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Impacts of Responding to Environmental Policy on the Development of Motor Corporation

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Abstract: In order to alleviate environmental pollution, many countries have launched a campaign to try to induce factories and other enterprises to reduce emissions of pollutants. One of the most important industries is the automobile industry, because automobile exhaust emission is one of the main causes of environmental pollution. So study the impacts of responding to environmental policy on the development of motor corporation, because it determines whether car companies are positive about environmental policy and the effectiveness of environmental policy. Through the review and summary of past literature, policy regulations and other information, as well as the analysis of the Toyota's development status and financial status. From the aspects of customers and enterprises, this paper explores the influence of policies on customers' intention to buy energy-saving cars and the influence of policies on enterprises' intention to research and develop energy-saving cars. Finally, the study finds that automobile companies' response to environmental protection policies has positive impacts on themselves

Keywords: new energy vehicles, environmental policy, Toyota

1. Introduction

Recent years have seen an increase in the intensity of global warming, which not only affects the stability of natural ecosystems but also poses a threat to both human and animal survival. Suffering from increasingly harsh climate conditions, how to control the continued deterioration of the environment has become the same goal for the whole world. One of the main reasons is that when people burn fossil fuels, such as oil, coal, etc.

In all over the world, exhaust emissions from gas-powered vehicles are a serious problem. Therefore, many countries began to develop more fuel efficient or new energy vehicles to reduce the environmental impact of vehicle exhaust emissions.

The purpose of this paper is to evaluate the effect of environmental policies on automobile companies. Nowadays, the attitude of automobile companies towards the environmental protection policy is worth studying and discussing. Almost all businesses are based on profit, so governments need to incentive enterprises through environmental policies, ensuring enterprises can make profits or receive benefits while undergoing transformation. Only by this, enterprises can have a positive and optimistic attitude towards the development and the sale of energy-saving vehicles.

The other part of this paper is analysis of the situation of Toyota Motor Company. Toyota Motor Corporation was one of the first companies to start the automotive energy transition, so its

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development is instructive. As a result, its development will affect the future predictions and judgments of developing car companies, which may influence the response of developing car companies to environmental policies.

2. Related Literature

This study analyzes factors which influence motor corporations' willingness to positively respond to environmental policies which were introduced in many countries. The first category of related literature is researches about car corporations that have willing to develop new technologies under some public subsidies or objective external factors which cause increasing need of fuel-efficient cars, as well as governments' support. The second category of related literature is Toyota motor's current year performance after they started to switch vehicle energy types.

2.1. The Willingness of Automobile Companies to Develop and Sell New Energy Vehicles

Several studies have shown that government subsidies and some external factors promote consumers' willingness to buy low emission and fuel-efficient cars. The study from Taiju Kitano's shows that government initiatives and financial incentives in Japan have increased customer demand for new-energy vehicles while lowering the number of older fuel-powered vehicles on the road, at the same time, it increased the profits of automobile enterprises [1]. In China, Ziying Yang& Manping Tang found that Chinese government published three policies to encourage Chinese to use fuel-efficient vehicles and new energy vehicles. It boosted sales of fuel-efficient cars, which meant that it encouraged car companies to produce fuel-efficient cars [2].

Government support also plays an important role. In China Plant Engineering, Ministry of Science and Technology of the People's Republic of China (MOST) presented that they organized the implementation of the national key research and development plan for new energy vehicles, continued to support new energy in various aspects, and supported the high-quality development of China's new energy vehicle industry [3].

2.2. The Impact of Developing Fuel-efficient Vehicles on Toyota Motor

As the world's oldest mass-produced hybrid car manufacturer, Toyota was the first to start the automotive energy transition, so this study will set Toyota as an example. In recent year, Mengyi Lu reported in Car issue that Toyota has made a series of plans and prospects for pure electric vehicles. Their strategies developed from popularizing pure electric versions for all vehicle lines, to increasing sales of electric models, to releasing more than 10 pure electric models in China [4]. From Toyota's president's speech, it showed that in the last year, Toyota was not as profitable as before, and they would increase their investment in expenditure [5].

