

**Heavier lorries and their impacts on the economy and
the environment**

for Freight on Rail

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Executive Summary

This report considers three key questions

Do bigger and heavier lorries reduce traffic?

Does cheaper HGV travel encourage more of it?

How important are the largest HGVs in producing greenhouse gas?

After examining the most reliable sources of national statistics, the conclusions are:

1. Rather surprisingly, there is no direct evidence of larger or heavier lorries leading to reductions in the numbers of HGVs or total HGV traffic (measured as vehicle kilometres).
2. Despite several increases in maximum weight and volume, the average payload has fallen instead of rising.
3. One likely reason for the predicted benefits not arising is the bunching of almost all new vehicles at the maximum permitted weight, rather than a range of weights suited to actual loads.
4. The sensitivity of HGV vehicle kilometres to changes in cost in the UK appears to have been seriously underestimated, particularly taking mode transfer into account.
5. HGV traffic is an important source of greenhouse emissions from transport, second only to cars and vans and to international aviation.
6. Emissions from HGV traffic have grown significantly since 1990, by 25-30%, the latest revised DEFRA assessment appears substantially correct.
7. Without a significant change in freight policy, HGV emissions will not meet the targets in the draft Climate Change Bill.
8. A combined approach, transferring mode, reducing the amount that goods have to travel and improving vehicle fuel efficiency, could reduce CO₂ emissions by 27% in a 10-15 year period.
9. This reduction would enable the freight sector to meet the Government's Climate Change Bill targets for 2020.

1 Introduction

This research has been commissioned to address three key questions in relation to road freight transport.

Do bigger and heavier lorries reduce traffic?

The first question is how far there is any evidence that previous changes caused a measurable improvement in efficiency and an accompanying reduction in traffic from Heavy Goods Vehicles (**HGVs**). This report includes a new analysis using the most reliable national statistics available, such as the Continuous Survey of Road Goods Transport (**CSRGT**)ⁱ. Clearly, the rationale for increasing weight and size limits depends on creating significant economic and environmental benefits.

Does cheaper HGV travel encourage more of it?

The second key issue is how far reductions in cost for bulk loads carried by HGVs causes extra HGV traffic. There are three potential reasons that this might occur:

- attracting goods travelling within the UK which would otherwise use rail or water;
- loading imported or exported goods at a port which decreases travel by sea but increases travel by road (this includes the use of RO-RO);
- creating extra HGV traffic through longer journeys, for example through more centralised distribution systems and business using more distant suppliers (sometimes expressed as an elasticity).

There has been some work already on how far changing limits might influence the choice between road and rail, although evidence from the UK is complicated by the constant changes in road and rail freight financial and regulatory frameworks. The largest HGVs with the heaviest loads are clearly the most likely road vehicles to be competing with rail.

However, there are also issues over where goods are landed, in other words minimising inland travel by using ports closer to where goods are to be consumed (or stored for onward distribution). This in turn links to port policy and the DfT's consultants on freight modelling (MDS)ⁱⁱ have published relevant work. This showed how applying environmental charges would cause more HGV traffic on motorways, but that this would be balanced by more people choosing ports closer to their final destination. This also needs to be seen in the context of available port capacity.

There is also a variety of work from Europe and the USⁱⁱⁱ giving an answer to the above questions in the form of a combined effect, in other words how much extra HGV traffic is generated when costs are reduced. These elasticities of demand are much higher than the one used in the UK (0.1 – an often repeated value whose origins are difficult to find). In fact several studies suggest high values close to or exceeding one, which mean substantial change in response to either increase or decrease in cost. More recent

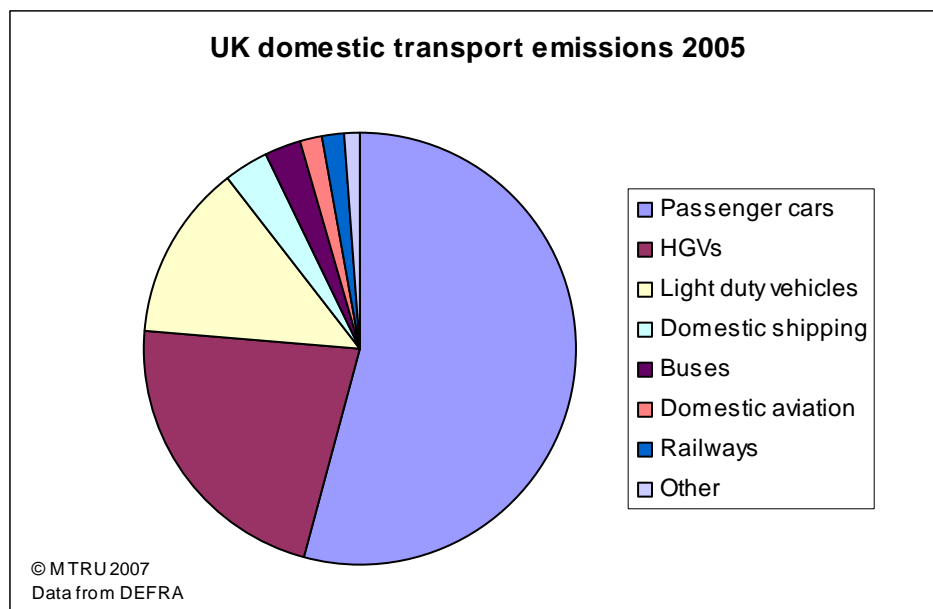
European examples ^{iv}, ^v, also suggest, at least in the short term, that the amount of goods (tonnes) is less sensitive to cost changes than how far they travel (tonne kilometres). Responses clearly differ between commodities, and the range of choices open to freight users (as well as operators).

