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The Pattern of Electric Vehicle Demand among the Upper-middle Income Class in Indonesia

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PROBLEM BACKGROUND

Electric vehicles have emerged as a very promising solution as awareness of the effects of fossil fuel vehicles on air pollution and climate change has increased. Electric vehicles are not only changing the way we move, but they are also changing many aspects of our lives, from the environment to the economy and public health.

As of 2023, the global market size for electric vehicles has reached USD 388.1 billion and is expected to continue to grow to USD 951.9 billion by 2030 (Marketsandmarkets, 2023). With the increasing technology, environmental awareness, and government policies, electric vehicles are becoming a promising choice as a sustainable transportation. As consumers and industries become more aware of climate change and air pollution, they are starting to switch to electric vehicles to reduce carbon emissions. This has led to the growing electric vehicle market with innovation and investment around the world.

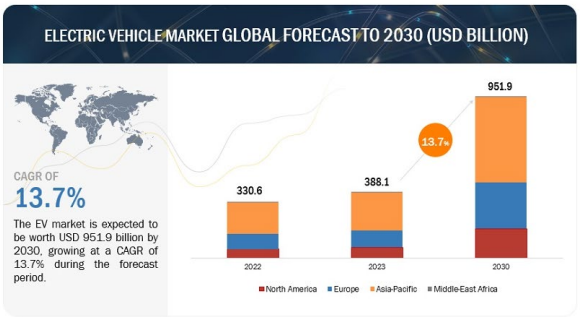

Figure 1. Global Electric Vehicle Market and 2030 Forecast in Billion USD
Source: Marketandmarket, 2023.

From the data above, it can be seen that the development of the electric vehicle market will grow by 13.7% from 2023 to 2030. Specifically for the Asian market, it is estimated to reach 29,653,000 units in 2030 or an increase of 19.0%. Therefore, the development of battery technology for greater energy, fast-charging capabilities, and cost reduction will cause the electric vehicle market to continue to grow.

The mass production of batteries with large volumes, as well as technological developments, will make the battery production costs decrease from year to year. This is important because

batteries are one of the most expensive components in electric vehicles. The battery price in 2010 was around $1200/kWh and has become $160/kWh in 2023 and is expected to become cheaper, reaching $60/kWh in 2030. In China, it is even cheaper, reaching $100/kWh in 2023. With the cheaper battery price, the price of these vehicles will also be cheaper.

With the increasing demand for electric vehicles from the public, it also increases the need for other infrastructure, especially charging stations. This also encourages the development of faster and more efficient charging methods. The global price for electricity used to charge electric vehicles is estimated to be $190 billion in 2030, which is equivalent to only 1/10 of the current price of gasoline and diesel. (International Energy Agency, 2022)

In Indonesia, the electric vehicle market is projected to reach a value of around US$2.02 billion, or equivalent to Rp30 trillion, assuming an exchange rate of Rp14,888.95/US$. According to a report by Maximize Market Research, the Indonesian electric vehicle market is projected to reach US$2.02 billion in 2029, after reaching US$533.19 million (around Rp7.93 trillion) in 2020. A growth of 20.96%. The electric vehicle market is projected to reach 250,000 units in 2030, accounting for 16% of total electric car sales. Similarly, demand for electric motorcycles is also expected to increase, with an estimated sales of 1.9 million units in 2030, or 30% of total new two-wheeled vehicle sales. Gaikindo also noted that the wholesale sales volume of electric cars in the domestic market in December 2022 amounted to 2,404 units, which was the highest achievement of the year. If accumulated, the total wholesale sales volume of pure battery electric vehicles (BEV) in Indonesia during the January-December 2022 period reached 10,327 units. (Agung Jatmiko, 2023).

Another data projected by the State Electricity Company (PLN) is that in Indonesia it will reach more than 65,000 units by 2030. PLN also estimates a significant increase, reaching around 16,000 units in Indonesia by 2025, and after that, there is expected to be a constant increase of 8–9,000 units per year. (databoks,2021).

Figure 2. Target Development of Electric Vehicles in Indonesia
Sumber: datanesia, 2022.

Therefore, important factors that drive the growth of the electric vehicle market in Indonesia are starting to be considered, including the country's abundant natural resources, namely nickel, which is an important component of electric vehicle batteries. The government is also building a wide network of charging stations to boost the electric vehicle market. This includes

government incentives such as tax breaks, which are attracting investors to the electric vehicle industry in Indonesia.

