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Understanding vehicle lifetime mileage and its impacts on the cost-effectiveness of light-duty vehicle CO_2 Regulations

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Background to project

- European regulations have historically revolved around test cycle based metrics of CO_2 performance (i.e. grams CO_2 per kilometre travelled).

- Distance travelled is an important element in determining the cost effectiveness of the Regulations

- It may be more cost effective to apply different targets to vehicles that are used more intensively (i.e. those with high lifetime mileage) to those used less frequently.

Study aims and objectives

1. Obtain a detailed understanding of data availability on
   - Vehicle size (mass and footprint)
   - Lifetime vehicle mileage
   - Mileage accumulation over time

2. Gather real-world data for the above parameters and perform detailed analysis to examine linkages between mileage and mass/footprint

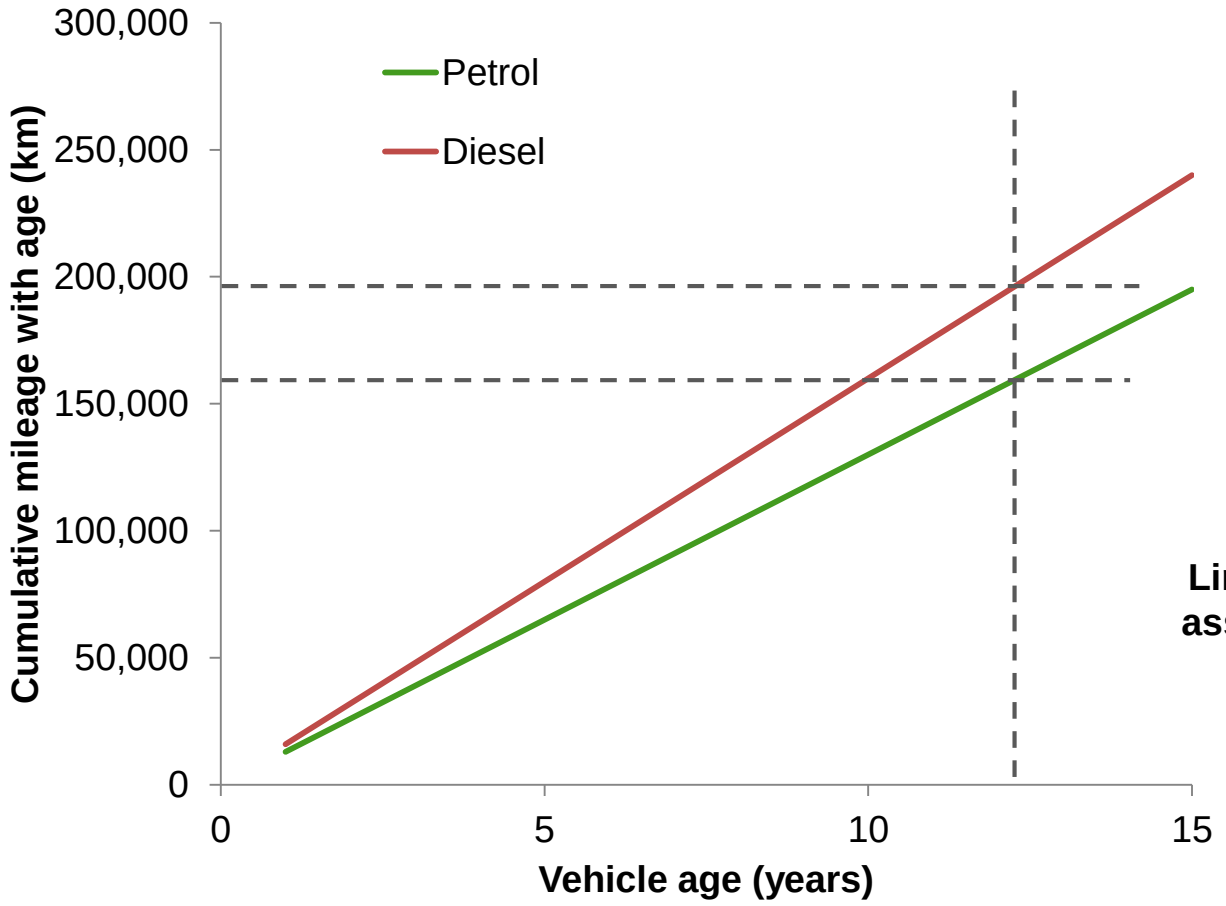
3. Carry out further analysis to investigate the potential cost implications of using lifetime mileage as a cost optimising method for target setting for different vehicle segments

