Economic Considerations in Consumer Choice: A Study by Vehicle Engine Type in the French Car industry

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Overview

Industrial sectors are undergoing major transformations, driven not only by technological advances but also by new rules and regulations. The automotive industry in particular is undergoing a major metamorphosis. In order to meet the Paris Agreement's climate objectives, public authorities around the world are implementing different policy instruments at national, regional, and sub-national level to tackle green-house gas emissions (GHG).

The European Union adopted a new directive banning the sale of combustion engine vehicles from 2035. This law has a huge impact on the automotive industry, and in particular on the power-train ecosystem. In France, over 95% of new vehicles sold in 2018 were internal combustion engines. It is therefore clear that the production of personal cars will be considerably impacted by this law[i]. On the other hand, the car market is also influenced by consumers' behaviors. If carmakers fail to meet consumers' expectations, they may turn to other brands or other types of transportation. Furthermore, one of the most important decisions that consumers face when buying a new vehicle is the choice of engine type. This decision is considerably influenced by a large number of economic indicators, including the cost of the initial purchase, maintenance costs and long-term economic benefits. Since the law was passed, consumer enthusiasm for electric vehicles has not been as high as had been hoped. In 2024, the market for electric cars was down on the previous year. The repercussions of this decline could have a major impact on the car industry. In France, for instance, both the ecological bonus-malus policy will be strengthened starting January 2025. The amount of the ecological bonus and the types of vehicles concerned will be significantly reduced. In addition, the government has strengthened the environmental malus, which will include plug-in hybrid vehicles from January 2025. This study aims to analyse the economic factors influencing consumer choices regarding engine types in new vehicles. Furthermore, it examines the impact of economic disruption on new vehicle sales.

Methods

The aim of this study is to predict new vehicle sales in France by considering the economic indicators that may influence consumers' choices. These indicators include government incentives, such as the ecological bonus, and the average price of a vehicle. It is important to note that this data is not open-source. A brainstorming phase was carried out to determine open-source data that could explain the unavailable economic indicators as well as the consumer choices. This study takes a data-driven approach, using open-source data to gain an economic understanding of consumer behaviour. The methodology involves the collection and aggregation of data from various sources such as the Insee (Institut national de la statistique et des études économiques) database and the French government database. We divide engines into three types: internal combustion, electric and hybrid. The exogenous variables are like GDP or number of unemployed[ii] [iii]. The study uses different ARMA-GARCH time series models[iv][v] that incorporate exogenous variables to explain vehicle sales by engine type.

Results

This study investigates the impact of economic indicators on new passenger vehicle purchases in France from 2010 to 2024 using a time series model. The findings reveal that economic indicators significantly influence vehicle purchases, with effects varying by engine type. These results highlight the nuanced relationship between economic indicators and consumer choices in the French car industry.

The preliminary results show that the ARMA models are not valid because of the heteroscedasticity of the residuals. The variance in the residuals can be explained by various adverse shocks, such as the COVID-related confinement in

2020. To solve this heteroscedasticity, we suggest considering an ARMA model coupled with a GARCH model. GARCH models make it possible to take account of volatility and the various shocks to which a time series, such as financial series, may be subject.

Conclusions

This study provides a solid framework for understanding the economic considerations that drive consumers' choice of vehicle engine type. By analysing the key economic factors and their impact on consumer behaviour, this research contributes to the debate on the potential impact on the automotive sector and economic decision-making. Future research can build on these results to explore other economic and environmental dimensions of consumer choice in the automotive market.

References

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