

THE COST OF DRIVING: CHOICES, POLICIES

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Overview

The paper looks at the choices which consumers and policy makers face in transportation, in particular light duty passenger vehicles (cars). The focus of the paper is on the unit cost (cost per distance driven), the specific total (well-to-wheels) CO₂ emissions per distance driven, and the tax and subsidies policies which affect unit cost and the choices which consumers make between available propulsion technologies. An attempt is made to assess the possible future patterns of car ownership in several regions of the world and the likely effects of the policies in these regions on the fleet structure, demand for various kinds of energy used for propulsion, and the overall effects on CO₂ emissions.

Methods

A simple “levelized cost of driving” model is used to assess the unit cost of various propulsion technologies and fuel pathways (e.g. petroleum products, hybrid, all electric). Various types of cars are considered as “generators” of an identical product: a unit of distance travelled. The cost of that unit is assessed on vehicle life cycle and well-to-wheels basis, i.e. it includes tax paid by the consumer and subsidies that reduce cost, as well as energy spent to procure the fuel and the make and dispose of the car. The values of key variables (e.g., miles driven, vehicle acquisition cost, cost of energy, engine energy consumption, etc.) are assessed based on available statistics. Sensitivity analysis is performed in order to identify the key factors.

Results

In the unit cost structure, the cost of fuel (energy) rarely dominates: the bulk of cost is in vehicle acquisition and fixed cost, including taxes and other mandatory cost (e.g. insurance) over which the consumer has virtually no control once a vehicle is acquired. Depending on the origin of electricity and other factors, “new” technologies, such as all-electric vehicles and plug-in hybrids, some of which are marketed as “zero emissions”, do not always demonstrate clear-cut advantages over “traditional” propulsion technologies (such as gasoline and Diesel) in terms of specific emissions, and may actually be disadvantaged in terms of unit cost.

Conclusions

Policies that are concerned with the future car fleet structure and energy demand for automotive applications have to be better aligned both with the advantages of the “new” propulsion and energy technologies and the trade-offs between “traditional” and “new” technologies in terms of cost and emissions.

References