How important are the largest HGVs in producing greenhouse gas?

The final question relates to the current method for calculating CO₂ emissions from HGVs. It is now widely agreed that earlier Office of National Statistics (ONS) data for HGV emissions ^{vi}, while prepared in line with international guidelines, was incomplete. This is because it omitted the significant number of HGVs operated by businesses for their own purposes (called “own account”). Instead it analysed data from hauliers who are open to all customers (“public haulage”). In the international guidelines, emissions from own account operation are included in the totals for the individual industries they serve. The sector “road transport industry” is based on public haulage.

In fact, ONS have published revisions to their figures to allow for omissions and DEFRA has used these in its latest sustainable indicators reports. They are lower than the original ONS, but there has been some criticism that even these estimates of increasing emissions are still too high. Different data sources give different results, and this is discussed further in this report. Whichever source is used, however, HGV emissions are very significant in terms of transport totals and have grown considerably since 1990.

Figure 1



It is also true that figures which look at all HGVs over 3.5 tonnes tend to conceal the real trends in what most people consider to be heavy lorry use (for example articulated vehicles with more than 3 axles). At the opposite end of the spectrum, any move from using the lightest HGVs (3.5 to 7.5 tonnes) into using the far less regulated large van sector must be recognised in a

meaningful analysis. For example, the DfT's 2004 national survey of company owned vans ^{vii} showed that 32% of the distance they travelled was used to carry goods, the same as driving between home and work.

This report focuses on the heaviest goods vehicles and gives an overview of the strengths and weaknesses of different approaches. It is the heavy articulated HGVs which have been subject to the most significant changes in weight and size limits. These are also the vehicles most associated with environmental damage and road infrastructure costs, and the ones in direct competition with other bulk freight modes such as rail and coastal shipping.

2 The impact of previous increases in size and weight

Key changes since 1983

Prior to earlier increases in size and weight, there has always been a discussion of whether this would produce economic and environmental benefits. The increases have been focussed on one particular type of HGVs - articulated lorries with more than 4 axles. This section looks at the patterns of articulated HGV (artic) use across a number of changes from 1983 to 2002. The key changes are set out below.

Table 1

Key changes in maximum size and weight for articulated HGVs with 4 axles or more

1983	Gross weight up to 38 tonnes (on 5 axles or more) Previously 32.5 tonnes
1990	Length up from 15.5 metres to 16.5 metres
1996	Width up from 2.5 to 2.55 metres
1999	Gross weight up from 38 tonnes on 5 axles to 40 tonnes from 38 tonnes to 41 tonnes on 6 axles
2001	Gross weight up from 41 tonnes on 6 axles to 44 tonnes, including drawbar trailers

In summary, from 1983 to 2002, payload volume increased by 10 to 12%, maximum payload weight by about 45%. Clearly the precise amount depends on the type of vehicle cab and specialist equipment.

Apart from the width increase, all of these represent major change and in some cases existing vehicles were capable of carrying the new weights and could be uprated almost immediately.

The objective for the next section of this study was to find evidence of a direct impact in terms of reduced vehicle use or ownership. This involved three key indicators.

