ARE THE EFFECTS OF VARIATIONS IN FUEL PRICES ON FUEL CONSUMPTION OF PASSENGER CARS SYMMETRICS? SOME EVIDENCE FROM AN EMPIRICAL STUDY

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(1) Overview

Our concern is the reduction of the fuel consumption of private vehicles. In an economic policy perspective, we focus on actions on prices. If a government wants to make a price policy, it should be able to decide if it raises the tax on the type of fuel he wants to control or reduces the price (subsidy) for alternative types of fuel. In order to answer this question, we investigate the price reaction of consumers in developed and emerging countries. We have first to assess if the consumer is sensitive to a price variation, and second, if he is more affected by a rise or a fall in price (Tax or subsidy, development of alternative fuel or not, fixed or floating tax...). This leads us to analyse if price variations have a symmetric or asymmetric effect on fuel demand.

This is generally admitted that there is a form of irreversibility in the effect of prices variations on energy demand. This discovery results from the attempt to anticipate the energy demand, after the oil price collapse of the mid 1980s. The conclusion of this literature is that the demand reacts more strongly after a price rise than a comparable fall [Dargay (1990), Gately (1992, 1993), Gately Huntington (2001), Hogan (1992)]. There are two main reasons [Wirl (1988), Walker & Wirl (1993)] for this asymmetric effect, in the energy sector. The first reason is the irreversibility of technological progress. Because of an increase in prices, the industry triggers research and development efforts to make more fuel efficient equipments. The second reason is prices expectations. The demand response to a price variation depends on the individual perception of future price level.

In this approach, it can be interesting to compare an industrialised region and an emergent area because we want to test if households behaviours are different in two countries with distinct economic characteristics.

(2) Methods

We want to analyse the relationship between fuel consumption, fuel prices, income and motorisation rate, in two different areas, through an econometric analysis.

First, our approach is based on a cointegration analysis. It is a log linear equation with fuel consumption as the dependant variable that gives us long run elasticities.

Second, we are interested in analysing the short run behaviour. If series are cointegrated, an Error Correction Model (ECM) is used to obtain short-term elasticities.

In both long run and short-term models, we test if price variations have symmetric effects on fuel consumption of particular vehicles. Thus, it is necessary to split up price into several series. We make a comparison of three different decompositions [Wolffram (1971), Traill & al (1978), Gately (1992)]. If the models admit that there is asymmetric effect of price variations, we keep them, otherwise we have to build long-term and short-term models without price decomposition.

We estimate these models for private vehicles gasoline consumption in India and in the USA. Data were obtained from sources such as World Bank database, Enerdata, IEA and United Nations for India, and World Bank, Department of Energy and United Nations for the USA.

(3) Results

Concerning India, consumption, income, motorisation rate (cars and two wheelers) and prices were not stationary. We used a cointegration relation for long-term equation and an ECM for short run relationship. Price elasticity seemed to be stronger than income elasticity in the long-term, but lower in the short run. Wald test showed that there was no asymmetry in the effect of price variation on consumption in India in the short run, but, in the long-term, households seemed to be more sensitive to a strong price increase.

About the USA, we estimated long run and short run relationship between gasoline consumption, prices, motorisation rate (cars) and income. The preliminary results showed that price elasticity seemed to be high in the long run, thanks to the level of gasoline taxes and Wald test seemed to conclude for an irreversible effect of price variations on fuel consumption in particular vehicles both in the long and short run.

(4) Conclusion

Preliminary results seem to point out a symmetric effect of price variation in an emergent country (India) in the short run and an asymmetric effect in the long-term, but household seem to be especially sensitive to a strong increase in price. Moreover, concerning a developed country (as the USA), preliminary results seem to show that there is an asymmetric effect of variation in price, both in the short and long run.

These results mean that if we had to make economic policy to reduce fuel consumption, it would be really different in the USA and in India, because household have not the same behaviour.

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