3. Factors Which Influence the Willingness of Automobile Companies to Respond to Environmental Policies

This study analyzes two factors which influence automobile companies to respond to environmental policies. For most of automobile companies, they sell goods for profit or other benefits, and it is almost impossible for them to develop things which cost a lot but earn little. So there must be some factors which push or pull the development of automobile energy saving, so automobile companies can positively respond to environmental policies.

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3.1. Customer Purchase Intention

In order to encourage automobile companies to develop and sell new energy vehicles, some country set policies to push customers to choose fuel-efficient cars, and indirectly increased the willingness for innovation and transformation of the automotive industry. The explanations below are some situations that how government encourage customers to buy fuel-efficient cars according to publish environmental policy.

3.1.1. Environmental Policy in Japanese Market

The 2010 target fuel economy standard, which automakers were obligated to meet by that year, was the original fuel efficiency goal introduced in 1999. The corporate average fuel economy by weight category was controlled by this criteria. There were two categories of low emission certification: 50% and 75% reductions. And then motor corporations in Japan producing new eco-cars based on these standards. To encourage customer to buy eco-cars, replacing their regular cars, Japanese company introduced a new subsidy policy.

The subsidies measure for the regular cars contained two parts, one was RP, the other was NRP. For RP, if old car owners scraped their car and bought new one that achieve 2010 fuel economy standards, they would receive the subsidy. For NRP, buyers would be eligible for the subsidy if they purchased vehicles with fuel economy ratings that were 15% higher than the 2010 fuel economy standards objective and were certified to reduce emissions by 75% [1].

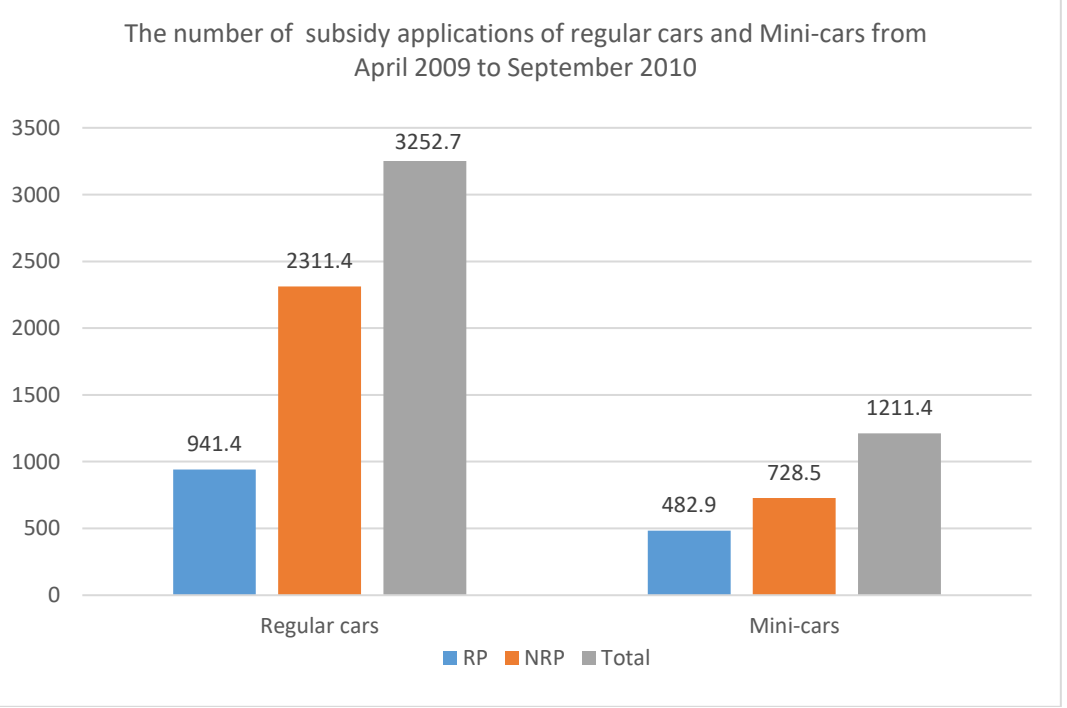

Figure 1: The number of subsidy applications of regular cars and Mini-cars from April 2009 to September 2010.

