HOW TO ESTIMATE GASOLINE PRICE ELASTICITIES OF AUTOMOBILE TRAVEL DEMAND

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Overview

There is a huge literature about estimating price elasticities in transport demand as shown by meta analyses and review studies like Espey (1998) and Hanly et al. (2012) and they only take analyses on fuel and automobile travel demand into account. In these review articles it also becomes clear that in the reviewed studies exists a considerable variety in the applied estimation methodologies and Espey (1998) shows that the choice of estimation method has an impact on the results of the estimated elasticities. Although the impact is not huge, it is significant and with regard to the use of price elasticities for forecasts and policy advice also minor differences matter. For example in the discussion if fuel taxes are more preferable than fuel efficiency standards when it comes to policy measures which ought to curb emissions in transportation. With our paper we contribute to the methodological debate in the literature of estimating price elasticities of transport demand by comparing established as well as new estimation methods with regard to their ability in achieving the most precise estimates of price elasticities.

Methods

One of the most prominent estimation methods used in the transport demand literature are linear regression models which are applied to log-linearized multiplicative demand function of the Cobb-Douglas type. However since Haworth and Vincent (1979), it has become clear that log-linearizing estimation regression models using a log transformation may lead to biased estimates, and thus faulty elasticity values. Silva and Tenreyro (2006) took up on this finding and raise a further problem of log-linearizing – the occurrence of zero observations in the dependent variable. Especially for micro-data this is not a rare event. Taking the log of these observations would cause them to drop out of the sample and thereby to a bias of the estimates. Having these problems in mind we analyze and compare the different empirical methods applied in the literature theoretically as well as empirically. As an empirical case study we use the German Mobility Panel (MOP 2013) which is a German household survey on transport behavior. To compare the different estimation models empirically we apply the Model Confidence Set (MCS) which has been established by Hansen et al. (2011). The MCS is to our knowledge the only procedure which allows model selection among non-nested models. It compares the predictive ability of the models and identifies a set of models which performs best in predicting the observed data.

Results

We find that there are significant differences between the different estimation methods in the predictive ability. But not only the method matters, also the specification of the estimation equation leads to differences in the performance. According to the MCS Zero-Inflated Poisson and Zero-Inflated Negative Binomial regression models perform best concerning their predictive ability. The estimated gasoline price elasticities of the automobile travel demand vary from -0.24 to -0.57.

Conclusions

Especially the large variance in the elasticity estimates makes clear that an evaluation of the estimation method is important as different methods can lead to very different results even if they are applied to one and the same dataset. The conclusion is not that a certain estimation method like zero-inflated models is *the* workhorse for all future studies on price elasticities of transport demand. It is rather the emphasis of the importance of choosing carefully the right model for the dataset in use. In this paper we shed light on possible problems in estimating price elasticities of transport demand and suggest a procedure how to choose the most preferable regression model.

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