ESTIMATING THE REBOUND EFFECT OF THE US ROAD FREIGHT TRANSPORT

ABSTRACT

The US road freight sector has continued to grow over the past decades as a vital link in the nation's economic activities. The growth is expected to continue given the surging development of e-commerce and the increasing imports of manufactured goods. Increased freight activities could result in more energy consumption and hence increased greenhouse gas emissions. Policymakers have attempted to manage the growth of energy usage through improved fuel economy based on technological advances. However, such improvements may not lead to anticipated goals due to the rebound effect, where improvements in energy efficiency trigger more travel and more energy consumption thus offsetting energy savings from improved efficiency. Therefore, this study aims to determine the potential rebound effect from improved energy efficiency in the US road freight sector. We apply eight fuel cost models and incorporate asymmetric price responses in estimating the US road freight sector's rebound effect from 1980-2016. In addition, we apply a recently developed robust data envelopment analysis (DEA) approach to determine the annual rebound effect in the road freight sector. Our results suggest that the short-run rebound effect ranges between 6.4% to 12.1% and the long-run rebound effect is around 7% in the US road freight sector. Our further analyses after accounting for the asymmetric price responses show that that fuel consumption increases in responding to the decrease in fuel price and vice-versa. The values are considerably less than that found for many other industrialized countries and emerging economies. However, we have seen a drastic increase in the rebound effect in more recent years. The variability of the US rebound effect over time could be linked to several factors such as the types of commodity to be transported, shipping distances, modal share, and geographical location. Our findings suggest that overlooking the rebound effect in energy and environmental policies could impede the goal of reducing total energy consumption and accompanying emissions. Policymakers should incorporate the rebound effect from efficiency improvement in the policy development and utilize some potential programs such as a systematic cap-and-trade scheme, a sector-specific energy or environmental tax e.g., carbon tax to reduce the adverse influence of rebound effect in related policies.

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