On the other hand, Indonesia has now returned to the group of upper-middle-income countries or Upper Middle-Income Country (UMIC) amid various global pressures and uncertainties. According to the World Bank, Indonesia's Gross National Income (GNI) per capita rose by 9.8% from USD4,170 in 2021 to USD4,580 in 2022, which is a strong economic recovery that places Indonesia back in the upper middle class. (CNBC, 2023; Kemenkeu, 2023). This status will strengthen the confidence of investors, trade partners, bilateral partners, and development partners in Indonesia's economic resilience. Increasing income also increases household consumption, and this household consumption contributed the majority or 53.31% of Indonesia's total gross domestic product (GDP) in the second quarter of 2023, or grew 5.32% year-on-year (yoy). (Cindy Anur, 2023).

A study conducted by The Boston Consulting Group (BCG) in 2013 showed that there is a change in the consumption patterns of the middle class in Indonesia, which is indicated by a new wave of upper-middle class consumers, or Middle and Affluent Consumer (MAC), which will grow in both number and purchasing power. According to the study results, the change was followed by a change in the consumption trends, which moved from basic needs products to products that offer greater convenience, and from consumption of basic needs to tertiary needs. (Eko Wicaksono et all, 2020)

One example of a change in consumption patterns as income increases can be seen in the sales data for hybrid cars in the following figure.

Gambar 3. Sales of Hybrid Cars after the COVID-19 Pandemic
Sumber: Indotimur,2023.

Since the announcement of the end of the pandemic on May 17, 2022, sales of hybrid cars have skyrocketed, from 787 units sold in 2019 to 5,100 units in 2022. (Andriansyah, 2023). The change in consumer behavior in relation to the increasing income in the purchase of hybrid cars is influenced by situational factors, namely the factor of the environmental conditions of the community that desires a green environment with fresh air. Then the social situation due to economic conditions, the smart community in car consumption that can influence consumer buying decisions.

When the economy of a country increases or the population becomes richer, three things happen: (1) more households choose to use transportation goods and services; (2) household spending on private transportation increases, and (3) car ownership and use increases. Research shows that, when per capita spending increases by 10%, transportation spending increases by 17% for all transportation, 10% for transportation services, and 20% for private transportation. At this time, car ownership and carbon dioxide emissions will continue to increase, and by 2035. (Mathilde L., Ewane T,2022).

In this situation, electric vehicles (EVs) are a solution for reducing carbon emissions. This is supported by the growing purchasing power of Indonesian people, as well as their increasing knowledge and awareness of the environment to address the greenhouse effect. This has led people to be more inclined to buy electric vehicles instead of conventional vehicles that use gasoline or fossil fuels. However, the main challenge is that the production costs of EVs are still high, making them relatively more expensive than gasoline cars. However, the factor of environmental awareness can offset the factor of price, as well as the sensitivity of consumers to the advancement of EV technology. (Bengang G, Jiali W & Jinshi C, 2020).

LITERATURE STUDIES

Consumer buying behaviour is determined by demand , while consumer demand for electric vehicles is influenced by three main factors: social factors, product factors and personal factors. There are several underlying demand models, namely: Attitude-Behavior-Situation Model, Value-Belief-Normative Theory Model, and Consumer behavior decision theory. Lazareva and Dong (2023) study on Chinese car buyers analyzed the impact of these three factors on consumer demand for electric vehicles using a Probit model, focusing on the impact of government policies in encouraging the willingness to buy electric vehicles. The results of the study showed that subsidy policies have a positive impact on consumers' willingness to buy electric vehicles, while tax reduction policies do not show an impact. Gender, education level and environmental awareness also affect consumer willingness, while the attributes of electric vehicles will reduce consumer interest. Based on the results of the study, it is suggested that the Chinese government should provide a series of campaigns to raise awareness of the importance of the environment.

A study by Axsen et al. (2021) using the theory of adoption and non-adoption of electric vehicle demand found that consumer perceptions of incentive policies, as well as immature perceptions of the environmental benefits and risks inherent in electric vehicle technology, indicate that economic incentives alone are not enough to make consumers consider using electric vehicles. The study found that there is widespread ignorance or misunderstanding about electric vehicles, so it is important to provide information to consumers to support the adoption of electric vehicles. The researchers emphasized the importance of information dissemination and adoption in adopting new technologies, as well as the perceptions of strangeness and trustworthiness of the technology identified by potential adopters or consumers. This is a barrier that shows the importance of 'normalizing' new technologies. The researchers also identified misunderstandings about other attributes such as driving range, safety, reliability, and charging time that affect consumer adoption.

According to the value-belief-norm theory, moral norms precede behavior. They are also connected to the values and beliefs that drive that behavior. Moral norms are individual beliefs about "right" behavior that lead to positive self-evaluation. Moral norms emerge from social norms, which are sets of standard behaviors that are considered "right" or "wrong" by a particular group in a particular situation. The content of moral norms comes from internalized social norms. For example, internalized social norms about environmental protection, such as the new ecological paradigm, encourage people to participate in actions that support the environment, such as reducing carbon dioxide emissions. This behavior is based on personal values, such as the biosphere, altruistic, or egoistic.

