Impact of Hybrid vehicles on Environmental Protection and energy conservation

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Abstract:

This study is about environmental protection and energy conservation in the India vehicle market. Based on that, we focus on comparison of combustion vehicles with hybrid vehicles. Data was collected through questionnaire. The analysis includes a description of the sample and chi-square tests. We analyze two different particular engines (combustion engine vehicles and hybrid electric vehicles). We compare these two engine vehicles, and analyze the trends of the market. We use scientific data and existing theories to analyze the vehicles, including "Full Costing", "PPC (Production Possibilities Curve)", "Supply Demand Curve". We conclude that hybrid engine vehicles are environmentally friendly and energy conserving, but they have higher lifecycle costs. The analysis also shows that different ages, education levels and regions affect the customers' preferences for these two kinds of vehicles. Our original idea is the problems of hybrid vehicles and how to support and popularize hybrid vehicles depends on the exact national conditions and policies implemented. However, consumers might not be able to accept the "environmental protection and energy conservation" concept immediately, because it's difficult to change the consumption concept of a generation or culture. Therefore, the government should carry out policies that are suitable for their local region to update the consumption concepts of the consumers and promote the new energy vehicles. Thus, the goal of environmental protection and energy conservation can be reached.

Keywords: Environmental protection, energy conservation, combustion vehicles, hybrid vehicles, new energy and greenhouse gas emission

I. Introduction:

The majority of vehicles on the road in 2010 were conventional vehicles based on internal-combustion engines. The biggest advantage of the conventional vehicles is that the oil based fuels can enable them to achieve high performance over a long range. However, their excessive dependence on oil and their low efficiency bring serious greenhouse gas emissions, has led to increasing concern over their negative environmental and economic impacts. CO2 emissions of vehicles result in air pollution which is a serious environmental problem in the world, especially in the developing countries like India. In India most cities suffer from poor air quality, which has received increasing attention in the past decade [1-2]. The growth of the number of cars in the world is expected to increase more than fourfold by 2050 to 3 billion, and more efficient and less oil-dependent means of transportation are being increasingly investigated [3]. Due to the number of vehicles increasing, many governments promote adoption of hybrid and electric vehicles as an important part of the combination of technologies required for reducing greenhouse gas emissions and energy use. Recent interest in climate policy has resulted in many of the biggest automobile producers increasing production of hybrid vehicles such as the Honda Civic and Insight Hybrids, Mahindra Reva, Chevrolet Malibu Hybrid, and the Mercedes-Benz S400 Hybrid. Toyota Prius and Ford Fusion Hybrid are full hybrids [4-5] Efficiency in the use of the modern hybrid electric vehicles is increasing. Compared to a conventional internal combustion engine vehicle, hybrid electric vehicles can improve fuel economy and lower greenhouse gas and tailpipe emissions. In a world of limited resources and many petroleum users and emissions sources, the policy question is whether the best use of resources is to build hybrids, to improve the fuel economy and environmental emissions from other mobile sources, or to devote the resources to other environmental projects [6]. Our study is about lifecycle cost of vehicles and consumers' perceptions. However, as a result of the high total costs of maintenance, battery, CO_2 emissions, fuel economy, the price of the hybrid vehicles is higher than that of combustion vehicles. Due to this situation we try to find out how the Indian government could solve the high cost problem through subsidies and taxes, in order to control the production and popularize hybrid vehicles [7-9].

II. GENERAL HYPOTHESIS

According to what we have learnt, hypothesis is envisaged of one or several possible conclusions of the research subject. Besides, it uses existing materials and scientific principles as the basis. Therefore, based on the study of the previous literature review, we have come up with following three hypotheses in the interest of investigate our research questions. Different consumers' perceptions are relevantly related with their purchase decisions on consumption. Different ages influence the customers' preferences for vehicles claim that age is important. Categorizing consumers by age reveals that this factor is related with their purchase decisions. Thus, our first hypothesis is:

H1: There will be differences depending on the age of consumers and their preference of hybrid and combustion vehicles.

In addition, different education levels influence the customers' preferences for vehicles. Consumer education programs educate students to act as wise consumers. Consumers have their rights and responsibilities such as social concern, safety and a healthy environment. Different consumers have different ages and education levels. Their different ages and educations affect their purchase decisions indirectly. Thus, our second hypothesis is:

H2: There will be differences depending on the education level of consumers and their preference of hybrid and combustion vehicles

Besides, different locations influence customers' preference of vehicles. There are three locations include which are village, town, metropolitan city. Thus, our third hypothesis is:

H3: There will be differences depending on the location of consumers and their preference of the hybrid and combustion vehicles.