N.B Official mileage datasets were obtained from UK, France and Belgium to use within this study

Current assumptions used in regulatory analysis

- The previous approach used for cost effectiveness analysis of the car and van CO_2 Regulations assumes that all **petrol cars** drive **14,000km per year** for 13 years (lifetime mileage of 182,000 km) and all **diesel cars** drive **16,000km per year** for 13 years (lifetime mileage of 208,000 km).

- **LCVs** were assumed to drive **235,000 km over their lifetimes**



Linear approach to cumulative mileage assumed for the purposes of regulatory analysis

Results of analysis of periodic technical inspection data

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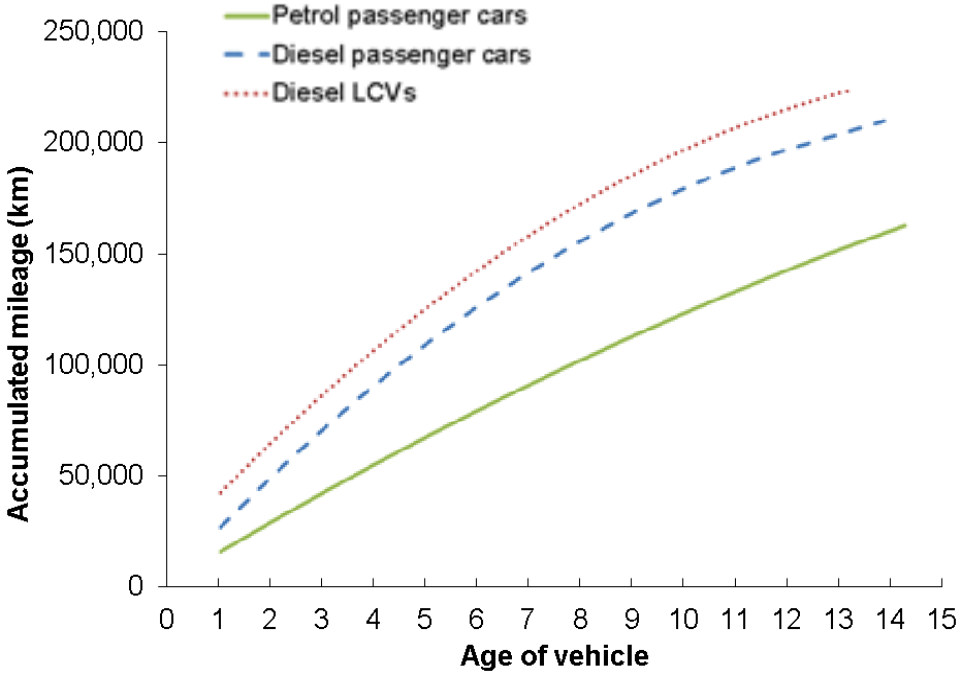
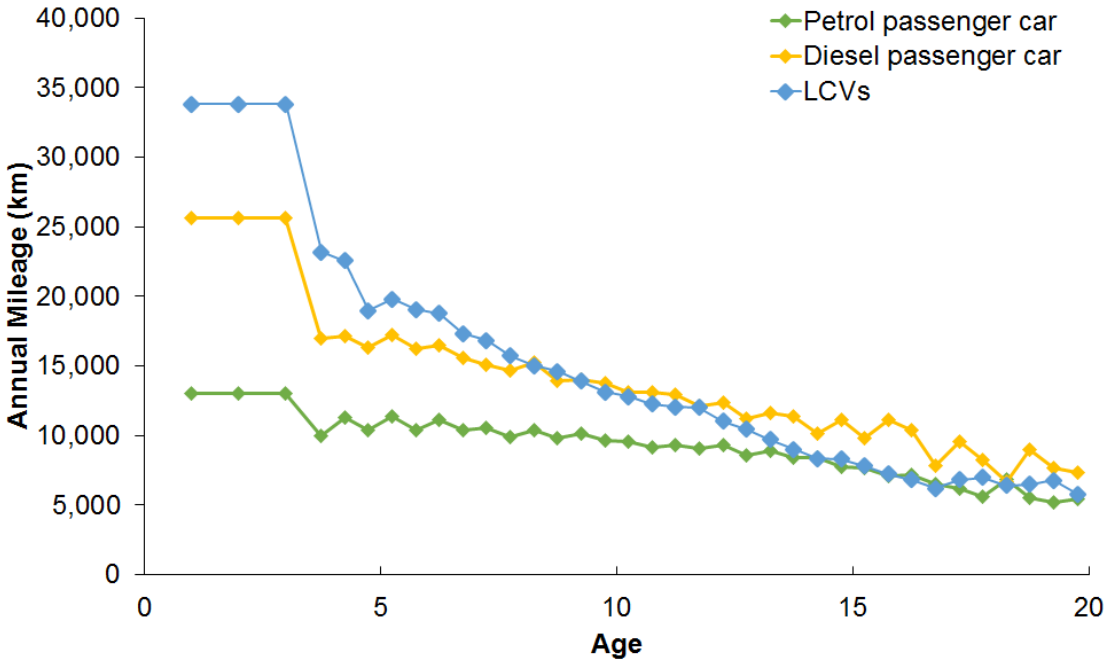
- Mileage records from periodic technical inspection databases indicate that **vehicles are driven more intensively early in their lives** (particularly diesel cars and LCVs).
- **Average lifetime has been increasing since 2006** and is currently 14.5 years for petrol cars; 14.1 years for diesel cars; and 13.5 years for LCVs
- Average lifetime mileages are 162,000 km for petrol cars, 211,000 km for diesel cars and 220,000 km for LCVs
- Key, in terms of cost effectiveness, it is observed that;
  - **In their first 3 years, LCVs accumulate over 45% of their lifetime mileage**
  - **For diesel cars this figure is over 35% and petrol cars is around 25%.**