General beliefs and personal values are the yardsticks that individuals use to choose and validate situations, other people, and themselves. For example, views on the relationship between humans and the environment can be (1) considering humans as part of the environment; (2) considering that humans have the right to exploit their living environment; or (3) considering that humans and the living environment are interdependent. Perceptions like this influence individuals' ecological behavior.(Bridi and Alhosany, 2021)

Many previous studies on the factors of subsidies and tax incentives for EV demand have shown that although subsidies are important, consumers have higher satisfaction with tax incentives. Other studies have shown that direct government subsidies to consumers are more effective than tax incentives. Research shows that financial factors have a positive impact on demand, but in addition, improvements at the technical level of these vehicles also have an impact.(Gong,B., Wang, J. and Cheng,J.,2020)

RESEARCH METHOD

To study the demand for electric vehicles (EVs) among Indonesians in the upper middle income level, three research models were estimated using the Probit model (Elena I. Lazareva and Yinan Dong, 2023) as follows.

The original text states that three research models were used to study the demand for EVs in Indonesia. The models were estimated using the Probit model, which is a statistical model that is often used to predict binary outcomes.

Attitude-Behaviour-Situation Model study the impact of policy factors and product feature factors as situational factors affecting the purchase intention of electric vehicles. **This includes government policy. This model has the following equation:**

$yi = Pi\ \beta + \varepsilon i$ ………………………………… (1)

The Value-Belief-Normative Theory Model (VBN Model) states that consumer behavior decisions are directly influenced by three types of factors: values, beliefs, and norms. The model is formulated as follows:

$yi = Pi\ \beta 1 + Ci\ \beta 2 + \varepsilon i$ ………………………………(2)

Consumer behavior decision theory analyzes the motivations, attitudes and intentions of consumers to reveal the factors that influence consumer behavior and its development. This model examines the impact of individual characteristics on the demand for EVs. The variables included in this model are age, gender, income, education, and environmental awareness.

The formula is:

$$yi = Pi\ \beta1 + Ci\ \beta2 + Ei\ \beta3 + \varepsilon i \quad \text{.....(3)}$$

where: yi= the respondents' willingness to buy an electric vehicle or consumers' purchase intention; Pi= the respondents' attitudes about the different government policies; Ci=the basic information about the respondents; Ei= respondents' answers about the attributes of the EVs; εi= the error terms. This model examines the impact of both individual and vehicle characteristics on the demand for EVs. The variables included in this model are price, range, and charging infrastructure.

Behavioral intention (BI) = f(V, B, N), where: BI= the consumer's intention to perform a certain behavior, such as purchasing an electric vehicle; V=the consumer's values; B= the consumer's beliefs; N= the consumer's norms

The VBN Model is a theory of consumer behavior that was developed by Paul C. Stern and his colleagues in the 1990s. The model proposes that consumers' values, beliefs, and norms are the primary determinants of their behavior. **Values** are the things that are important to a consumer. For example, a consumer may value environmental protection, social responsibility, or financial savings. **Beliefs** are a consumer's perceptions about the world around them. For example, a consumer may believe that electric vehicles are better for the environment than traditional gasoline-powered vehicles. **Norms** are the social expectations about how a consumer should behave. For example, a consumer may feel a social obligation to purchase an electric vehicle if their friends and family members are doing so. The VBN Model has been used to explain a wide range of consumer behaviors, including purchasing decisions, energy consumption, and recycling behavior.

All these variables include cognitive-knowledge factors, which include the respondents' knowledge about the government policy and the environment, as our antecedent variables. Household demographic variables include the respondents' age, gender, education level, and income. The study will use two types of variables: cognitive-knowledge factors and household demographic variables.

Cognitive-knowledge factors are factors that are related to the respondents' knowledge about government policy and the environment. These factors can influence the respondents' attitudes towards and intentions to purchase an electric vehicle. **Household demographic variables** are factors that are related to the respondents' age, gender, education level, and income. These factors can also influence the respondents' attitudes towards and intentions to purchase an electric vehicle.

As a policy variable is government subsidies. Based on the rules officially set by the government regarding government subsidies for the purchase of battery-based electric vehicles, which include electric cars and motorcycles, will be in effect on March 20, 2023.(Kemenpan,2023).

For variable Ei, driving range, charging time, safety of the EV, charging facilities, and maintenance of the EV are included as variables to measure the attributes of the EV. Equation (3) is an addition of EV attribute variables to Equations (1) and (2). The model will be estimated using the Probit regression model.

The sample will be collected using the inverse square root method, which would lead to a minimum required sample size of 160 (Kock and Hadaya, 2016). Therefore, 160 samples are required for this investigation as a minimum.

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