Analyzing Life-Cycle CO2 Reduction Potentials of Motor Vehicle Inspection Policy

Topic: (10.4) Environmental IO modeling and CO2 Emission
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In 2009, the Japanese government introduced a vehicle replacement scheme for replacing older cars with lower fuel efficiency by new cars with higher fuel efficiency to reduce CO2 emissions from the transportation sector (Ministry of Economy, Trade and Industry, Japan, 2012). Although the demand policy such as the vehicle scrappage scheme has an effect of shortening â€œeconomicâ€• lifetime of automobile rather than â€œphysical lifetimeâ€• of automobile, there are only few studies about the life-cycle environmental impacts of changing the economic vehicle lifetime through the demand policy. This study develops an integrated assessment framework by combining dynamic discrete choice model (e.g., Rust, 1984) with the product lifetime analysis model (Kagawa et al., 2011). The parameters of the dynamic discrete choice model were estimated by using the annual car sales and replacement data during 1993 to 2014 (Japan Automobile Dealers Association, 2014) and annual average driving distance data during the same period (Ministry of Land, Infrastructure, Transport and Tourism, 2016). From the results, we addressed the following question of how the Japanese car inspection policy and scrappage scheme affected the life-cycle CO2 emissions from vehicles through the entire economy. We found that modifying the regulation policy with a focus on car inspection system and a subsidy to support such maintenance cost for older cars that make car owners keep their automobile longer, would increase environmental benefits.