

# ***WHY FLEX-FUEL FAILED? A HOUSEHOLD PERSPECTIVE***

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## **Overview**

The purpose of this paper is primarily to analyze which are the most important factors affecting customers' fuel choices. There are a number of questions that we will address for owners of flex-fuel cars:

- What are the main factors that influence the choice between ethanol and petrol?
- Do the customers' environmental attitudes influence their choice of fuel?
- How does information affect the consumers' choice?

These are questions that are important to address in order to understand why ethanol failed in the Swedish market. The analysis was conducted in a binary choice framework. Data was collected through a survey. The results contribute to improved knowledge about which factors that are important for the fuel choice of flex-fuel car owners in Sweden. Such knowledge is crucial, both for policy makers, automotive industry and for a number of other actors involved in the development of the future Swedish energysystem.

There is currently a governmental aim in Sweden to have a fossil fuel free vehicle fleet in 2030. In order to meet this goal and reduce the dependence on fossil fuels, biofuel driven vehicles can potentially constitute a substantial part of the vehicle fleet. Ethanol (E85) was introduced in Sweden ten years ago as an effort to decrease the dependence on fossil fuels. Several policy instruments (e.g., tax exemption for biofuels), were introduced to increase the use of biofuels. Furthermore, the use of biofuels was initially supported by the Swedish Act on the Obligation to Supply Renewable Fuels (the Pump Act, 2005). The law stipulated access to biofuels in the whole country by forcing fuel filling stations to provide a fossil free alternative to petrol and ethanol became the most common alternative. Ethanol consumption initially increased significantly, especially at times when the price spread between petrol and ethanol was in favor of ethanol. Ethanol thus became the most commonly used biofuel in the Swedish market. However, since the end of 2012 the use of ethanol has decreased.

There are several possible reasons for the decline of ethanol. The price difference between ethanol and petrol has since the introduction diminished. In addition, during this ten year time period there have been a number of debates, both in media and among researchers, concerning the pros and cons of ethanol as fuel. Concerns have been raised about ethanol's climate effects as well as biofuel vs. food production and alarming reports that ethanol may have a detrimental effect on the motor and its performance. Today we know that the promotion of ethanol failed in Sweden, despite the policy instruments that were introduced. Altogether these issues mentioned may have affected the consumers' attitudes towards biofuels and their incentives to use ethanol. The previous reports that analyses ethanol in the Swedish market mainly evaluate the role of ethanol in a societal and environmental perspective, while knowledge about how ethanol was perceived by the consumers is more limited.

## **Method**

A survey format has been used to collect the data for the analysis. The survey was sent out to 1200 owners of flex-fuel cars in Sweden in March 2016. The first part of the survey collected information about the respondents' driving habits and motives for buying a flex-fuel car. In the second part of the survey the respondents were asked whether they would fill the tank with ethanol or petrol the next time they were fueling. They were asked to make four repeated hypothetical choices, each with a different price spread between the two fuels. They were also asked about their attitudes and norms concerning different fuels and the degree of their environmental engagement. Finally the survey collected information about the respondents' socioeconomic background.

The analysis is conducted in a binary choice framework. The respondents stated fuel choice was the dependent variable and the factors expected to affect their choice, e.g., fuel prices and attitudes and beliefs about different characteristics of biofuels, were used as explanatory variables. Our hypothesis was that it less probable for an average respondent to choose ethanol when the price difference is smaller. In addition, we expect that consumers that believe that ethanol is harmful to the engine and its performance or that ethanol competes with food production are less likely to state that they would choose ethanol. Also, people who express strong environmental concerns are expected to state the choice of ethanol more frequently. The study adds to the previous mainly qualitative literature by its quantitative approach, which facilitates inference based tests on what

factors that are related to fuel choices as well as on their relative importance.

## **Results**

It is necessary to understand how households value and perceive different fuels to know how fossil free fuels should be promoted in the future, for example the relative importance of the price in comparison with attitudinal factors and beliefs. The results contribute to improved knowledge about why many flex-fuel car owners are reluctant to fuel their car with ethanol.

If it is, for instance, shown that price is an important factor, new fuels might need to be subsidized to be able to penetrate the market. In case there is instead a strong influence of the debate in the media of possible pros and cons of ethanol this implicates that information is vital. In such a case it is important to clarify misunderstandings and rumors that occur straight away for the customers to have a fair chance of making the choice of fuels based on facts.

## **Conclusions**

Improved knowledge about important factors for Swedish households' fuel choice is crucial, both for policy makers, automotive industry and for a number of other actors involved in the development of the future Swedish energy system. The results will provide important insights for decision makers in order to avoid the mistakes that were made when ethanol was introduced, in the promotion of future fossil free fuels and what policy instruments to use. Results are thus useful from an energy systems perspective and in striving for a fossil fuel free vehicle fleet in the Swedish energy system.