

VEHICLE EXCISE DUTY EVASION 1999

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Enquiries about the contents of this bulletin should be addressed to:

Department of the Environment, Transport and the Regions

Branch TSR4

Zone 1/34

Great Minster House

76 Marsham Street

LONDON

SW1P 4DR

Tel: 020 7944 6399

Fax: 020 7944 2166

E-mail: Vehicle_stats@detr.gov.uk

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SUMMARY OF KEY RESULTS

Main results for Great Britain:

- Vehicle Excise Duty evasion is estimated to cost £183 million in the year 1999/00.
- The revenue lost from VED evasion is equivalent to 3.9 per cent of the total revenue that should be raised. The equivalent figure in 1994/95 was estimated at 4.1 per cent. This 5 per cent reduction in evasion is equivalent to a saving of around £17 million per year.
- Evasion was lower in 1999 than in 1994 for all main vehicle classes. Evasion in the Private and Light Goods tax class, which accounts for more than 85 per cent of vehicle stock, fell by more than 8 per cent from 3.7 to 3.4 per cent of vehicles in use.
- The survey also showed that vehicles that are not correctly licensed are travelling less, when compared to properly licensed vehicles than they did 5 years ago. Evasion amongst traffic on the roads has fallen from 3.0 per cent to 2.3 per cent in the Private and Light Goods tax class.
- Evasion amongst the vehicle fleet is highest amongst motorcycles and special machines. However, evasion amongst motorcycles has fallen from around 35 per cent of vehicles in use to 25 per cent between 1994 and 1999.
- Evasion rates are higher for older vehicles. Evasion amongst vehicles more than 10 years old is more than twice the evasion level of vehicles less than 10 years old. Evasion is around 10 times higher for vehicles whose owner details are not known.

Main results for Northern Ireland:

- VED evasion is estimated to cost £13.7 million in the year 1999/00.
- Revenue lost is equivalent to 9.6 per cent of total revenue. This compares with 10.1 per cent in 1996/97.
- Evasion in the Private and Light Goods class fell from 10.5 per cent to 10.0 per cent in the same time period. Evasion amongst goods vehicles fell from 7.5 per cent to 7.0 per cent.

1. Overview of the survey

1.1 Vehicle Excise Duty (VED) evasion is measured by directly observing traffic on roads at specified sites around the country and recording licence plate numbers for comparison with records held by the government licensing agencies. For Great Britain, this is the Driver and Vehicle Licensing Agency (DVLA) while there is also a separate Driver and Vehicle Licensing Northern Ireland (DVLNI). To move from initial observations to end results, many factors have to be taken into account. In particular, the survey results from the different sites need to be adjusted to make them representative of the normal traffic flows on the roads in the UK. Also, after initial results are known, a further analysis is carried out to determine the extent to which the average mileage of unlicensed vehicles differs from that of properly licensed vehicles.

1.2 Appendix A describes the survey procedure in detail and Appendix D describes the adjustments made to account for the relative mileage of evaders and non-evaders.

1.3 The survey was conducted in June 1999 and covered 256 sites throughout the United Kingdom. For most of this publication, results from Northern Ireland are kept separate from those of Great Britain. This avoids certain definitional problems since vehicle records in Northern Ireland are held in a different database from those in Great Britain. Also, this makes comparisons against previous surveys easier since Northern Ireland was not included in the major survey of VED evasion in 1994 but was covered separately in 1996. Reports were published on both the Great Britain survey in 1994 and the Northern Ireland survey in 1996.

2. Different types of results from the survey

2.1 The different stages of the survey yield different measures which are of interest:

A crude measure of evasion

2.2 The most basic measure of VED evasion is to take the total number of licence plates recorded and the total number of these that are not correctly licensed and to calculate evasion on this basis. In the Great Britain survey, a total of 1,085,209 valid licence plates were recorded and 24,191 of these were found to be unlicensed upon comparison against information held on the DVLA database. This comes to 2.2 per cent evasion. However, this measure will include some vehicles more than once and takes no account of the fact that different sites have different traffic levels.

2.3 A variation on the above evasion measure is to look at the number of different vehicles observed in the survey and the percentage of those that are evading. In total, 887,974 vehicles were observed in Great Britain and 21,267 were unlicensed (2.4 per cent). There are certain analyses that can only be done at this vehicle based level – for example, see tables 14, 15 and 16 in Appendix B.

Traffic weighted measures of evasion

2.4 Several of the tables in this publication represent evasion in terms of ‘evasion in traffic’. This measure splits the observations into the different sites and calculates the weighting that the different sites should have. For each region of the country, sites within a certain road class are weighted together where possible to reflect the average daily traffic levels of those sites to give an estimate of evasion by road class. National travel estimates are then made to take into account different levels of vehicle mileage on different types of road for each region. All these weightings are also split down according to the main vehicle tax classes.

Evasion amongst vehicle stock

2.5 As described in Appendix D, vehicles that are evading VED are thought to have lower mileages than non-evading vehicles. To check the extent to which this is the case and in order to make the adjustment, repeat sightings of vehicles are analysed. By comparing the average number of repeat sightings of evading vehicles with the average number of sightings of non-evading vehicles, a model can be developed and an adjustment made. This is described in detail in Appendix D. The resulting measure is evasion in the vehicle stock or in other words, the proportion of those vehicles which should be paying VED but which are not.

Revenue lost from evasion

2.6 The DVLA and DVLNI databases contain information on the licensed stock so by combining with the estimates of the evasion rate, it is straightforward to calculate an estimated figure of unlicensed stock. By calculating the average value of licences for each vehicle tax class, as described in more detail in Appendix C, a revenue loss figure can then be calculated.