Analysis of whether lifetime mileage varies with vehicle mass

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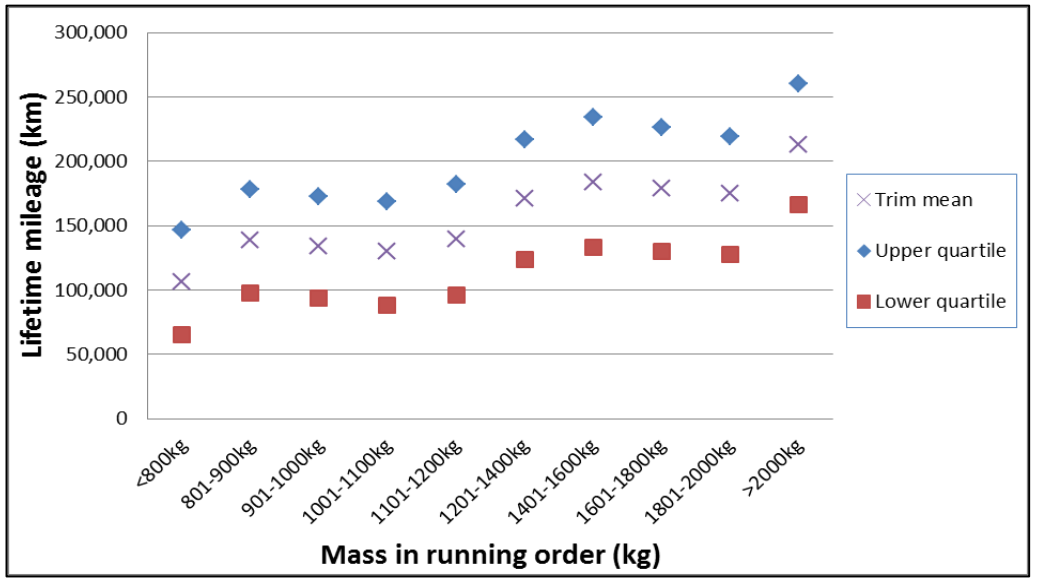
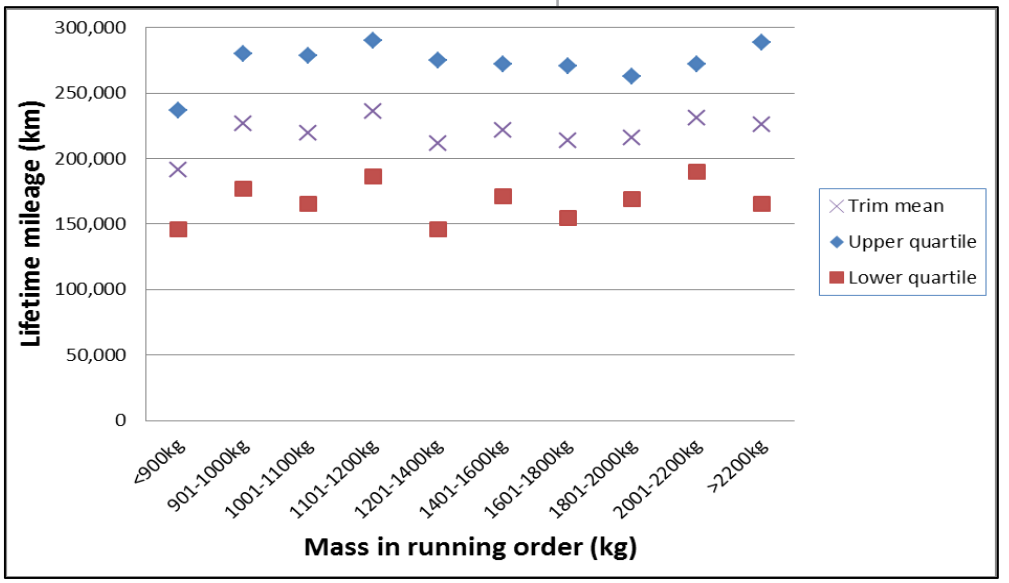
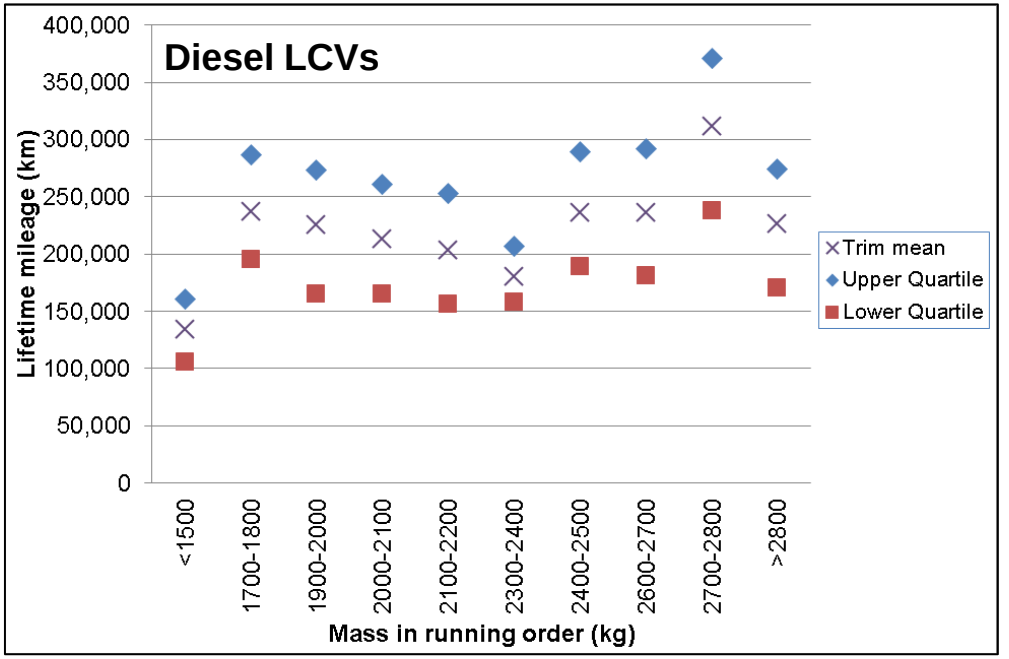
Petrol passenger cars