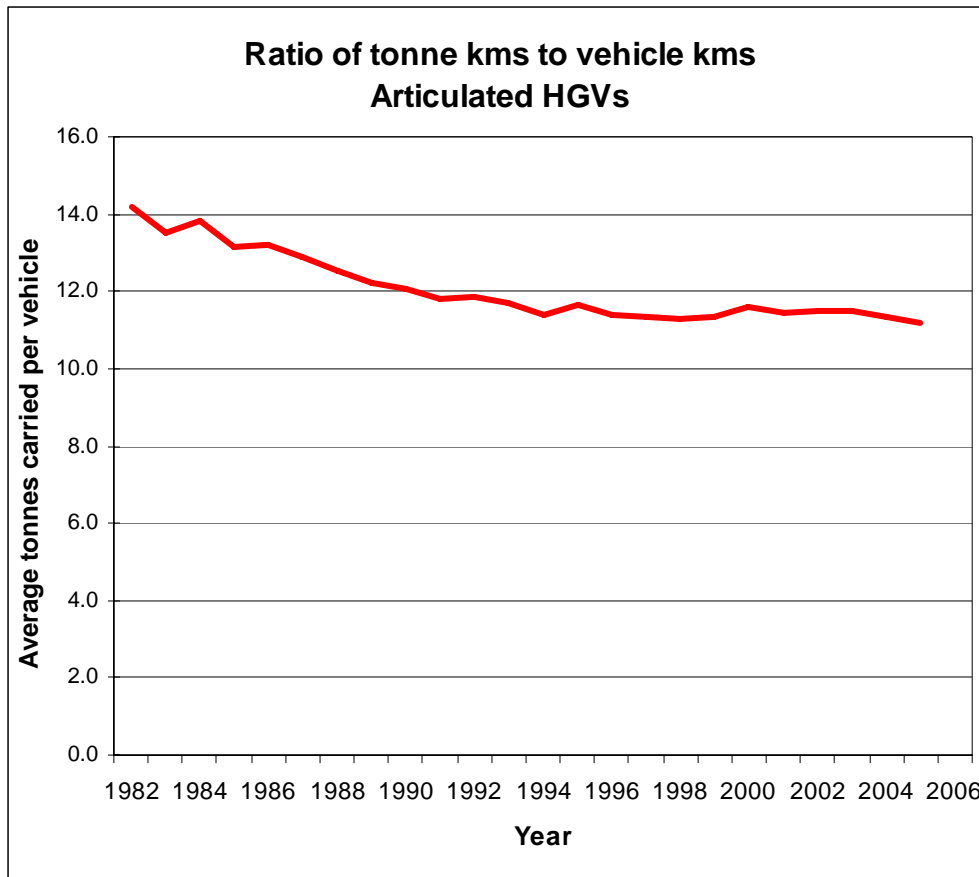
Indicator 1: average payload

The first measure considered is how much freight (in terms of tonnes) the average artic carries. This is simply calculated from CSRGT by dividing the survey tonne kilometres by the survey vehicle kilometres. If the increased limits had an impact, this should show up as an increase in the average payload in the following years. The exercise was undertaken for the type of vehicles which were subject to the increases: artics with a gross permitted weight of 33 tonnes or more.

In fact the average payload has fallen considerably since 1983, with very little evidence of even short term increases. Since 1995 there has been relative

stability, although weight limits have increased twice, allowing an extra 6.5 to 7 tonnes payload on 6 axles. This is shown in Figure 2 below.

Figure 2



*Source: CSRG T 1990, 1995 and 2006
For details on sources see Section 4*

The above is a very surprising result because, if industry predictions of improved efficiency were correct, significant long term increases should have resulted from the increase in gross permitted weight. It may seem common sense that when articulated lorries become larger and heavier, they should carry heavier payloads. Before discussing why this has not happened, the reason for expecting increases can be explored in more detail as follows.

Considering the 1999 increase, the case was put that there were many loads which could not be carried because they would cause the permitted weight to be exceeded. In its consultation document^{viii} the DfT assumed this figure as 50%. This should lead to a reduction of 6,500 artics needed and 490 million vehicle miles travelled on 1995 levels. When weight limits are raised, many of the weight constrained loads can be carried, although perhaps not up to the maximum weight. Assuming that half the payload increase can be used, this would mean an increase in average payload of 1.25 tonnes. Even after allowing for the fact that not all artics are at the maximum weight, there should still be some significant change. It should be noted that the average payload

calculated from CSRGT should increase independently of any general rise or fall in the amount of goods carried.

This analysis is based on weight increases, but there is considerable interest in the road freight sector over low density goods which may fill a vehicle before its maximum weight is reached. This is often referred to as volume constraint or “cubing out”. This effect has been discussed at least as far back as the 1980s. Direct and robust evidence on the extent of this problem and how it has changed over time is not available, but there are two important indicators as to its extent.

Can “cubing out” explain falling payloads

The first is that there are vehicle options which would allow a far greater volume for the same gross weight. The first of these is draw bar trailers, which can carry up to 44 tonnes. These can be 18 metres long and are articulated in the middle of the vehicle rather than just behind the driver’s cab. Demand for such vehicles has been extremely low throughout the period studied here. They are not suitable for container traffic, but otherwise can utilise swap bodies offering similar flexibility to the trailers used by traditional artics. In addition, lighter artics on 4 axles could be used to give a much higher volume to weight ratio. They would be cheaper to operate and produce less CO₂. However, this category of vehicle has in fact declined in number very significantly, from 42 thousand in 1990 to 16 thousand in 2005^{ix}.

There is one other factor which complicates the issue – the use of “double decking”. This addresses the problem of goods on pallets not reaching the full height of the load area. This means that goods are constrained by the floor area rather than volume. Creating a second floor in the trailer allows better utilisation. However, if this were widespread, the average payload should have risen rather than fallen.

The second reason for believing that volume constraint is not the only answer to the falling payloads is the increase in dimensions in 1990. This was very significant at about 8 to 10%. If volume was a problem this would have had a major impact and should have allowed average payloads to rise, at least in the short term. This simply did not happen. The most significant rise in payload (still small) occurred after the 2% increase in width in 1996 and lasted one year.