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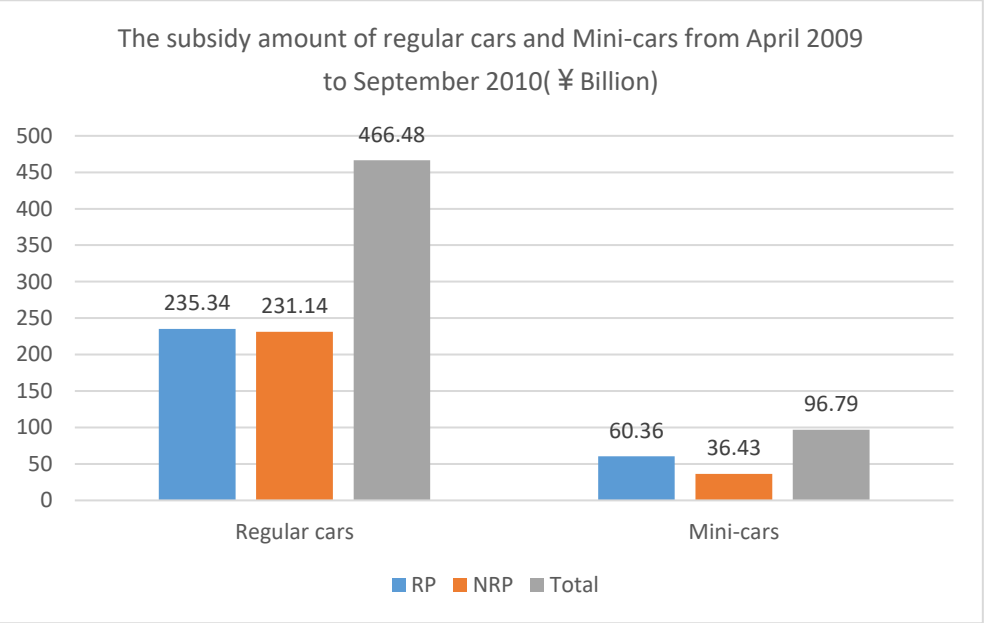

Figure 2: The subsidy amount of regular cars and Mini-cars from April 2009 to September 2010 (￥Billion).

From figure 1 and 2, it could be seen that the Japanese government spent a lot on environmental subsidies, and RP played a more important role in this program, which could encourage customers to buy eco-cars and give up the old car. And then, because of rapidly increasing market demand, car companies preferred to produce and sell eco-cars.

3.1.2. Environmental Policy in Chinese Market

The usage tax on vehicles and vessels must be paid in China by the owner or manager of the vehicle or vessel. In 2011, Chinese government punished a new policy, which mentioned that VVUT could be exempted for cars with new energy and vehicles that were conducive to energy conservation [2]. According to Fig. 3 below, market shares of fuel-efficient cars increased after the VVUT was put into place, while those of fuel-inefficient cars decreased.