Diesel passenger cars



- Results indicate that lifetime mileage increases with mass for petrol cars
- Lightest petrol cars **(<800 kg)** have average lifetime mileage of **109,000 km**
- Heaviest petrol cars **(>2,000 kg)** have average lifetime mileage of **212,000 km**
- No clear relationship between mass and mileage for diesel cars or LCVs



Assessment of cost reduction of applying mileage weighting factors to the regulations

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Four step process

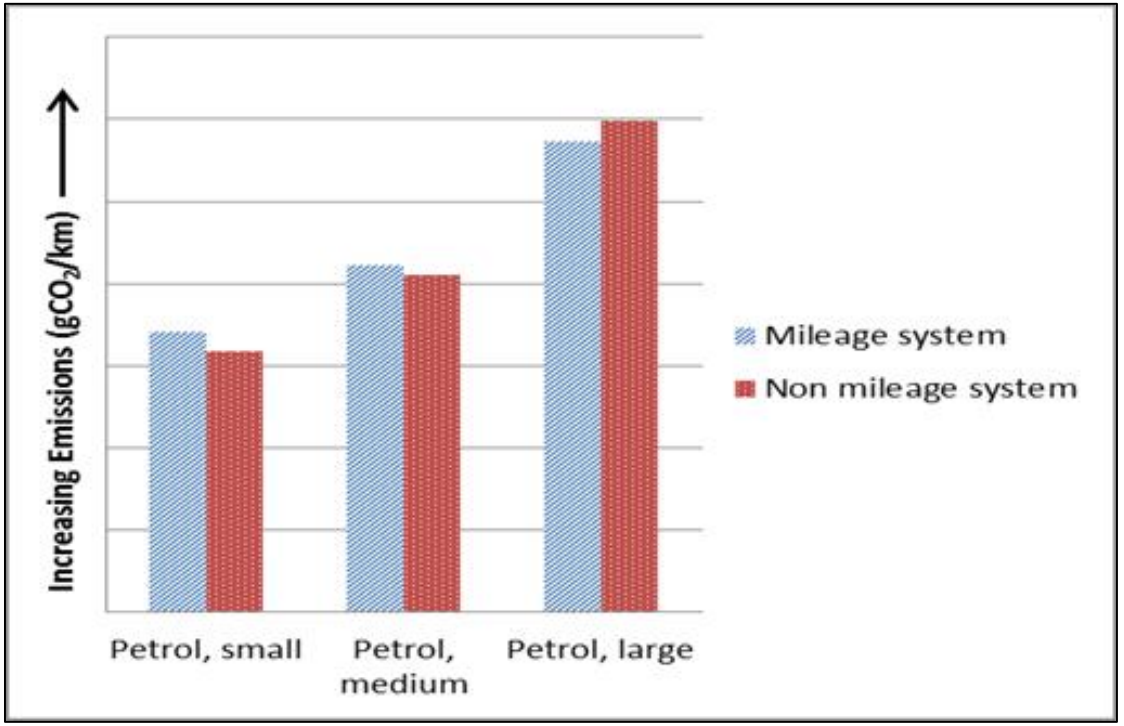
1. Calculate cost and effort to target data per manufacturer under a non mileage weighting system using cost curve model and cost optimisation techniques