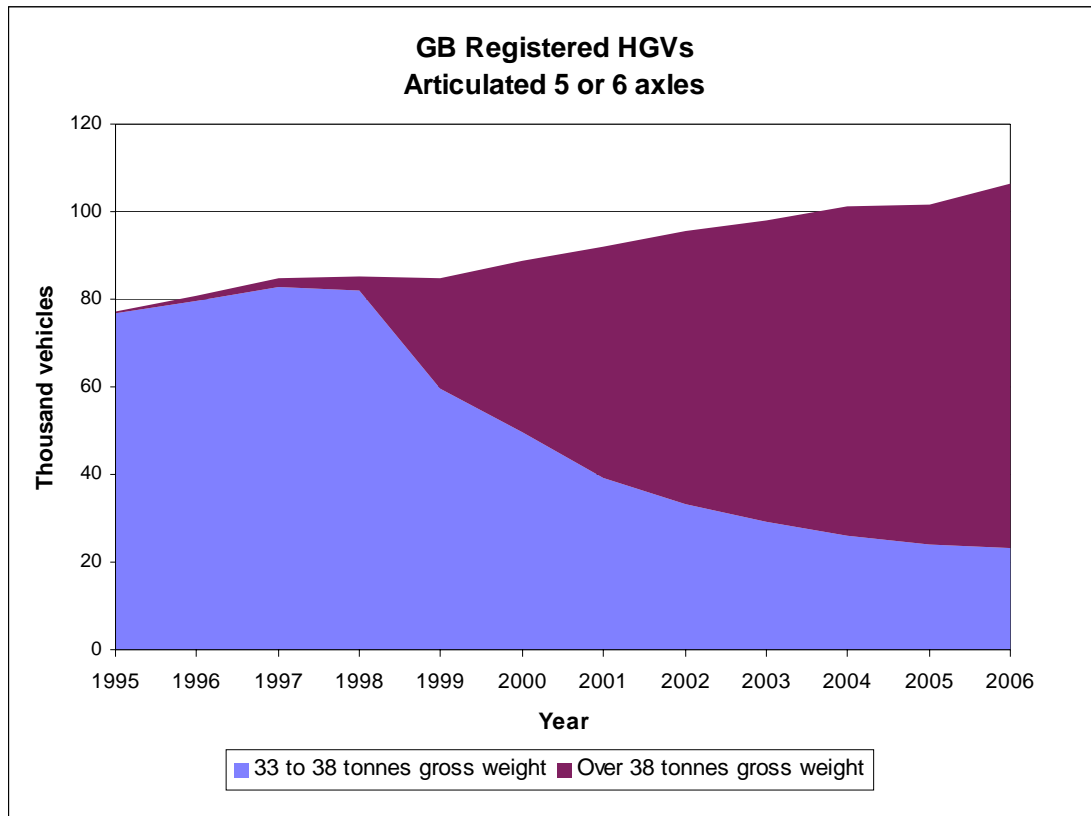
A limited question has been asked on how far vehicles are full in CSRGT from 1998. Unfortunately the data from CSRGT in this area is variable and there are issues about multiple deliveries reducing average payloads. This is in itself strongly related to having vehicles which are over capacity.

Can a fall in payloads be caused by over capacity?

There is however, an alternative explanation as to why average payload should fall. The great majority of road freight in artics (73.6%) is carried by public hauliers, and they will tend to purchase the heaviest vehicles, so that

they can carry the heaviest load they are ever asked to. However, most loads are determined by businesses who produce goods in a similar way for their customers before and after changes to the size and weight of HGVs. The actual pattern of deliveries doesn't change very much (although low transport costs may lead to fewer depots, resulting in longer distances). Evidence showing the bunching of vehicle ownership in the heaviest category is shown in Figure 3.

Figure 3



Source: Transport Statistics Great Britain (TSGB)

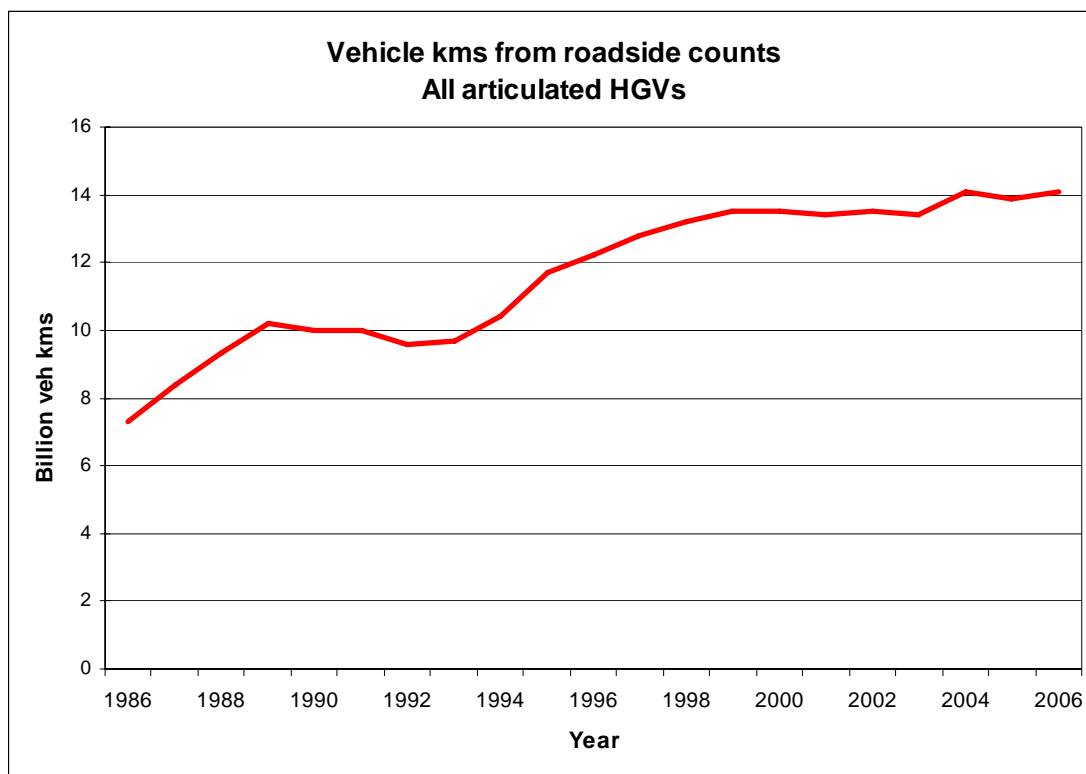
Thus hauliers have to carry similar loads but in heavier vehicles. These will also use more fuel than smaller vehicles, and this is explored in Section 3. The lack of impact on average payloads is entirely consistent with this explanation. This also explains the lack of any impact on the overall level of vehicle traffic, which is the next indicator.

Indicator 2: Articulated HGV traffic

According to the national traffic surveys, traffic from all articulated vehicles (registered in GB or elsewhere) has doubled between 1985 and 2005. There was a dip from 1990 to 1993 due to the recession, and a stabilisation after 1999. In 2004 the figures rose significantly, but in 2005 appear to have fallen slightly.

