

The Environmental Consequences of Lifetime Extension of New and Used Cars: Japan's Case

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Author: Yuya NAKAMOTO

Co-Authors: Daisuke NISHIJIMA, Shigemi Kagawa

Global Warming has become more serious in our society, and Japan tries to reduce CO₂ emissions. In Japan, the transportation sector occupies 17.1% of the total amount of CO₂ emissions of Japan in 2012 (Ministry of Land, Infrastructure, Transport and Tourism, 2013). The CO₂ emissions in the transportation sector have increased due to the increase in the transportation volume during 1990 to 2012 (Ministry of Land, Infrastructure, Transport and Tourism, 2013). The Japanese government has introduced a vehicle replacement scheme to replace older cars with lower fuel efficiency with new cars with higher fuel efficiency and attempted to reduce CO₂ emissions from the transportation sector.

With this background, Kagawa et al. (2013) propose an environmental impact assessment method for assessing the effectiveness of scrappage schemes for reducing CO₂ emissions taking into account the rebound effect, driving behavior for older versus new cars and entire lifecycle emissions for during the manufacturing processes of new cars. They found that CO₂ emissions would only decrease if users of the scheme retained their new gasoline passenger vehicles for at least 4.7 years. However, their assessment framework did not consider the vehicle lifetime and market of 'used cars' and therefore they ignored life-cycle emissions of reusing older cars as used cars.

This study considers the vehicle lifetime and market of both new and used cars and develops an automobile life-cycle input-output framework considering lifetime of used cars. We used the car sales data during 1993 to 2014 (Japan Automobile Dealers Association, 2014), 2005 environmental input-output table (National Institute for Environmental Studies, 2010) and parameters of the vehicle lifetime density function estimated by Kagawa et al. (2011). We addressed the following question of how the market expansion and lifetime extension of used cars affect life-cycle CO₂ emissions through the entire economy. The results show the following. Under the benchmark lifetime function, a 10% increase in the market share of used cars yields the reduction in the cumulated life-cycle emissions during 1993 to 2014 amounting to 80 million tonnes-CO₂. We found that modifying this policy with a focus on subsidies of used cars with higher fuel efficiency, and setting the target car age of used cars, would increase environmental benefits.