

TECHNICAL APPENDIX

This Technical Appendix presents the effects on CO₂ emissions of the UK car scrappage scheme as referred to in Chapter 6: Reducing surface transport emissions through low-carbon cars and consumer behaviour change.

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1. SCRAPPAGE SCHEMES

A scrappage scheme offers a price incentive to consumers to scrap their old cars and buy a new one. In April 2008 the government announced a scrappage scheme for the UK to help to offset the dramatic decline in car sales due to the recession. In theory this scheme could have a positive environmental benefit, as the new cars which will replace scrapped cars have lower emissions on average than old cars. However, our analysis suggests that the impact on CO₂ of the announced scheme will be small. The use of a scrappage scheme may be appropriate if carefully designed to facilitate a step change to a ultra-low carbon technology.

2. CONTEXT OF THE ANNOUNCED SCHEME

The Government set aside £300 million for a scrappage scheme which will run from May 2009 to March 2010 and will cover up to 300,000 vehicles. Car and Van owners can receive a £2,000 discount on a new vehicle when they scrap a vehicle that is 10 years old or more. The scheme has been announced in the context of a recession which has resulted in a significant drop in sales of new cars in the UK - sales of new cars in April 2009 were 24% lower than in April 2008¹ - and is primarily designed to boost the sales of cars².

It is not clear how effective the scheme will be in generating additional car sales, and it could result in considerable deadweight loss. There are approximately 7 million cars and 600,000 vans currently in the parc that are 10 years or older and hence eligible for the scheme. In an ordinary year without a scrappage scheme we would expect approximately 20% of cars and vans over 10 years old to be scrapped – that is about 1.5 million vehicles. Even taking account of the impacts of the recession on sales and scrappage rates, it is likely that some consumers will buy new vehicles under the scheme who would have scrapped their old car a bought a new one anyway. However, throughout our analysis we have assumed that vehicles purchased under the scheme are additional to a state of the world where there is no scrappage scheme.

3. ANALYSIS OF IMPACTS ON CO₂

There is a potential for a saving in CO₂ from the scrappage scheme as replacing a vehicle that is 10 years old with a brand new car will result in an increase in the average efficiency of a vehicle in 2009. This is because the efficiency of vehicles has improved over time: A new

¹ SMMT

² It has not been presented by the Government as an environmental measure

car in 1999 had a carbon intensity 185 gCO₂/km³ compared to a new car in 2008 which had an average carbon intensity of approximately 160gCO₂/km⁴.

However, the impacts of the scrappage scheme persist over time. People who brought forward the purchase of a new car to take advantage of the scrappage scheme, will not buy cars in future years as they would have done otherwise. This means that car sales fall in subsequent years and given that new cars in future years will be even more efficient than new cars in 2009, in some years after 2009 the net effect of the scrappage scheme may be a net increase in CO₂.

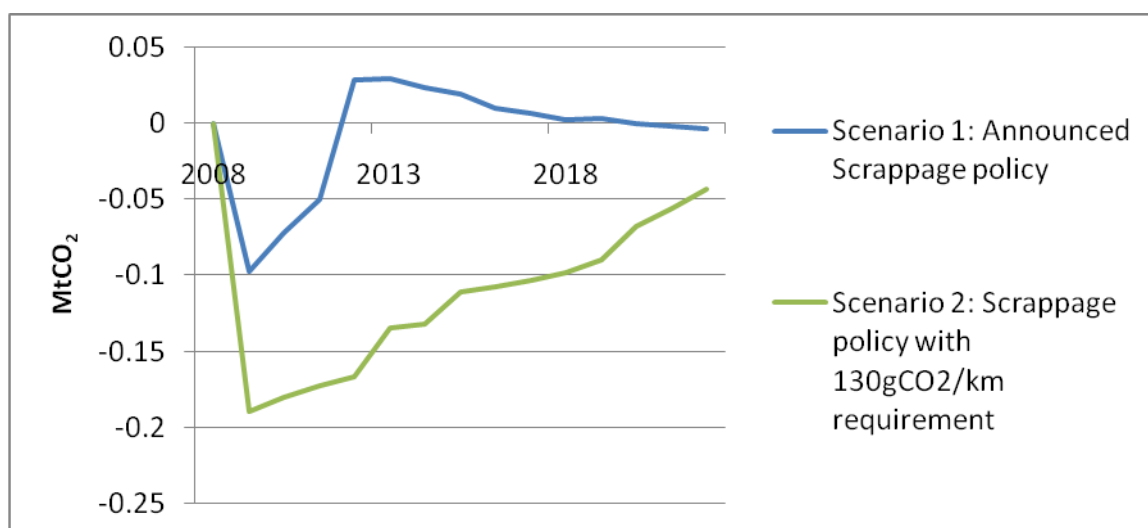
To establish the impact on tailpipe CO₂ emissions; we used data and fleet rollover assumptions from the Transport Technology Marginal Abatement Cost Curve (MACC) model built by AEA for the Committee on Climate Change We modelled two scenarios:

- Scenario 1: all cars older than 9 years are scrapped and replaced by new cars of a similar type (i.e. new small cars replace old small cars, new medium cars replace old medium cars, etc.) for one year only.
- Scenario 2: as Scenario 1, but replacement cars have emissions of 130 gCO₂ / km or less (i.e. a large old car cannot be replaced by a new car with emissions above 130 gCO₂ / km).

4. RESULTS

The impact on tailpipe emissions is shown below in Figure 1.

