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THE DEMAND FOR GASOLINE OF PASSENGER VEHICLES IN JAPAN TO 2010: A VEHICLE STOCK AND VEHICLE EFFICIENCY APPROACH

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Overview

Japanese vehicle fuel economy has not improved significantly since 1989, while Japan's gasoline demand has not decreased since 1987. The objective of the paper is to predict how changes (1) in the car stock, (2) in vehicle utilisation, (3) in car fuel efficiency and (4) in the macro-economy impact on gasoline demand of Japan's vehicle sector. In particular we ask if the present vehicle fuel efficiency target by the Japanese Government is enough to offset the rapid growth in gasoline demand in Japan by 2010. The literature in transport economics (Franzen and Sterner, 1995; Espey, 1998; Sakaguchi, 2000) has consistently modelled efficiency changes by means of a time trend variable overlooking the importance of endogenising changes in energy efficiency of vehicles impacting on gasoline demand when building gasoline demand models.

Methods

By OLS regressions in the exercise we generate our parameters. By analysis of 21-year time series data (1980-01) of Japan's transport activity, its vehicle stock, its transport energy demand and its economy we calibrate the demand for gasoline to the year 2010 by private vehicles. Our study is based on 9 calibrated equations whose estimates feed the main gasoline demand equations. Model outputs include gasoline demand, vehicle stock, vehicle usage and fleet fuel efficiencies that incorporate vehicle age.

Results

The quantitative analysis (1980-01) showed that: that gasoline demand increases to 48 mn. (Kloe) under the *base case* scenario and declines to 43 mn. (Kloe) under the *efficiency* scenario by the year 2010, thus satisfying the Japanese Government fuel economy target for private vehicles. We find that the Japanese Government target for fuel economy of vehicles to 2010 can lead to substantial reductions in gasoline demand. Our results also show that car utilisation increases following increases in households owning more than one car during years 1980-01.Vehicle fuel efficiency, utilisation, and the vehicle stock produce estimates of gasoline demand. By including the effect of the vehicle stock and of demographics into a structural model of gasoline demand we improve the validity of the model's results.

Conclusions

The rapid growth in the stock of Japanese private vehicles has increased the demand for gasoline, which has not decreased since 1987. Therefore predicting gasoline demand is essential to foresee future oil requirements of the Japanese economy. We have identified key historical relationships impacting on gasoline demand thus allowing an approach involving changes in vehicle stock and fuel efficiency rather than building a single equation model using a deterministic trend in modelling gasoline demand as standard econometric models do.

The three key empirical models developed here rely on economic conditions before and after an economic boom and an energy crisis. From a methodological view our car stock approach incorporates capital stock characteristics into the gasoline demand model with the inclusion of a supply curve to capture the surviving car stock. By including the car stock variable and demographic changes we improved the validity of the model's results, as well as the accuracy of gasoline demand projections.

Our results bear important implications for global oil demand and the energy security of the Japanese economy. The Government's target for fuel efficiency of vehicles, if achieved, can strengthen Japan's energy security by reducing its oil dependency. This research should be extended to examining how the diffusion of luxury, suv's and mini cars affect the overall fleet fuel efficiency and growth in gasoline demand. Future research should also examine consumer choice of vehicles since such choices will impact on the future level of vehicle fuel efficiency shaping the evolution of gasoline demand in the next decades.

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