2. Assign every vehicle in the CO_2 database an average lifetime mileage value and therefore calculate a sales AND mileage weighted average for each manufacturer.

3. The calculated effort in a non-mileage system and our lifetime mileage data results in a maximum amount of CO_2 emissions per manufacturer in grams per year to achieve their target.

4. Under a mileage-weighted target system, every manufacturer would be obliged to reduce a certain amount of total lifetime CO_2 emissions, the distribution of this reduction over the segments can be determined by the manufacturer in such a way that, in theory, the costs will be reduced in relation to a non-mileage weighted system.

Emissions targets for different vehicle types under (a) mileage-weighted and (b) existing system



Impacts of mileage-weighing on costs to meet targets

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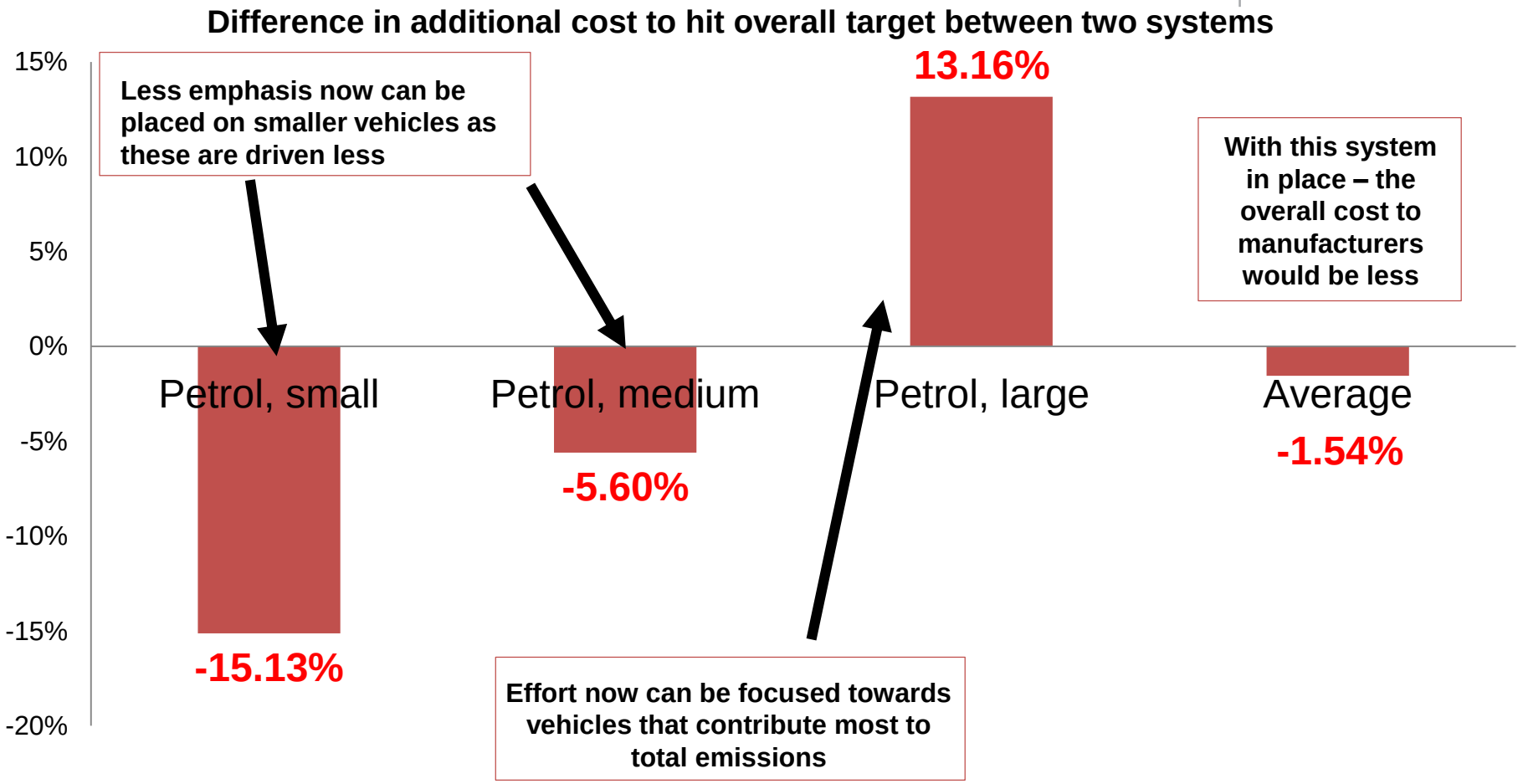