Figure 1. Incremental tailpipe emissions of scrappage policy relative to no-scrappage policy scenario



Source: CCC calculations

³ p6 NTM Assumptions 2008

⁴ SMMT

We see here that an initial saving in tailpipe emissions is eroded over time as fewer more efficient cars are bought in years after 2009 and in Scenario 1 emissions become positive. Moreover, we see that the impact even in 2009 is very small. The cumulative saving to 2020 under Scenario 1 is 0.1 MtCO₂ and under Scenario 2 is 1.6MtCO₂.

Overall it is not surprising that a measure targeting a one-off redistribution of vehicle sales over time (bringing forward sales to help the industry through hard times) is likely to result in a one-off redistribution of emission reductions.⁵ However, the more efficient the new cars bought are relative to the current stock, the greater any emissions saving will be. This suggests that a scrappage scheme should have a requirement that new cars bought are low carbon, if it is to be used as a tool for delivering carbon savings.

5. PRODUCTION AND DISPOSAL EMISSIONS

The total impact on CO₂ is complicated by accounting for the total lifecycle of the car. The production of a car from extraction of raw materials to assembly of the car and running the show room result in emissions and a scrappage scheme will result in some extra cars being produced. Given the extent and complexity of the supply chain, establishing the true level of emissions is extremely difficult and this is an area where more work needs to be done to establish a robust figure for the impact of cars.

Schweimar and Levin (2000)⁶ estimate the lifecycle emissions of a Golf A4, including extraction of raw materials, manufacture of the car and its parts, disposal and the extraction and refining of the fuel. For our analysis we took their results and accounted for improvements in manufacturing as reported by SMMT⁷; from this we arrived at a figure of 4 MtCO₂ for emissions from the production, manufacture and disposal of the car. A factor of 8.8% was used on tailpipe emissions to derive emissions from extraction and refining of fuel.

Other estimates suggest a figure of a similar order of magnitude for non-use emissions: Defra estimates around 3 tCO₂ and a study by MIT estimates it to be around 6 MtCO₂⁸.

Figure 2 shows the CO₂ impact from non-use emissions under Scenario 1 and the net impact. Non-use emissions are allocated to a car in the year in which it is sold. In reality the emissions profile may not look exactly as shown in Figure 3 as in 2009 cars sold are likely to have been produced in previous years. Additional cars will still be produced under the scrappage scheme so the net impact will still be similar even if the profile of emissions is not realistic.

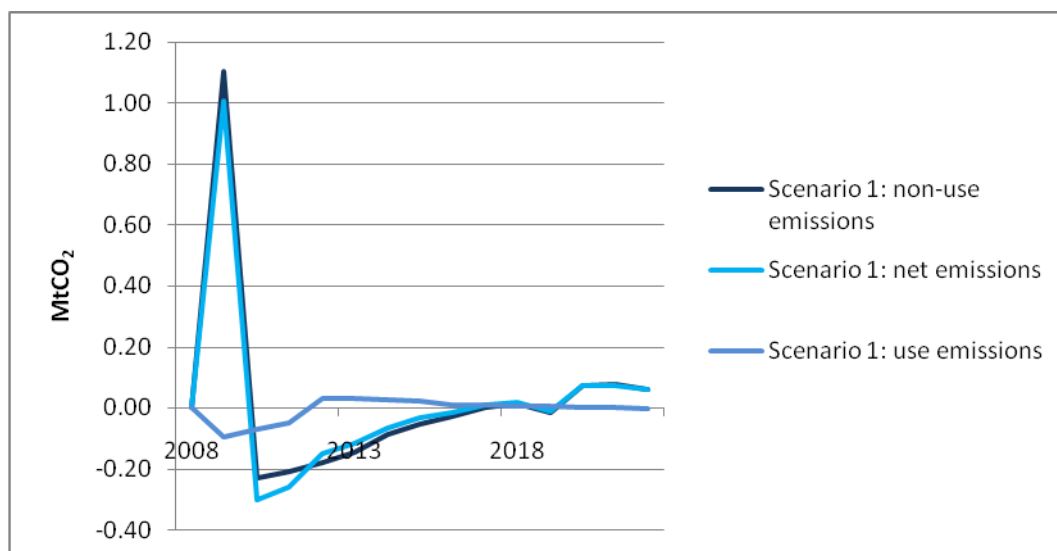
Figure 2. Emissions from production, disposal and use of a car

⁵ In our analysis we assume that cars have an average lifetime of 13 years and that the number of cars in the parc is exogenous and dependent on projections of the number of households and GDP.

⁶ Schweimar and Levin (2000). *Lifecycle inventory for the golf A4*.

⁷ SMMT (2009). *Sustainability Report*

⁸ Weiss et al (2000). *On the road in 2020*



Including available estimates of full lifecycle emissions further reduces the attractiveness of the scrappage schemes described in Scenarios 1 and 2 from a carbon reduction perspective. In particular the impact to 2020 of including these additional emissions is an increase in CO₂ of 0.2 MtCO₂ relative to the baseline in Scenario 1 and total abatement of 1.4 MtCO₂ in scenario 1 (both relative to the baseline).

6. CONCLUSIONS

A scrappage scheme can induce a short-term reduction in tailpipe emissions to the extent that it brings forward sales of new, more efficient vehicles. The more efficient the new vehicles are relative to the current stock the greater the reduction.

However any reduction in tailpipe emissions associated to a time-limited scheme is likely to be short lived as the initial increase in sales of new vehicles is offset by a reduction in sales in subsequent years.

Also, the total CO₂ impact of a scrappage scheme is not clear and will depend on the size of the emissions from production of the car –further work needs to be done to confidently establish this.

A scrappage scheme could have a long term impact on emissions if it was used to introduce a new technology or significantly lower emissions standards through appropriate eligibility conditions; however further work would need to be done to establish the size of this potential.