2.7 Because the characteristics of evasion are different in Northern Ireland from those seen in Great Britain, Northern Ireland results are presented separately in section 6.

3. Main results for evasion in traffic, Great Britain

3.1 The adjustments described in paragraph 2.5 can only be made at a national level since only then is enough information available to give reliable results. Most of the detailed results are therefore only possible at the evasion in traffic level.

3.2 Table 1 shows evasion in traffic according to vehicle tax class in 1999 and compares against figures from the last major survey of VED evasion in 1994. Note, however, that the taxation system has changed since 1994 and certain of the tax classes are no longer directly comparable.

Table 1: Evasion in traffic in Great Britain, by tax class, 1994 and 1999

<u>Tax class</u>	<u>Percent</u>	
	<u>1994</u>	<u>1999</u>
Private and Light Goods	3.0	2.3
Goods	2.8	2.1
Motorcycles	32.3	21.3
Bus ¹	0.9	0.7
Exempt	3.9	1.6
Special ²	32.5	22.3
Other ³	3.0	8.5
All taxation groups	3.1	2.4

1 Public transportation vehicles with more than 8 seats. Introduced in July 1995. Formerly, this class included taxis - now in PLG.

2 Mainly agricultural vehicles, various changes between 1994 and 1999.

3 All other vehicles - again there are differences between 1994 and 1999.

3.3 Surveys of VED evasion have always shown a wide variety in evasion across the tax classes. Typically evasion is highest amongst motorcycles and ‘special’ machines, largely consisting of agricultural vehicles and various concessionary vehicles. Evasion is generally lowest amongst exempt vehicles that pay nothing for VED and amongst public transportation vehicles. However, it is the Private and Light Goods (PLG) group that is most important since it covers nearly 90 per cent of all vehicles. Figures for some of the less common tax classes can be subject to substantial statistical error. See Appendix E for further details.

3.4 Evasion in traffic has fallen since 1994 (table 1) for all tax classes with the exception of the ‘other’ class, which is likely to be due to the change in definition of that category. Of the main tax classes, the largest fall has been for motorcycles (falling by more than a third) and overall, evasion in traffic was 0.7 percentage points lower in 1999 than in 1994.

Table 2: Evasion in traffic, by tax class and road type, 1999

Tax class	Road class	Percent		
		Weekdays	Weekends	All
Private and Light Goods	Motorways	2	1.8	1.9
	A road, built -up	2.5	2.6	2.5
	A road, not built -up	2.1	2.2	2.1
	Minor road, built -up	2.4	2.6	2.4
	Minor road, not built -up	2.4	2.6	2.5
<i>Total PLG</i>		2.3	2.4	2.3
Goods vehicles	Motorways	2.2	2.8	2.3
	A road, built -up	1.8	3.8	2.0
	A road, not built -up	1.5	3.7	1.7
	Minor road, built -up	3	6	3.3
	Minor road, not built -up	1.3	10.9	2.2
<i>Total goods</i>		1.9	4.2	2.1
Motorcycles	Motorways	35	31	34.1
	A road, built -up	26.9	24.8	26.4
	A road, not built -up	19.9	15.8	18.9
	Minor road, built -up	15.1	19.4	16.1
	Minor road, not built -up	22.3	18.8	21.5
<i>Total motorcycles</i>		21.6	20.5	21.3
Bus	Motorways	1.8	0.5	1.5
	A road, built -up	0.2	0.2	0.2
	A road, not built -up	0.3	0.5	0.3
	Minor road, built -up	1.5	0	1.1
	Minor road, not built -up	0.2	0	0.2
<i>Total bus</i>		0.9	0.2	0.7
Exempt	Motorways	2.6	2.3	2.5
	A road, built -up	1.4	2.2	1.6
	A road, not built -up	1.9	1.5	1.8
	Minor road, built -up	1.1	1.5	1.2
	Minor road, not built -up	1.6	1.7	1.6
<i>Total exempt</i>		1.6	1.8	1.6
Special	Motorways	19.5	34.9	23.0
	A road, built -up	19.9	22.1	20.4
	A road, not built -up	19.4	30.8	22.1
	Minor road, built -up	18.7	42.1	24.3
	Minor road, not built -up	24.6	29.7	25.8
<i>Total special</i>		20.2	29.1	22.3
Other	Motorways	3.5	7.6	4.4
	A road, built -up	7.6	13.4	9.0
	A road, not built -up	7.1	11.9	8.2
	Minor road, built -up	13	10.3	12.4
	Minor road, not built -up	9.5	20.6	12.1
<i>Total other</i>		7.4	12.2	8.5
All vehicles	Motorways	2.2	2.0	2.2
	A road, built -up	2.5	2.8	2.6
	A road, not built -up	2.2	2.3	2.2
	Minor road, built -up	2.5	2.8	2.6
	Minor road, not built -up	2.4	3.1	2.6
<i>Total - all vehicles</i>		2.4	2.6	2.4

3.5 There is also some variation between different road types and between weekdays and weekends and this is shown in table 2. Because these results are based upon a sample survey, some of the figures in table 2 are subject to fairly large estimation errors. However, for PLG in particular, the estimates for individual road classes are likely to be accurate to within +/- 0.2 percentage points. As was the case in 1994, the road type with the lowest evasion rates within the PLG tax class was motorways. For motorcycles, however, evasion was highest on motorways, again, as was the case in 1994. The variation between weekday and weekend evasion figures is high enough to suggest a true difference for most categories of vehicle rather than just natural variation. Variation is highest for goods vehicles, with weekend evasion at more than twice weekday evasion. The overall average evasion rates for goods vehicles are much closer to the weekday rates than weekend rates since there is much less goods vehicle traffic at weekends.

