

Life-Cycle Cost of Manufactured Goods: A Case Study in US Ground Passenger Transportation

Topic: Life-cycle analysis

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National governments invest in research and development to advance efficiency and spur economic growth. There are, however, few studies that identify where investments will have the largest possible return on investment. This lack of research can result in the funding of investments with suboptimal returns. Initial research in this area has focused on examining production costs; however, to identify high-return areas of research, efforts need to be taken further to include both the production and use of a product. This paper examines the life-cycle cost of passenger ground transportation as a proof of concept to identify those items that have both a high cost and high environmental impact. Public research that focuses on these items has the potential to be more economical than other areas. This paper uses US input-output data from the US Bureau of Economic Analysis, data from the American Time Use Survey, and environmentally extended input-output data to examine the supply chain for production and use of ground transportation equipment. This paper is unique in that it identifies the costs, some of which are not documented in GDP (i.e., uncompensated time use), along with the environmental impacts of producing and using a class of manufactured goods. The Pareto principle, which posits that roughly 80 % of a problem is due to 20 % of the causes, is utilized for targeting specific efficiency solutions. Those supply chain entities that are above the 80th percentile for both financial costs and environmental impacts are identified. The robustness of this identification is examined using Monte Carlo techniques. Forty-three supply chain entities were identified as being above the 80th percentile for cost, measured in value added, and environmental impact with six being above the 95th percentile for both.