The summary of this is set out below in Figure 4. Overall, vehicle kilometres appear to rise and fall independently from changes in weight and dimensions. Factors such as GDP, logistical patterns (such as centralisation of depots), fuel price, and the cost of alternatives will all have some influence.

Figure 4



Source: TSGB, 1996 and 2006 editions

Indicator 3: Vehicles registered

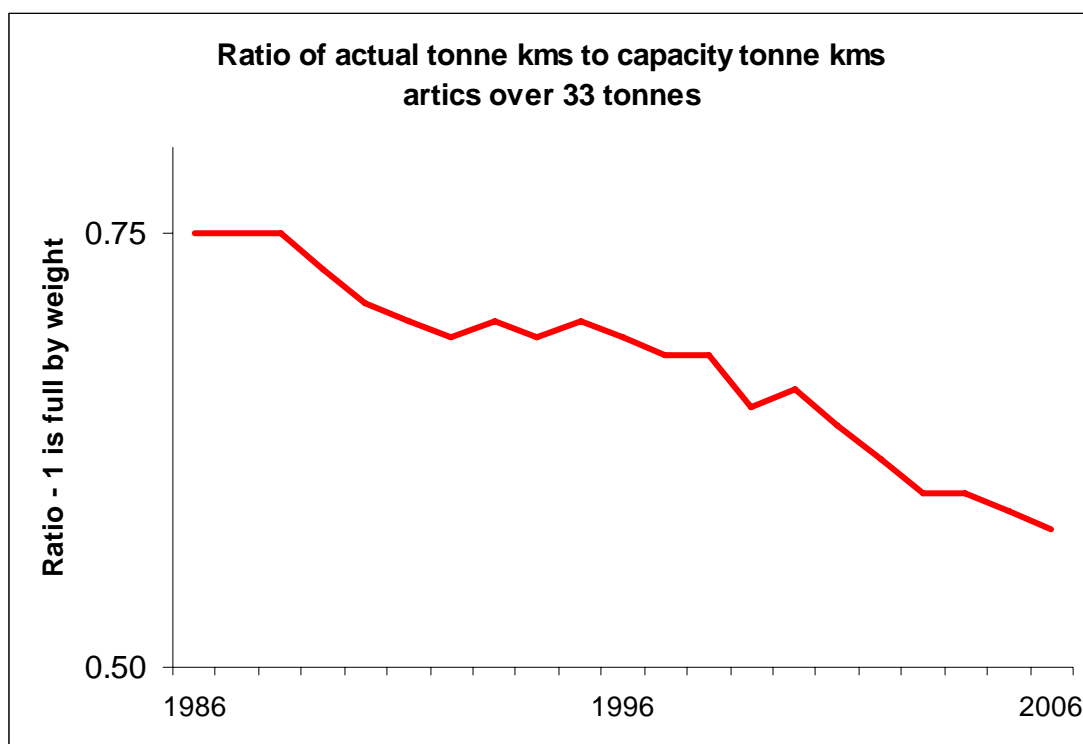
The last indicator set out here is the number of vehicles owned by GB operators. This provides a snapshot of the vehicle fleet and is another indicator frequently used when predicting the effect of increasing limits. For example, in relation to raising limits to 40 and 44 tonnes, the DfT predicted that a saving of “some 6,500 lorries would be achieved, perhaps over a period of over 4-5 years”. The limits were raised in two stages in 1999 and 2001 and there is no clear evidence of a reduction. This is shown in Figure 2 above and Figure 6 at the end of this section. The DfT did consider that a reduction in cost “may have some generating effect” but thought this “unlikely to be significant”^{viii}. In fact, between 1983 (when first introduced) the number of artics over 33 tonnes has grown in every year except 1991.

It should be noted that there were other arguments in the document, relating to reducing road damage and pollution through specifying axle numbers and type, which led to the approval of heavier vehicles.

Going back to earlier increases, the Government appointed Armitage Inquiry into heavy lorries, reporting in 1980^x, quoted TRL work to estimate a reduction of 10,100 in the number of artics with 4 or more axles – about 13%. It also stated that the total capacity of the fleet would decrease slightly if tonnes stayed the same.

There is no evidence that the reduction in numbers occurred but there is some evidence that the capacity of the fleet has grown faster than the amount of freight transport actually carried or the weight of goods transported. This is referred to as the “average lading factor” shown in Figure 5.

Figure 5



Source: CSRG T 1995, 2005 and 2006

The Armitage Report is also interesting because it was the largest UK inquiry into the issue of raising lorry weights, not only in the context of EU proposals but also in relation to environmental controls. Several of its key environmental recommendations, on which the conclusion that limits should be raised was based, were either ignored or have had their “final limit” breached. For example, the public was to be reassured that, after this set of increases, the matter would be settled. In paragraph 311 the report states,

“Implementation of the proposals we have made on dimensions would remove the threat of ever bigger lorries and the sense of visual intrusion which they bring.”

The Armitage maximum length of 15.5 metres was exceeded in 1990.