3.6 For PLG, the sample in the survey is large enough to enable a breakdown by region and still to give results to a reasonable level of precision. Table 3 shows this breakdown, for 1994 and 1999. The regional pattern is similar for both years with high evasion rates in Wales and Greater London and lowest rates in East of England, East Midlands and Scotland. The largest change has been seen in the North West although it should be noted that there has been a slight change in the regional definitions (Cumbria moved from the North in 1994 to the North West in 1999).

3.7 The following evasion rates represent evasion observed in the given areas. This is not the same as evasion amongst vehicles registered in that area. For example, much of the traffic observed in the Midlands could well be passing through from one region to another.

Table 3: Evasion in traffic in the Private and Light Goods tax class, by region, 1999 and 1994

Region ¹	Percent					
	Weekdays		Weekends		All	
	1994	1999	1994	1999	1994	1999
East of England	2.3	2.2	2.3	2.2	2.3	2.2
East Midlands	2.2	1.4	2.5	1.6	2.3	1.5
Greater London	3.3	3.1	3.5	2.8	3.3	3.0
Northern	2.5	2.5	2.1	1.9	2.4	2.3
North West ²	3.7	2.5	3.7	2.5	3.7	2.5
Scotland	2.3	1.4	2.3	1.9	2.3	1.6
South East	3.3	2.4	3.4	2.6	3.3	2.5
South West	2.9	2.1	2.9	2.5	2.9	2.2
Wales	4.0	3.2	4.2	3.4	4.0	3.2
West Midlands	2.8	2.5	3.3	2.4	2.9	2.5
Yorkshire and the Humber	3.0	2.3	3.1	2.4	3.0	2.4
All Great Britain	2.9	2.3	3.1	2.4	3.0	2.3

1 Changes in the definitions of areas between 1994 and 1999 mean that East of England, Northern, North West and South East areas are not strictly comparable.

2 Includes Merseyside.

4. Main results for evasion in stock

4.1 By the procedures described in Appendix D, estimates for the relative mileage of evaders and non-evaders can be derived. Adjustments can then be made to the evasion in traffic results to given estimates of evasion in total stock. Table 4 shows the results from the 1999 survey and estimates the total unlicensed stock. Table 5 shows the comparison between the 1999 and 1994 surveys. Generally, evading vehicles appear to be travelling less. This has meant that while the evasion in traffic figures above are a lot lower than in 1994, evasion within the total stock of vehicles in use is closer to 1994 levels.

Table 4: Estimated unlicensed stock by

<u>Tax</u>	<u>Evasion stock</u>	<u>License stock</u>	<u>Evading stock</u>
Private and Light	3.4	24,95	869
Good	3.1	414	13
Motorcycles	24.8	801	265
Bus	1.0	83	1
Exemp	10.3	1,57	181
Specia	38.2	292	179
Othe	28.4	37	15
All tax	5.1	28,15	152

4.2 Table 4 shows that the best estimate of total unlicensed stock at the end of June 1999 is 1.52 million in Great Britain, almost 60 per cent of which comes from the PLG tax class. This compares with an estimate of 1.56 million from 1994 as shown in table 5. Between 1994 and 1999, licensed stock has risen from just over 25 million to just over 28 million while estimated unlicensed stock has remained fairly stable. The largest increase has been amongst those vehicles that are exempt from paying for their VED. The largest decreases are for motorcycles and for special machines although in this latter case, estimates are subject to wide error levels – see Appendix E.

Table 5: Unlicensed stock in Great Britain, 1994 and 1999

Tax class	Evasion in stock (%)		Evasion in stock (000)	
	1994	1999	1994	1999
Private and Light Goods	3.7	3.4	864	869
Goods	3.1	3.1	14	13
Motorcycles	34.9	24.8	371	265
Bus ¹	1.4	1.0	2	1
Exempt	4.9	10.3	53	181
Special ¹	44.5	38.2	254	179
Other ¹	5.9	28.4	3	15
All tax groups	6.2	5.1	1559	1522

1 Not comparable - see notes to table 1

5. Estimated revenue loss

5.1 Table 6 combines the estimated unlicensed stock figures of table 4 with the average licence fee, the calculation of which is described in Appendix C, to estimate the total revenue being lost from VED evasion. In the financial year 1999/00, it is estimated that £183 million will be lost in Great Britain. This represents 3.9 per cent of the total revenue that should be collected. The largest loss, nearly three quarters, comes, not surprisingly, from the PLG tax class with a further 13 per cent coming from goods vehicles due to the higher rates of VED.

Table 6: Estimated revenue loss from evasion

Tax class	Evading stock (000)	Average value of licence (£)	Revenue loss (£m)
Private and Light Goods	869	155	135.1
Goods	13	1829	24.1
Motorcycles	265	43	11.3
Bus	1	303	0.3
Exempt	181	0	0
Special	179	60	10.7
Other	15	124	1.8
All tax groups	1,522		183.3

Table 7: Revenue loss, 1994/95 and 1999/00

<u>Tax class</u>	<u>Revenue loss in 1994/95 (£m)</u>	<u>Revenue loss in 1999/00 (£m)</u>
Private and Light Goods	118.6	135.1
Goods	23.4	24.1
Motorcycles	11.7	11.3
Bus ¹	0.3	0.3
Exempt	0	0
Special ¹	8.9	10.7
Other ¹	0.2	1.8
All tax groups	163.2	183.3
As % of total revenue	4.1	3.9

1 Not comparable - see notes to table 1.

5.2 Table 7 shows the comparison between the estimated revenue loss in 1999/00 and 1994/95. Although the revenue lost has increased between 1994 and 1999 in Great Britain, this is due to increases in the average value of licences and the increases in vehicle stock. The 3.9 per cent of revenue that is lost through evasion is less than the equivalent in 1994. For example, the revenue lost in Great Britain within the PLG tax class increased by 14 per cent from 1994 to 1999. Over the same time period, the value of an average PLG licence increased by 13 per cent and the PLG stock increased by nearly 11 per cent.