III. EMPIRICS

Based on the three general hypotheses, a questionnaire has been made to collect the data we need. According to the respondents answer, we calculated the data by using Chi-square test in order to see if there are any connections between the variables. Detailed result will be analyzed in the following chapters.

a) Hypothesis of different ages of consumers

H0: There will be differences depending on the age of consumers and their preference of hybrid and combustion vehicles.

H1: There will be no differences.

Table 1. Data (different ages and vehicles) in survey

age / vehicle	21-29	30-39	40-49	Row Total
Combustion	5	6	2	13
Hybrid	28	14	2	44
Col.Total	33	20	4	57

Explanation:

1. Null hypothesis. H0:

There are differences, which mean there is differences between the observation and expectation.

H1: there are no differences between the observation and expectation.

2. Statistical test:

Since there are more than two categorical variables and they are independent random sampling, the chi-square test is appropriate.

3. Significance level:

Let $\alpha = 0.05$.

Decision: Table 1 presents that the preference of either hybrid vehicles or combustion vehicles correspond with consumers' ages.

Chi-square Test:

Expectation of C1 = $\frac{33 \times 13}{57} = 7.5$ Expectation of C2= $\frac{20 \times 13}{57} = 4.5$

Expectation of C3 = $\frac{4 \times 13}{57} = .91$ Expectation of C4 = $\frac{33 \times 44}{57} = 25.4$

Expectation of C5 = $\frac{20x\ 44}{57} = 15.4$ Expectation of C6 = $\frac{4\ x\ 44}{57} = 3.1$

O	E	O-E	$(O-E)^2$	$(O-E)^2/E$
5	7.5	-2.5	6.25	0.833
6	4.5	1.5	2.25	0.5
2	0.91	1.09	1.18	1.29
28	25.4	2.6	6.76	0.266
14	15.4	-1.4	1.96	0.127
2	3.1	-1.1	1.21	0.39

$$X^2 = \sum \frac{(O-E)^2}{E}$$

$$X^2 = 3.406$$

df = (2-1)(3-1) = 2

X^2 table = 5.991

X^2 Calculated < X^2 table

Accept the Null Hypothesis

Therefore, there is support for Ho. We conclude that there are differences depending on the ages of consumers and their preferences of the hybrid and combustion vehicles.

b) Hypothesis of different education levels of consumers:

H0: There will be differences depending on the education levels of consumers.

H1: There will be no differences.

Table 2. Data (different educations and vehicles) in survey

education / vehicle	student	Research scholar	faculty	others	Row Total
Combustion	4(3.15)	1(0.94)	6 (9.15)	7 (4.73)	18
Hybrid	6 (6.84)	2 (2.05)	23 (19.8)	8 (10.2)	39
Col.Total	10	3	29	15	57

Decision: Table 2 presents that the preference of either hybrid vehicles or combustion vehicles correspond with their education levels. The numbers in the brackets indicate the expected number.

$$X^2 = \sum \frac{(O-E)^2}{E}$$

$X^2 = 3.4939$

df = (2-1)(4-1) = 3

X^2 table = 7.815

X^2 calculated < X^2 table

Accept the Null Hypothesis

Therefore, there is support for Ho. We conclude that there are differences depending on the education levels of consumers and their preferences of hybrid and combustion vehicles.

c) Hypothesis of different regions of consumers:

H0: There will be differences depending on the location of consumers and their preferences of hybrid and combustion vehicles.

H1: There will be no differences

Table 3 Data (different locations and Vehicles) in survey

Region / vehicle	village	Town	city	Row total
Combustion	2 (0.63)	6 (6.9)	4 (4.42)	12
Hybrid	1 (2.36)	27 (26.05)	17 (16.5)	45
Col Total	3	33	21	57

Decision: Table 3 presents that the preference of either hybrid vehicles or combustion vehicles corresponding with their location. The numbers in the brackets indicate the expected number of consumers.

$$X^2 = \sum \frac{(O-E)^2}{E}$$

$$X^2 = 4.958$$

$$df = (2-1)(3-1) = 2$$

$$X^2 \text{ table} = 5.991$$

$$X^2 \text{ calculated} < X^2 \text{ table}$$

Accept the Null Hypothesis

Therefore, there is support for Ho. We conclude that there are differences depending on locations of consumers and their preferences of hybrid and combustion vehicles.

IV. CONCLUSION

Primary data collection was completed through a survey with 57 people participating. Survey participants were asked questions regarding their preference for combustion or hybrid vehicles. Positive answers were summed up to produce an indication of preferences, which were used to categorize respondents into two categories: preferring combustion, and preferring hybrid. These two categories could then be analyzed for correlation with other variables that were surveyed during the same data collection period: age, region and education. Survey results indicate that survey participants with faculty members prefer hybrid vehicles. We found that younger people who took our survey more strongly support hybrid vehicles than older people, which is most apparent in the 21- 29 age group. We also found that survey respondents who live in the town and metro cities prefer hybrid vehicles.

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