

Supplementary information

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Make electric vehicles lighter to maximize climate and safety benefits

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In the figure ‘Cost–benefit calculus’, we calculate the climate benefits of avoided emissions and the weight externality from increased passenger fatalities in vehicles struck by heavier ones. Here we describe these calculations in more detail.

Climate benefits

The climate benefit is calculated as the difference between (1) the avoided tail-pipe emissions from an internal combustion vehicle driving 1 kilometre with an assumed fuel rating of 20 miles per gallon, and (2) the power-sector emissions from generating sufficient power to charge an electric vehicle to drive 1 kilometre.

For power-sector emissions, we use country-level average emission intensities. We also assume that the electric vehicle has a fuel economy of 2 miles per kilowatt hour. The fuel rating assumptions were meant to reflect petrol versus electric-truck specifications. For the figure, we apply a value of US\$150 per tonne CO₂ on the net avoided emissions.

Weight externality

The weight-externality calculation is based on ref. 1. It represents the increased likelihood of death in a collision for a passenger in a struck vehicle due to being struck by a heavier one, multiplied by a value of statistical life, and converted to a per kilometre value.

The calculation is:

- (1) 700-kg weight difference between petrol and electric truck, multiplied by
- (2) 0.0365 probability of a serious collision per year (from ref. 1), multiplied by
- (3) 0.0012 increase in probability of death in a struck vehicle for every 500 kg (linearized from ref. 1), divided by
- (4) 500 (to normalize for the likelihood per 500 kg value in (3), multiplied by
- (5) \$11,600,000 value of statistical life (from US Department of Transport), divided by
- (6) 15,962 miles*1.61 km/miles to turn the above annual value into a per km value (used US DOT Transportation Energy Book, Table 3.14, Year 0-1 for Light Truck)

1. Anderson, M. L. & Auffhammer, M. *Rev. Econ. Stud.* **81**, 535–571 (2014).