6. Main results for Northern Ireland

6.1 In order for the results of the roadside survey in Northern Ireland to be comparable with those from the 1996 survey, the sample of registration marks had to be proportionally larger in Northern Ireland than in other regions of the UK. However, there are still limitations on the reliability of the results. It is therefore not possible to reproduce all the same analyses as for Great Britain. In particular, most of the following only report results for the two main tax classes: Private and Light Goods and Goods vehicles.

6.2 Table 8 shows figures for evasion in traffic. As suggested above, because of the large potential statistical errors in all but the main categories, the only reliable results are the decreases in evasion for Private and Light Goods and Goods vehicles.

Table 8: Evasion in traffic in Northern Ireland, by tax class,

Tax	Percent	
	1996	1999
Private and Light Goods	9.2	7.2
Motorcycles	43.9	34.2
Bus ¹	..	0.7
Exempt ¹	..	5.4
All taxation ²	9.0	7.2

1 Not available for the 1996

2 Including special and other tax classes for which results very few

6.3 The number of vehicles evading has increased for PLG in Northern Ireland due to an increase in overall stock, which outweighs the decrease in evasion. The evading stock of goods vehicles however has fallen with both a fall in levels of evasion and a slight decrease in the total number of goods vehicles. Table 9 shows the evasion in stock in the two years of the survey.

6.4 As was the case in the rest of the United Kingdom, evading PLG vehicles travel less mileage than properly licensed vehicles and this effect is greater in 1999 than it was in 1996. Consequently, although evasion in traffic is more than 20 per cent lower than it was in 1996, evasion in stock is much closer to the previous level. Appendix D describes the way in which the relative mileages are estimated.

Table 9: Unlicensed stock in Northern Ireland, 1996 and 1999

	Evasion in stock (%)		Evasion in stock (000)	
	1996	1999	1996	1999
Northern Ireland				
Private and Light Goods	10.5	10.0	61.4	68.8
Goods	7.5	7.0	1.5	1.3

Table 10: Estimated revenue loss from evasion

<u>Tax class</u>	<u>Evading stock (000)</u>	<u>Average value of licence (£)</u>	<u>Revenue loss (£m)</u>
Private and Light Goods	68.8	154.9	10.7
Goods	1.3	933	1.2

6.5 As shown in table 10, an estimated £11.9 million in lost revenue is estimated for Northern Ireland in the PLG and goods tax classes, compared to £10.3 million in 1996/97. This is however a smaller percentage of the total revenue than in 1996/97, 9.6 per cent compared to 10.1 (table 11).

Table 11: Revenue lost from evasion, 1996/97 and 1999/00

	<u>Revenue loss in 1996/97 (£m)</u>	<u>Revenue loss in 1999/00 (£m)</u>
Private and Light Goods	9.1	10.7
Goods	1.2	1.2
<u>As % of revenue¹</u>	<u>10.1</u>	<u>9.6</u>

1 Percentage of revenue which should be collected for these tax classes only.

6.6 Using the results from the two main tax classes, it is possible to estimate the total revenue that is lost from evasion, but only by making assumptions. If the pattern of revenue loss is assumed to be the same across tax classes in Northern Ireland as it is in Great Britain, it is estimated that £13.7 million will be lost in 1999/00.

Appendix A – Survey design and methodology

A1 Throughout June 1999, over 1.2 million registration marks were collected at sites around the UK by contractors working on behalf of the Department of the Environment, Transport and the Regions. Collection was conducted at 256 sites, distributed across the regions of the UK according to methods established in previous surveys.

A2 Roadside surveys are considered to be the only reliable way of estimating VED evasion. Personal interviewing or other surveys would face severe problems of underestimation since people rarely admit to illegal activities. Conducting a survey of traffic on roads establishes for sure whether vehicles are in use and by comparison against up to date information held by the DVLA, it is straightforward to deduce whether vehicles are correctly licensed or not. Similarly, for the survey conducted in Northern Ireland, records can be checked against the equivalent database at Driver and Vehicle Licensing Northern Ireland.

A3 The design of the survey involves the selection of sites of 4 different road types in each of 53 police force areas. The road types covered in each area were built-up A roads, non built-up A roads, built-up minor roads and non built-up minor roads. As well as these, 2 motorway sites were covered in each Government Office Region (except Merseyside, which is included with the North West for the purposes of this report), except in London, where 4 motorway sites were chosen. Further to these sites, 20 sites were selected in Northern Ireland to cover the different road classes and to give a large enough survey sample to give reliable results.

A4 At each site, the contractors were required to collect data for one twelve hour period on a weekday and for six hours on weekends. On weekdays, surveying was between 08:00 and 14:00 and between 15:00 and 21:00, while on weekends surveying was for one of these periods only. Weekend surveying was predetermined to give equal numbers of morning and afternoon counts and equal numbers of Saturday and Sunday counts; otherwise surveying was down to the discretion of the contractors.