Conclusions on indicators

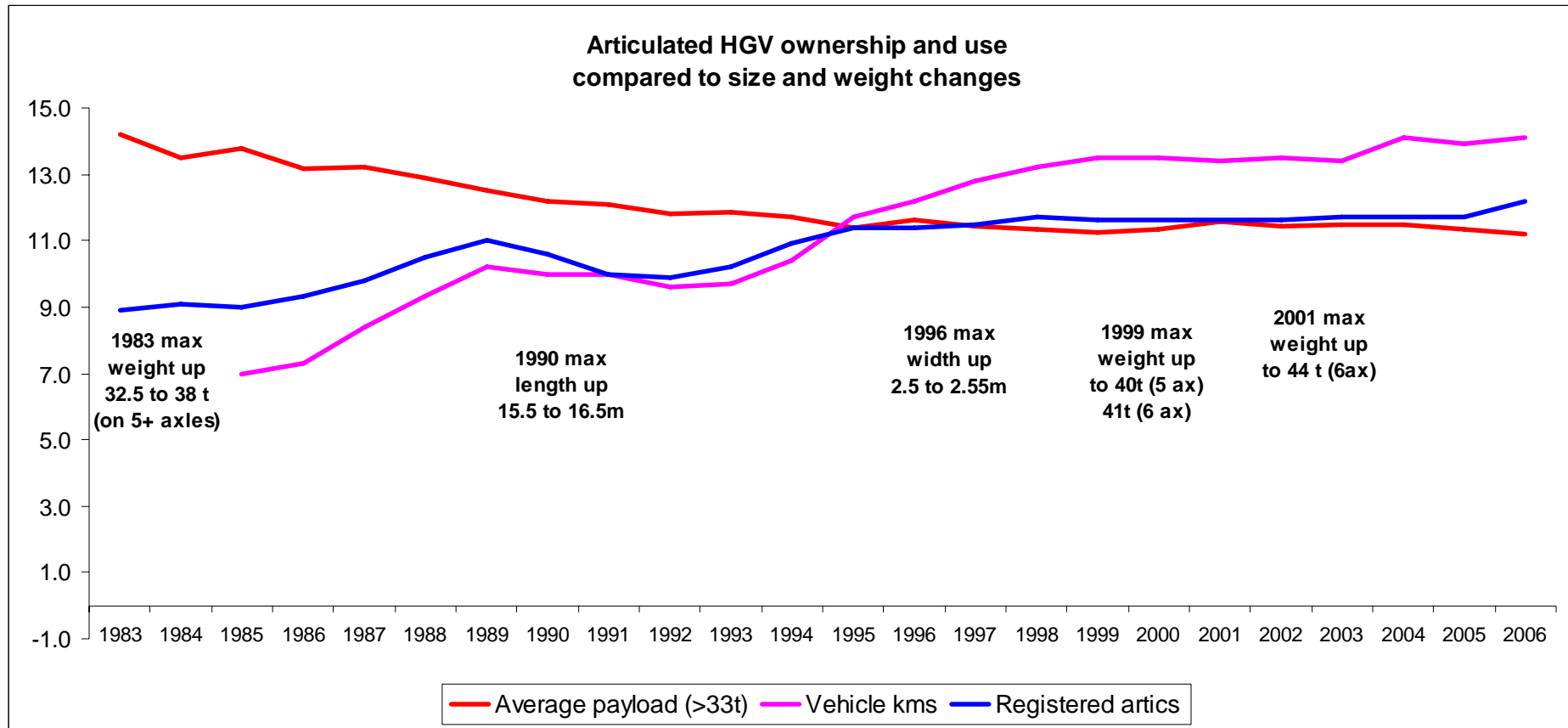
Despite some statistical limitations, there appears to be no direct evidence that the predicted benefits from heavier and larger lorries have materialised. The precise reasons for this need further research, but the hypothesis that hauliers always “buy the biggest” is borne out in the registration statistics, and helps to explain the lack of any discernible efficiency improvements. This is not to say that some individual operations, focussing on a continuous stream of bulk goods from one place to one other place, have not benefited from heavier and larger lorries. Nevertheless, the overall picture is surprisingly blank in terms of identifying benefits from previous change in the size and weight of HGVs.

A chart showing some key indicators and the most significant changes to HGV limits is shown as Figure 6.

While it could be argued that changes in size and weight may slow down growth rather than reverse it, the impact of some changes should have shown up, particularly in the years immediately following. Figure 3 showed the very rapid increase in fleet carrying capacity. Any such effect would be increased because the first users of heavier vehicles should be those who stood to gain most.

This report does not focus on mode split in any detail, but the loads which benefit most from increased weights and size are precisely of the type that rail and water were competing for. In the context of rising fuel prices, the competitive edge for such traffic might move in favour of the low carbon modes. Fuel used and the consequent greenhouse gas emissions from the heaviest lorries are considered in the following section.

Figure 6



3 Emissions from heavy goods vehicles

Figures have been published for emissions and how they change in preparation for an assessment against 1990 levels (the common base for progress on greenhouse gas targets). Targeted reductions for the UK as a whole have now been included in the draft Climate Change Bill ^{xi}.

It is now widely agreed that earlier Office of National Statistics (ONS) data for HGV emissions, while prepared in line with international guidelines, was incomplete. This is because it omitted the significant number of HGVs operated by businesses for their own purposes (called “own account”). Instead it analysed data from hauliers who are open to all customers (“public haulage”). In the international guidelines, emissions from own account operation are included in the totals for the individual industries they serve. The sector “road transport industry” is based on public haulage.

It is sometimes claimed that the latter increased faster than own account operation and thus the increases were exaggerated. In fact, this effect has largely reversed so that the balance of vehicle kilometres (the best measure for emissions) between the two types of operation in 2005 was very close to that in 1990, in fact slightly lower for artics. This is shown in Table 2 below.

