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de Borger, Bruno; Mulalic, Ismir; Rouwendal, Jan

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Bruno De Borger

Department of Economics, University of Antwerp, Belgium
bruno.deborger@ua.ac.be

Ismir Mulalic

Technical University of Denmark, Bygningstorvet Building 116 Vest, 2800 Kgs. Lyngby, Denmark
imu@transport.dtu.dk

Jan Rouwendal

VU University, De Boelelaan 1105, 1081 HV Amsterdam, The Netherlands
jrouwendal@feweb.vu.nl

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Abstract

The rebound effect is the causal impact of an increase in fuel efficiency on the demand for car kilometres. The rebound effect has been studied in several different sectors (for a survey, see Greening et al. (2000)). Some recent studies have extensively focused on passenger transportation using macro data (see, Small and Van Dender (2007); Hymel et al. (2010)). However, the rebound effect is essentially a phenomenon that occurs at the level of the individual actor and it seems appropriate to investigate it on micro data as well. This is the purpose of the present paper. We estimate the rebound effect using individual Danish administrative register data.

Central to the analysis is a demand equation for car kilometres in which the fuel price and fuel efficiency are the main explanatory variables. We start by imposing the restriction that only fuel cost per kilometre matter (as is suggested by conventional theory) but also estimate versions in which the coefficients for fuel price and fuel efficiency can differ. We use administrative register micro data over the period 2004-2010 to estimate the demand equation. We apply fixed-effect panel-data (first-diff.) techniques.

The focus is on car users that switch cars during the period of observation. Endogeneity of the fuel efficiency of the new car is an important concern. We deal with endogeneity of car characteristics, following Berry, Levinsohn and Pakes (1995), by instrumenting them using the characteristic of the old car relative to the average Danish car. We also model the car switching decision using a Heckman model and incorporating the age of the old car as an additional variable.

Preliminary results include the following. First, the data reject the conventional formulation in which only fuel cost per kilometre matters. If we include fuel price and fuel efficiency separately in the equation, the coefficients differ. Second, the Heckman selection equation confirms higher fuel prices induce households to switch car, probably a more fuel efficient one. Third, although preliminary, the results suggest the presence of a rebound effect of the same order of magnitude that has been found in the macro studies.

References

Berry, S., J. Levinsohn and A. Pakes. 1995. Automobile prices in market equilibrium. Econometrica, 63. 841-890.

Greening, L.A., Greene, D.L., Difiglio, C., 2000. Energy efficiency and consumption—the rebound effect—a survey. Energy Policy 28, 389-401.

Hymel, K.M., Small, K.A., Van Dender, K., 2010. Induced demand and rebound effects in road transport. Transportation research part B 44, 1220-1241.

Small, K.A., Van Dender, K., 2007. Fuel efficiency and motor vehicle travel: the declining rebound effect. The Energy Journal 28 (1), 25-51.