A5 The precise location of each site was chosen by the contractors and checked by the Department for suitability. Certain sites; all motorways and some major roads, required the collection of registration marks to be by video with transcription onto computer back at the office. In these cases, cameras were moved across all lanes in both directions to give a representative sample of the traffic at each site. At other sites, registration marks were recorded manually by the contractors in a way as to avoid any bias in the data.

A6 Depending on the road type at a given site, the contractors had a certain minimum number of registration numbers to collect. The minimum could not always be achieved, especially on roads with particularly low traffic levels. On other roads, with video recording, the minimum requirement could easily be exceeded by using only a fraction of the recorded traffic. For both the Great Britain and Northern Ireland surveys, the overall minimum number of registration marks was comfortably exceeded.

A7 Inevitably on a survey of this size, some registration numbers will be misread, creating the potential for errors. However, the majority of incorrectly recorded registration marks will produce a new registration mark that has never existed. The computer programming to check the licensed status of vehicles with these registration marks will find no match on the DVLA database and the record will be ignored. There will, however, be some registration marks that are misread to give a genuine mark of another vehicle. In this case, there is a slight upwards bias in the estimate of evasion, since, especially for older vehicles a registration mark which is generated more or less at random is more likely to be unlicensed than the vehicle which is actually observed in the survey. However, this problem is ever present in such surveys and the evidence suggests that the effect is small.

A8 For survey sites in Great Britain, data were also gathered from the DETR National Traffic census to give estimates for average flow. This is necessary in order to weight sites together, with evasion rates from busier sites within the same road class carrying more weight. Minor roads, however, do not have reliable flow estimates and it was assumed that minor roads of the same type would have equal flows in a given region. For Northern Ireland, the data sources were different but the methodology is the same.

A9 Table 12 shows the number of registration marks recorded in the survey (including all sightings of any registration marks seen more than once) by Government Office region and by tax class. Generally the samples achieved in the different areas are a reasonable reflection of relative vehicle traffic in the areas concerned, although the sample is proportionally higher in Northern Ireland to enable analyses comparable to those carried out previously. Table 13 compares the total number of sightings in the 1999 survey against the number collected in 1994 (1996 for Northern Ireland).

A10 The pattern of sightings in 1999 is similar to that observed in the previous surveys. This is as expected since the methodology and the sites chosen are the same. In the Great Britain part of the 1999 survey, the contractors were able to collect almost 20 per cent more registration marks than in the 1994 equivalent. This was largely due to the use of extra field staff and direct entry of registration marks onto hand held computers. The largest increase in sightings was for the exempt category. This is due to the sharp increase in the last few years of the number of vehicles in this category, with numbers increasing by more than 50 per cent between 1994 and 1999.

Table 12: Survey size by tax class and region

Region	Total sightings			
	PLG	Goods	Other	Total
East of England	112,776	5,774	5,197	123,747
East Midlands	110,229	5,798	6,126	122,153
Greater London	98,010	3,705	3,603	105,318
North East	65,518	3,543	5,634	74,695
North West	105,329	5,917	8,912	120,158
Scotland	127,619	7,863	8,058	143,540
South East	92,408	4,519	3,996	100,923
South West	75,941	2,999	3,198	82,138
Wales	54,670	3,846	5,148	63,664
West Midlands	64,084	3,424	3,444	70,952
Yorkshire & the Humber	65,610	7,504	4,807	77,921
Northern Ireland	58,376	2,730	6,351	67,457
All regions	1,030,570	57,622	64,474	1,152,666

Table 13: Sample sizes of the 1999 survey compared to the previous survey

Tax class	1994			1999			Total sightings
	Weekday	Weekend	All	Weekday	Weekend	All	
Great Britain							
Private and Light Goods	548,260	267,246	815,506	648,919	323,275	972,194	
Goods	50,327	6,218	56,545	48,365	6,527	54,892	
Motorcycles	2,814	1,681	4,495	3,424	1,851	5,275	
Bus ¹	6,813	2,464	9,277	7,584	3,225	10,809	
Exempt	14,328	7,505	21,833	25,680	13,710	39,390	
Special ¹	815	290	1,105	957	337	1,294	
Other ¹	904	381	1,285	959	396	1,355	
All vehicles	625,516	286,076	911,592	735,888	349,321	1,085,209	
1996							
1999							
Northern Ireland							
Private and Light Goods	38,717	20,406	59,123	38,567	19,809	58,376	
Goods	2,990	304	3,294	2,299	431	2,730	
Other	4,106	1,872	5,978	4,230	2,121	6,351	
All vehicles	45,813	22,582	68,395	45,096	22,361	67,457	

¹ Not comparable - see notes to table 1

Appendix B – Further analysis of VED evasion

B1 Evasion is more common in vehicles that have certain characteristics and the main examples of these are examined in this section. Factors affecting evasion rates include the age of a vehicle and the type of keeper. The following analyses are based on the numbers of vehicles seen in the survey so that any that are seen more than once are only counted once. This means that results cannot be traffic weighted in the same way as the results in section 3.