Table 2
Percent of vehicle kilometres by public hauliers

	Public haulage	
	Percent of total	
	All HGV	All Artics
1990	55.7%	75.8%
1995	58.4%	76.9%
2005	55.8%	73.6%

Source: CSRGT 1990, 1995, 2005

ONS have already published revisions to their original figures to allow for omissions and corrections and DEFRA has used these in its latest sustainable indicators reports. They are lower than the original ONS, but there has been some criticism that even these estimates of increasing emissions are still too high. One approach is to use the average fuel consumption figures from CSRGT and apply these to traffic survey data from TSGB. One problem with this is the change in survey structure for 2004. There is clearly a step change improvement in 2004 which is unlike earlier years. There is also the issue of CSRGT under reporting distances. This means that mixing CSRGT with TSGB will create some uncertainty even for 1990 to 2003, and does not appear to be advisable from 2004 onwards. This point is illustrated by comparing industry averages with the CSRGT results for 2003-5 in Table 3 below. In 2004, small rigid vehicles seem to become much less fuel efficient, then recover the following year, while artics and larger rigid HGVs become

more efficient. This is despite a move to heavier articulated vehicles, which consume more fuel (see Table 4).

Table 3
Average fuel consumption from CSRGT and RHA

	3.5 - 7.5t rigid	All Rigid	All Artics
2003	12.4	7.8	7.5
2004	10.9	8.3	7.9
2005	13.2	8.3	8.1
RHA	18 - 27		7.2 – 9.0

Source: CSRGT 2005, RHA

It is also true that figures which look at all HGVs over 3.5 tonnes tend to conceal the real trends in what most people consider to be heavy lorry use (for example articulated vehicles with more than 3 axles). At the opposite end of the spectrum, any move from using the lightest HGVs (3.5 to 7.5 tonnes) into using the far less regulated large van sector must be recognised in a meaningful analysis.

The reason for the move out of the 3.5 to 7.5 tonne range is that these are subject to stricter regulation and require operator licences. This is also the break point for much EU regulation for vehicle standards and working practices. This may help to explain the lack of growth in the 3.5 to 7.5 sector and the strong increase in the van sector. Despite a van survey in 2003 there is still little information comparable to the annual CSRGT. This creates problems for analysts at the lighter end of the HGV sector.

Fortunately this report is focussing on the heaviest articulated vehicles, where most change in size and weight has occurred. As mentioned above, there seem to be problems here, due to the change in CSRGT survey structure in 2004. Disaggregated data may address this problem, but industry estimates of fuel consumption for “typical” vehicles in different weight categories can also be obtained. The RHA estimates for the heaviest artics are set out in Table 4 below.

Table 4
Average fuel consumption by vehicle weight

Weight	Axles	Configuration	MPG
44t	6	3 tractor + 3 trailer	7.2
41t	6	3 tractor + 3 trailer	7.5
40t	5	2 tractor + 3 trailer	7.8
38t	5	2 tractor + 3 trailer	8
32/33	4	2 tractor + 2 trailer	9

Source RHA

The above table shows a significant increase in fuel consumed as maximum permitted weight increases, as would be expected given the requirements for extra axles, larger engines, and more powerful brakes.

Mode split and traffic generation

In relation to HGV traffic and thus to emissions there is one other important factor. The overall quantity of traffic will be influenced by any change in cost. For example, cost decreases can cause:

- mode transfer: attracting goods travelling within the UK which would otherwise use rail or water;
- different choice of port: loading imported or exported goods at a port which decreases travel by sea but increases travel by road (this includes the use of RO-RO);
- the creation of extra HGV traffic through longer journeys, for example through more centralised distribution systems and business using more distant suppliers;
- extra HGV tonnes and tonne kilometres by handling goods more frequently (for example each time they pass through a depot they add to the national tonnes figure).

The overall effect, or the different individual responses, can be expressed as an elasticity. Thus an overall value of 0.9 for HGV vehicle kilometres would mean that if costs fell by 10%, there would be an increase of 9% in HGV traffic. This could be composed of all three elements listed above. It is also true that short run elasticities are low, while in the long term more substantial change takes place.

In the UK, the traditional value has been 0.1, although it is not clear whether this only refers to the third bullet above, and whether it represents a low, short term elasticity. The DfT's most recent publication on elasticitiesⁱⁱⁱ notes the variability of freight, but also points to an average value, across a wide range of studies, of 1.07. This includes all the factors influencing HGV use. Recent European studies back values below 1 but approaching it and suggest that vehicle kilometres are more sensitive than tonnes.

While further research is needed, the use of 0.1 in the UK does not appear to be reasonable as an overall long term elasticity. It may represent an immediate reaction to cost changes, where choice of suppliers, depot or mode are very limited. As contracts are renewed, or logistics systems reviewed, a wide range of options open up. Especially when freight transfers from rail and water are included, it should be very much higher.

It should be noted that when vehicle weights were last increased (2001), transfer from rail was felt to be so serious that a halving of rail track access charges (**TACs**) for freight operators was introduced in the same year^{xii}. While this was a sensible precaution, it does make it very difficult to assess the sensitivity of mode choice to the cost of road freight. These access

charges are currently being reviewed^{xiii}. One issue should be how much further they could be reduced to avoid the climate change costs of HGV use.

Rail emissions

The question of transfer to rail (or shipping) raises the issue of how much CO₂ rail freight produces. It is important to recognise that problems with current estimates of CO₂ emissions are not confined to road freight. The current UK greenhouse gas inventory is based on fuel use assumptions which do not appear to have undergone major revision since the early 1990s. They probably do not reflect current locomotive efficiency, particularly diesels. Changes in working practices to reduce fuel used (such as idling) have also contributed.