- Under a mileage based system, manufacturers are able to re-focus their efforts on vehicle segments that are responsible for the most CO_2 emissions

- Overall this reduces the costs for compliance by around 1.5% for vehicle manufacturers (analysed using both mass and footprint as utility parameter)

Effect of mileage weighting on total cost of ownership

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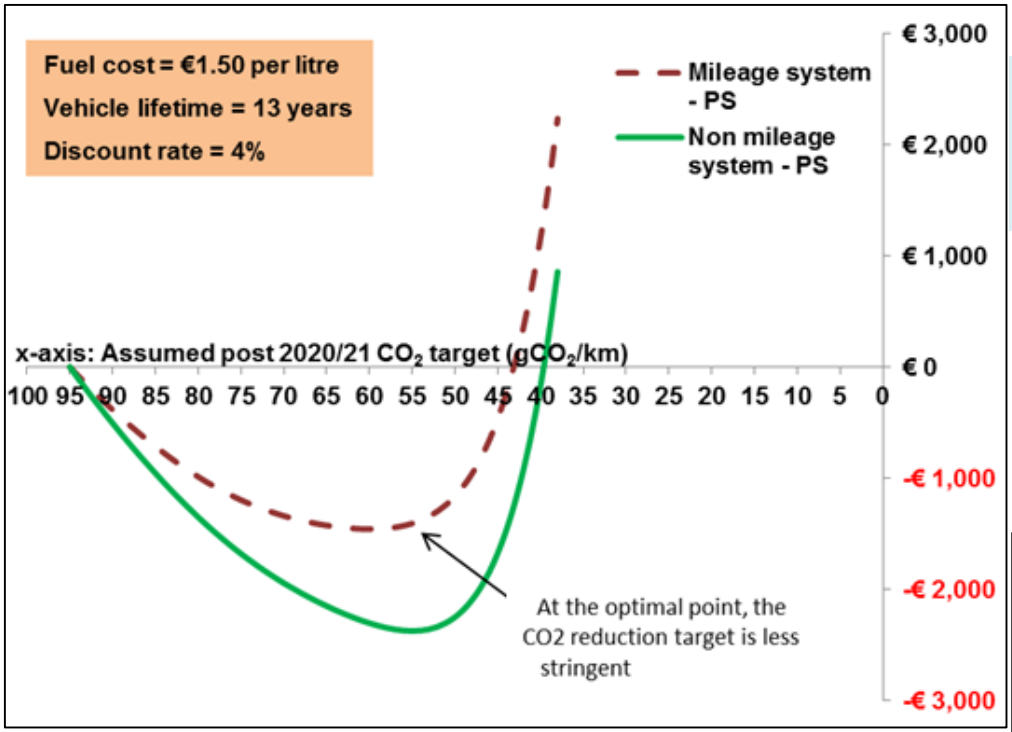
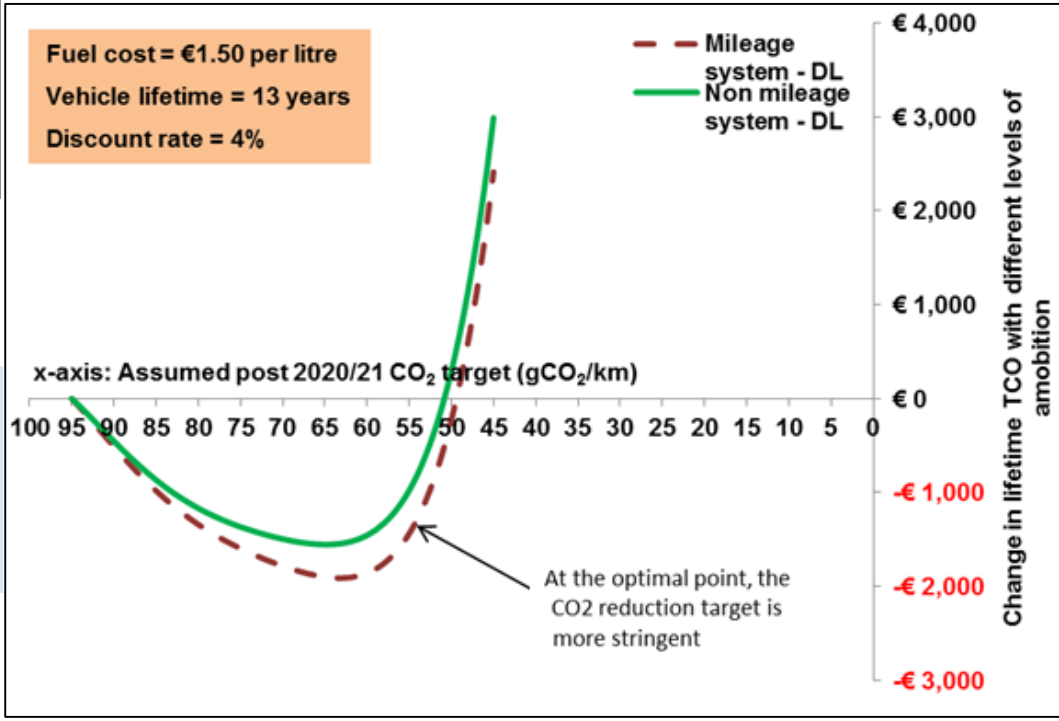


For **small petrol cars**, the optimum target CO_2 reduction level would be slightly higher (less stringent by 5 gCO_2/km) for these vehicles.

- For **large diesel cars**, the optimum target CO_2 reduction level would be slightly lower (more stringent by 2 gCO_2/km) for these vehicles.



Summary

- This study has improved our understanding of vehicle mileage and lifetime age characteristics
- Actual average lifetime ages for petrol cars, diesel cars and LCVs are higher than previously assumed
- Actual average lifetime mileage for petrol cars is significantly lower than previously assumed, whilst for diesel cars, the actual average mileage of 211,000 km is close to the assumption used to date
- For LCVs, the actual average mileage of 220,000 km is also lower than the assumption used to date
- Lifetime mileage appears to be correlated with vehicle mass for petrol cars; as mass increases, so does lifetime mileage
- No clear link between mass and lifetime mileage for diesel cars or LCVs
- A mileage-weighting function could be introduced to the Regulations to apply more stringent targets to vehicle types that have higher lifetime mileages
- Such an approach could reduce the costs of complying with the Regulations for manufacturers

QUESTIONS?

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