Table 14: Evasion by year of first registration, Great Britain

Year of first registration	Private and Light Goods		Goods		Motorcycles	
	observed	Evading (%)	observed	Evading (%)	observed	Evading (%)
Pre 1979	1454	18.7	44	34.1	70	37.1
1979 - 1984	18328	9.8	474	15.2	321	36.8
1985 - 1989	147894	5.3	6138	4.3	719	39.6
1990	46679	2.9	1847	2.3	227	23.8
1991	41190	2.3	1513	2.5	194	22.7
1992	44948	1.9	1887	2.8	173	25.4
1993	55430	1.6	2750	1.9	192	18.2
1994	62936	1.3	3953	2.2	220	15.5
1995	66773	1.3	5119	1.4	241	15.4
1996	74626	1.2	5349	1.4	369	14.6
1997	88512	0.8	5246	1.3	652	9.7
1998	96869	0.9	6397	0.5	851	6.8
1999	53740	0.5	3034	0.6	749	1.2
All years	799379	2.3	43751	2.0	4978	17.3

Table 15: PLG evasion by year of first registration

(Northern Ireland)

Year of first registration	Total observed	Evading (%)
Pre 1979	37	64.9
1979 - 1984	346	49.4
1985 - 1989	4211	21.1
1990	2059	12.5
1991	2187	12.0
1992	2473	10.1
1993	3146	8.4
1994	4189	8.0
1995	4629	6.5
1996	5178	5.3
1997	5828	4.6
1998	7148	4.6
1999	4510	4.2
All years	45951	8.3

B2 Studies have always shown that evasion is higher in older vehicles and table 14 shows that this was the case in 1999. Table 15 shows a similar pattern for Northern Ireland. In almost all cases, evasion increases with the age of vehicles and evasion rates are much higher among vehicles over 10 years old. One possible explanation is that for older vehicles, the VED represents more in comparison to the value of the vehicle. For those who can afford to buy new or nearly new vehicles, the additional expense of VED is a small part of their overall expenditure.

B3 Because evasion is higher amongst older vehicles, overall evasion rates for certain vehicle types can be influenced by a changing profile of the vehicle stock. For example, amongst motorcycles, evasion is lower in 1999 than it was in the 1994 survey. This is partly because evasion has fallen for vehicles of a given age but also partly because the stock of motorcycles has changed, with a lower average age in 1999.

B4 The type of vehicle keeper can also have an effect on the levels of evasion. A small proportion of vehicles registered on the DVLA database are described as 'between keepers'. In these cases, the previous owner has notified the DVLA of a change in keeper but the new owner has not fulfilled the legal obligation to inform the DVLA as to his/her details. For this group, evasion rates are much higher than the overall averages since it is much harder to track down and prosecute the correct owner.

B5 Table 16 shows this effect clearly. For all tax classes, evasion is much higher amongst those vehicles that are between keepers than for private or company owners. The survey estimated that there were more evaders amongst the between keeper group than the company owned group, despite there being nearly 20 times as many company owned vehicles. As would be expected, evasion is lowest amongst company owned vehicles.

Table 16: Evasion by tax class and type of registered keeper

Tax class	Private		Company		Between keeper	
	<u>Observed</u>	<u>Evasion (%)</u>	<u>Observed</u>	<u>Evasion (%)</u>	<u>Observed</u>	<u>Evasion (%)</u>
<u>Great Britain</u>						
Private and Light Goods	598241	2.2	189775	1.2	11400	27.5
Goods	3216	3.4	40087	1.5	406	35.7
Motorcycles	4528	15.0	264	17.4	186	73.7
Bus	372	1.3	5968	0.5	35	34.3
Exempt	27345	1.6	3525	1.6	354	27.4
Special	313	29.1	787	17.0	59	89.8
Other	354	6.5	730	8.5	29	65.5
All tax groups	634369	2.3	241136	1.3	12469	28.9

Appendix C – Average licence values

C1 In order to calculate the revenue loss from VED evasion, it is necessary to know the average values of the licences that are not being bought. This is determined by the tax class of the vehicles and in certain cases, other factors such as engine size or gross weight.

C2 Because of the introduction of a reduced rate of VED for cars with engine sizes of 1100 cc or less at the beginning of June, there are extra considerations for calculating the average licence value of vehicles in the PLG tax class. As well as taking the lower rate into account, it is also necessary to make an adjustment for the fact that the reduced VED rate is not applicable for the whole financial year.

C3 The taxation of goods vehicles is even more complex since VED rates depend on the construction of the vehicle, whether rigid or articulated; the number of axles and the maximum permitted gross vehicle weight. Generally, vehicles that are permitted to carry heavier weights pay higher VED rates. However, taxation rates are affected by the average weight per axle so that vehicles with multiple axles will tend to have lower rates than those with fewer axles. Furthermore, there is a separate class of tax bands for vehicles that meet certain environmental standards for emissions. Adjustments have also been made to take account of those vehicles subject to these lower rates.

C4 A further consideration in the case of goods vehicles is that because those vehicles that evade VED have a notably different profile from those that are properly licensed, the average licence value for an evading vehicle is different from that of the licensed stock. Because the evasion rate is lower amongst lighter, rigid vehicles with lower VED rates, the average licence value of an evading vehicle is significantly higher than for a non-evading vehicle (some £500 higher in Great Britain).

C5 Table 17 shows the calculated average value of licences for those licences being evaded. Average values are much higher for HGVs than any other vehicle type and lowest for motor cycles. There is an element of uncertainty about these estimates since they represent characteristics that are being measured by means of a sample survey. However, compared to other sources of statistical errors within this survey, these effects are negligible.

C6 Table 17 also shows the average licence values used in the 1994 survey although the changes to the taxation system in 1995 mean that comparisons have to be made with care. Of the categories that are comparable, the largest percentage increase has been for the motorcycles tax class but this is mainly because the stock profile has changed and there is now a higher proportion of motorcycles with larger engines.

C7 In Northern Ireland PLG licence values are slightly lower than in Great Britain, £154.9 compared to £155.3, due to a lower concentration of 6 month licences (which attract a 10 per cent premium). The average value of licence for an evading goods vehicle is much lower than in Great Britain due to the different characteristics of the stock in

Northern Ireland. However, a combination of rising excise duty rates and a change in the composition of evading stock has meant that the average value has increased by over 15 per cent since 1996/97.