A wide range of European studies suggest lower emissions, around 30 gms of CO₂ per tonne kilometre rather than the current UK 49gms. The latest report from CfIT^{xiv} supports an even lower figure of around 20 gms. Using these more recent emission levels would lead to reductions in the UK inventory figure of between 30% and 70%. Overall this means that rail carries about 8% of all freight traffic, producing about 1% of CO₂ emissions.

One problem is the widespread use of average CO₂ per tonne kilometre. This is a one step removed measure and it would be preferable to use the actual amount of fuel used. Train kilometres could be also misleading since there are wide differences in fuel consumed according to number of wagons, weight of goods and type of locomotive. If the tonne kilometre average is still to be the basis, further direct research is needed, although EWS has supplied some data to CfIT for their report. While further research is needed, the uncertainty is not whether rail is more efficient than road, but by how much. The commonly used approximation that rail is 10 times more efficient than road appears reasonable.

One relevant question here is how far rail and water can be expected to capture goods traffic and whether this would make a significant difference. There remain uncertainties over handling levels and emissions from handling. However, a significant increase in rail and water, and a change in port usage^{xv xvi}, could reduce road vehicle kilometres by 15%, roughly where they were in 1995. This could reduce overall freight CO₂ emissions by about 12%.

Measures to reduce the amount of HGV traffic per unit of GDP (reducing transport intensity in road freight) could contribute a further 8% reduction in CO₂ and improvements in HGV fuel efficiency of 10% could contribute a further 8% reduction. Both figures are compared to emissions today (2005). The basis for these indicative conclusions are shown below in Table 5.

Clearly they need to be further refined, but are in line with Government targets for rail freight (80% increase on 2000 levels by 2010^{xvii}).

Table 5
Feasible levels of reduction in GB freight kilometres

Current

Total freight CO2		33.2	
<i>Of which:</i>			
HGV CO2	28.6		(Source: DEFRA)
Rail	0.4		(Source: CfIT/DEFRA)
Water	4.2		(Source: DEFRA)

15% reduction in HGV vehicle kilometres through mode transfer

HGV CO2	24.3		
Rail	0.4		
Water	4.2		
Replacement kms	0.4		
Revised freight total		29.3	(88% of 2005)

10% reduction in transport intensity (especially logistics)

Revised freight total		26.9	(81% of 2005)
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10% improvement in HGV fuel efficiency

Revised freight total		24.2	(73% of 2005)
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Please note the sequence influences the absolute values of individual elements but not the overall impact. The sequencing is to avoid double counting.

Conclusions on emissions

The assumptions used above represent reasonable aspirations over a ten to fifteen year period. They illustrate the importance of a combined approach, incorporating mode transfer, vehicle fuel consumption and reductions in vehicle kilometres. The latter could be through improved utilisation or changes in distribution systems which reduce distance travelled.

Annex

Data sources for this analysis

There are several sources for data on road freight patterns. Three which are used in this report are the Continuing Survey of Goods by Road (CSRGT), national vehicle registration data, and the roadside surveys conducted to produce national traffic figures - Transport Statistics Great Britain (TSGB).

CSRGT is a useful source of data on loads and distance travelled by different types of HGV. It does not include foreign registered vehicles. It is undertaken annually, in a rolling weekly programme. It covers the period considered here, going back beyond the significant increase in vehicle weights in 1983 (from 32.5 to 38 tonnes gross vehicle weight). From 1989 it also collected information on fuel consumption. The survey was revised for 2004 to ensure it fully covered all categories of HGVs and thus results are not strictly comparable with earlier years. The figures for fuel consumption in that year appear to have changed more than expected and are out of line with other industry estimates. It is accepted that using CSRGT also underestimates the overall level of HGV use. One obvious reason is that foreign vehicles are not included, but there is also believed to be under reporting of vehicle activity in the survey itself.

As well as CSRGT, DEFRA have their own DTI sources for fuel efficiency, as does the industry (in this case we have drawn on the Road Haulage Association (RHA) figures).

For this report, changes over time for average distances and amount of goods carried are considered very reliable for relative changes in the pattern of GB operations. They do not provide reliable absolute figures and need to be supplemented by the roadside traffic counts and by surveys on foreign vehicles. Of course, roadside surveys are also based on a sample, however they produce significantly higher figures for HGV use. The final source which can be used is vehicle registration data. This gives no information on HGV use, but does not rely on sampling.

Thus it is the case that it is difficult to merge the surveys to produce absolute results. It is however, possible to assess some changes over time using CSRGT and other data, at least until 2003. These results still allow reasonable conclusions to be drawn about the importance of HGV traffic for climate change and trends in their pattern of use following previous increases in size and weight.

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- ^{xv} For example see the predicted reductions in: Foresight - Intelligent Transport Systems – Port Traffic Modelling, MDS Transmodal, DfT, 2005
http://www.foresight.gov.uk/Previous_Projects/Intelligent_Infrastructure_Systems/Reports_and_Publications/Intelligent_Infrastructure_Futures/Ports_traffic_modelling.pdf
- ^{xvi} Railfreight: delivering on growth, CfIT, 2002, Section 5
<http://www.cfit.gov.uk/docs/2002/railfreight/railfreight/05.htm>
- ^{xvii} Transport 10 Year Plan, DfT, 2000, Annex 2, Targets
<http://www.dft.gov.uk/about/strategy/whitepapers/previous/transporttenyearplan2000?page=16#a1050>