earlier survey of ‘ordinary’ drivers; 4479 usable questionnaires were returned. On average, company drivers cover much more than twice as many miles as ordinary drivers, and their overall reported accident frequency was 0.19 accidents per driver per year. A multivariate model was used to relate accidents to mileage and other variables such as age and experience of the driver. Accident frequency increases with mileage, but not in direct proportion to mileage and falls with age and experience. The comparison with the earlier survey showed that company car drivers have about 50% more accidents than ordinary drivers after allowing for their higher mileages. When the company car driver data was examined on its own, those who drove more than one car during their work had significantly fewer accidents; in addition there was a strong indication that those drivers who had been offered a reward for not having an accident, also had fewer accidents. 11% of the company car drivers had taken car driver training since passing the L-test; the difference between the accident liability of drivers that had received training and those that had not (-8%) was not statistically significant.

Related publications

TRL219 *The accident liability of car drivers: the reliability of self report data* by G Maycock, J Lester and C R Lockwood. 1996 (price code H, £35)

PR111 *Cohort study of learner and novice drivers: Part 3 Accidents, offences and driving experience in the first three years of driving* by E Forsyth, G Maycock and B Sexton. 1995 (price code C, £20)

RR315 *The accident liability of car drivers* by G Maycock, C R Lockwood and J F Lester. 1991 (price code C, £20)

RR306 *Individual differences in accident liability: a review of the literature* by J Lester. 1991 (price code B, £20)

RR270 *Factors affecting the accident liability of motorcyclists — a multivariate analysis of survey data* by M C Taylor and C R Lockwood. 1990 (price code C, £20)

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