Table 17: Average licence values, Great Britain

	£	
	<u>1994/95</u>	<u>1999/00</u>
Private and Light Goods	137	155
Goods	1724	1829
Buses ¹	208	303
Motorcycles	31	43
Special ¹	35	60
Exempt	0	0
Other ¹	74	124

1 Categories are not comparable due to taxation class changes - see notes to table 1

Table 18: Average licence values in Northern Ireland

	Average licence fee	
	<u>1996/97</u>	<u>1999/00</u>
Private & Light Goods	149	155
Goods:		
Rigid 2 axle	559	581
Rigid 3 axle	960	999
Rigid, multi axle	1398	1455
Artic, 2 +	1484	1545
Artic, 3 +	944	982
All goods:	803	933

Appendix D – Estimation of relative mileage of evading and non-evading vehicles

D1 It is a natural assumption that evading vehicles do not necessarily average the same mileage as properly licensed vehicles. A method has therefore been developed to test and model this effect. It is important to note that this model does not assume that relative mileage will be different but instead tests whether this is the case.

D2 The model is based upon the assumption that vehicles that travel further on average will be observed more frequently in the survey at given sites. Although repeat sightings are relatively rare, the survey is large enough such that enough repeat sightings are observed to give good results for certain vehicle classes. For other, less common tax classes, the relative mileage is estimated in the same way but is subject to large statistical errors.

D3 The one exception to this model is for motorcycles. For this tax class, an alternative data source is available; the National Travel Survey (NTS). Given that average mileage recorded in the NTS varies according to the age profile of the vehicles observed, the age profile of evading vehicles was compared with the profile of non-evaders and the relative mileage estimated. This is the same procedure that has been followed for motorcycles for previous surveys going back to 1984.

D4 For all tax classes except motorcycles, the procedure is the same. It is assumed that every vehicle has a probability of being observed in the survey, depending upon the vehicle's mileage and its proximity to the survey sites. This probability can be well approximated by the Poisson distribution. The poisson rate (λ) will vary between low mileage vehicles based far from any survey site to high mileage vehicles close to a survey site.

D5 It is further assumed that, given the random selection of survey sites, the distribution of the distance between where vehicles are kept and the location of the survey sites will be the same for evading and non-evading vehicles. The variable λ can be modelled as having a Gamma distribution, which means that the distribution of repeat sightings will have a Negative Binomial distribution. Examining the distribution of repeat sightings enables the parameters of the Gamma distribution to be calculated and the relative mileage to be estimated.

D6 Once the relative mileage estimates are available, the derived figures for evasion in observed traffic can be converted into the evasion rate amongst all vehicles in use. The details of this are as follows:

- i) Let: V_L = the number of non-evading vehicles
 K_L = the average mileage of non-evading vehicles
 V_U = the number of evading vehicles
 K_U = the average mileage of evading vehicles

then the proportion of evading vehicles, $p = V_U / (V_U + V_L)$

ii) The roadside survey observes the proportion of evading traffic, q where:

$$q = V_U * K_U / (V_L * K_L + V_U * K_U)$$

If $f = K_U / K_L$ is the relative mileage of evading to non-evading vehicles, then

$$q = V_U * f (V_L + V_U * f)$$

Solving for p in terms of q and f gives the following:

$$p = 1 / (1 + f * ((1 - q) / q))$$

iii) For example, in the 1999 survey, for the Private and Light Goods tax class in Great Britain,

$$q = 0.023$$

$$f = 0.679$$

so, $p = 1 / (1 + 0.679 * (42.5)) = 0.034$, as given in tables 4 and 5.

D7 Table 19 shows the way in which the relative mileage estimates are used to convert evasion in traffic into evasion in stock. As described in Appendix E, some of the estimates are of limited reliability and should be treated with caution.

D8 The relative mileage estimates make the most difference for the exempt tax class, with evading vehicles travelling only about a seventh of the distance of a licensed vehicle. The only case of evading vehicles doing more mileage than licensed vehicles is for goods vehicles in Northern Ireland. Although this is a surprising result and subject to considerable estimation error, the same result was observed in the 1996 survey.

D9 The most significant result is for PLG in Great Britain. In 1994, it was estimated that evading vehicles did around 0.8 miles per mile travelled by a licensed vehicle. In 1999 this figure has fallen to less than 0.7. Therefore, while table 1 shows that evasion in traffic has fallen from 3.0 per cent to 2.3 per cent, evasion in stock for this category has only fallen from 3.7 per cent in 1994 to 3.4 per cent in 1999. One interpretation of this is that evaders are perhaps being more cautious, resulting in lower mileage.

Table 19: Relative mileage estimates

<u>Tax class</u>	<u>Evasion in traffic</u>	<u>Relative mileage¹</u>	<u>Evasion in stock</u>
<u>Great Britain</u>			
PLG	2.3	0.679	3.4
Goods	2.1	0.682	3.1
Motorcycles	21.3	0.859	24.8
Bus	0.7	0.693	1.0
Exempt	1.6	0.146	10.3
Special	22.3	0.467	38.2
Other	8.5	0.236	28.4
<u>Northern Ireland</u>			
PLG	7.2	0.692	10.0
Goods	7.4	1.067	7.0

1 Average mileage per unlicensed vehicle for every mile travelled by a licensed vehicle.

Appendix E – Estimation Errors

E1 All of the estimates given in this report include some level of uncertainty since they are based on a statistical survey with a limited sample size. Different types of results have different error derivations depending on the types of assumptions that are made. In general, the larger the number of observations used to estimate a value, the more reliable the estimate that emerges. The following results give the 95 per cent confidence intervals for the main evasion estimates given in this report. This is the range of values within which we can be 95 per cent sure that the true value of what is being estimated lies. So, for example, table 20 shows that for PLG, the best estimate of evasion in traffic is 2.3 per cent but that with 95 per cent certainty the true level lies between 2.27 and 2.33.

E2 The errors involved in estimating the proportion of evading vehicles in traffic are of the usual type that would be expected to arise from a survey of this type. A sample of passing vehicles is drawn, all of which are either licensed or unlicensed. This is a standard binomial process and the errors involved in estimating the proportion of evading vehicles is a standard result. Table 20 shows results for estimating evasion in traffic.

Table 20: 95 % confidence intervals for evasion in traffic

	Percentage points	
	Evasion in	95 % confidence
<u>Great Britain</u>	<u>traffic</u>	<u>interval</u>
Private and Light Goods	2.3	+/- 0.03
Goods	2.1	+/- 0.1
Motorcycles	21.3	+/- 1.2
Bus	0.7	+/- 0.2
Exempt	1.6	+/- 0.2
Special	22.3	+/- 2.5
Other	8.5	+/- 1.5
<u>Northern Ireland</u>		
Private and Light Goods	7.2	+/- 0.2
Goods	7.4	+/- 0.9

E3 Appendix D describes the method involved in estimating the relative mileage of evading traffic compared to non-evading traffic. This is based upon the repeat sightings of a vehicle possessing a negative binomial distribution. Again, there are standard results that can be applied to derive error estimates. Table 21 shows the errors around these relative mileage estimates. The amount of evading traffic is particularly important in determining the size of the estimation errors in this case. This is one reason why buses have a very large margin for error; there are very few evading buses.

Table 21: Estimated relative mileage and 95% confidence limits

<u>Tax class</u>	<u>Relative mileage¹</u>	<u>95% confidence interval</u>
<u>Great Britain</u>		
Private and Light Goods	0.679	+/- 0.037
Goods	0.682	+/- 0.169
Motorcycles	0.859	+/- 0.245
Bus	0.693	+/- 0.595
Exempt	0.146	+/- 0.046
Special	0.467	+/- 0.276
Other	0.236	+/- 0.230
<u>Northern Ireland</u>		
PLG	0.692	+/- 0.078
Goods	1.067	+/- 0.468

1 Average mileage per unlicensed vehicle for every mile travelled by a licensed vehicle.

Table 22: 95% confidence intervals for evasion in stock estimates

<u>Tax class</u>	<u>Evasion in stock (%)</u>	<u>percentage points 95% confidence interval</u>
<u>Great Britain</u>		
Private and Light Goods	3.4	+/- 0.18
Goods	3.1	+/- 0.76
Motorcycles	24.8	+/- 9.58
Bus	1.0	+/- 0.91
Exempt	10.3	+/- 2.96
Special	38.2	+/- 14.3
Other	28.4	+/- 20.18
<u>Northern Ireland</u>		
Private and Light Goods	10.0	+/- 1.07
Goods	7.0	+/- 2.85

E4 To derive error estimates for the proportion of evading vehicle stock within all vehicles in use is complicated but can be derived from standard statistical results. The calculation relies on results that estimate standard errors of functions of other random variable. These results are shown in table 22.

E5 The estimation of licensed stock is not completely known but is relatively unaffected by statistical error. The only estimation involved is in the assumption that June stock figures are a good estimate of the average stock throughout the year. There are two factors which past experience suggests more or less cancel each other out, suggesting that this is a good approximation. Firstly, stock tends to grow over time – this would suggest that June figures are an under-estimate for the financial year 1999/00. However, stock levels are also, to some extent seasonal with December levels dropping, as some vehicles are not used over the winter. This suggests that June is over-estimating.

E6 Similarly, the errors involved in estimating average licence value levels are small. The only estimation errors here are caused by the fact that the average value of licences being evaded are not necessarily the same as the average value of licensed vehicles. The only case where an adjustment is made to account for this effect is for goods vehicles where evasion has always been shown to be higher amongst those vehicles with higher VED levels. Therefore the average value of licences being evaded is higher than the licences existing in the licensed stock. This is included in the estimation of the proportion of revenue being evaded. For other vehicle types, there is not enough evidence to suggest that the average evaded licence is any different in value from the properly bought licences and no adjustment is made.

E7 Finally, table 23 shows the 95 per cent limits of the estimated revenue loss for each tax class. The greatest element of uncertainty is for special machines (as was also the case in 1994). In this category, revenue loss could conceivably vary between nearly nothing on the best case scenario and over £30 million on the worst. There is also considerable variability in the estimate of revenue lost from motorcycles, since there is a combination of relatively high estimation errors and a large stock.

Table 23: 95 % confidence limits about estimated revenue loss

Tax class	Unlicensed stock in use (000s)			Revenue loss (£m)	
	lower limit	upper limit	Average licence (£)	lower limit	upper limit
Great Britain					
Private and Light Goods	821.2	917.4	155	127.5	142.5
Goods	9.9	16.6	1829	18.1	30.3
Motorcycles	144.4	420.5	43	6.2	18.0
Bus	0.1	1.6	303	0.0	0.5
Exempt	157.5	202.5	0	0.0	0.0
Special	0.0	513.3	60	0.0	30.8
Other	3.3	35.4	124	0.4	4.4
Northern Ireland					
Private and Light Goods	60.6	77.0	155	9.4	12.0
Goods	0.7	1.9	933	0.7	1.8