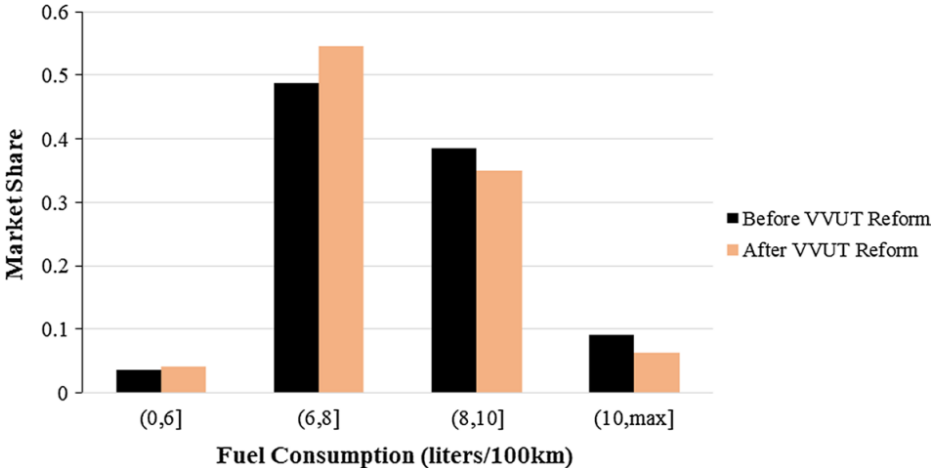

Figure 3: Market shares of cars by fuel efficiency before and after the VVUT reform (data source: Yang, Z., Tang, M.: Welfare Analysis of Government Subsidy Programs for Fuel-Efficient Vehicles and New Energy Vehicles in China. Environ Resource Econ 74, 911–937 (2019).)

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Additionally, China created a national program of subsidies for fuel-efficient cars on June 30, 2010, allowing qualifying consumers a one-time direct deduction of 3,000 yuan per car for fuel-efficient vehicles [2].

According to the examples in China, it could be seen that Chinese environmental policies provided people who use fuel-efficient cars generous subsidy, which successfully increased the market shares of fuel-efficient cars. A growing market can be an incentive to all companies.

3.1.3. Environmental Policy in the United States Market

In the United States, government also encouraged people to purchase PVEs by setting some policies, such as rebates, tax credits for income, and exemptions from excise taxes. To be more specific, in the following part, some examples in 2011's policies will be shown. 13 states established rebate schemes in 2011, when the government gave cash rebates to anyone who purchased or leased eligible PEVs. Credit for state income taxes paid by individuals was established in seven jurisdictions. And there were 4 regions which provided excise tax exemption to the qualified PEVs buyers [6].

In Haobing Liu and the other teammates' research, the study calculated monthly BEV and PHEV sales per million people in each state. The volume of purchasing of BEVs and PHEVs increased rapidly from January 2011 to December 2018 [6].

Overall, in the American case, government successfully stimulated the public's desire to buy energy-saving cars, which might also raise motor companies' willingness to develop and sell energy-saving cars.

3.2. Government Support for the Auto Industry's Switch to Fuel-efficient Models

Except motivating customers to buy fuel-efficient cars, government support is also a factor that push motor companies to develop fuel-efficient vehicles. In many commercial fields, if a company wants to achieve innovative development, it needs to invest a lot of money and research personnel up front, which means companies have to take risks in research and development of new products including the revenue from new products does not cover the upfront research and development costs, negative customer feedback, or research failure. For example, in 2016, Juicero invented a kind of juicer which claimed to have powerful juicing function without cleaning. But at last, some customers found that juicing by hand produced about the same amount of juice as this juicer. And then, the company lost customers quickly and went bankrupt.

Above these, companies are hard to make decisions about whether to develop new products. However, if governments are willing to provide some technical support or subsidize the company, more companies may be willing to develop new products, because governments can take part of the cost and risk. This part will analyze the government support, which promote the environmental transformation of the automobile industry by some friendly policies, setting China as an example.

3.2.1. Subsidies for the Promotion and Application of New Energy Vehicles

In China, government published "New energy vehicle subsidy Standard" to subsidize new energy vehicle enterprises. The "New Energy Vehicle Subsidy Standard" is a standard created to carry out The State Council's objectives for developing strategic emerging sectors and stepping up efforts to reduce emissions and conserve energy. According to the statistics, in this period, advance funds due this time are 11522901 millions in total [7].

According to document, it can be seen that Chinese government cost a lot in subsidizing new energy vehicle companies. Some larger new energy vehicle companies, such as BYD (364731millons) and Tesla (124034 millions), received more subsidies, which meant that these companies had more advanced products in the new energy vehicle market and occupied a larger share, and maybe

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development costs were greater [7]. In Du Yunchao and Li Mingwei's research, they came to the conclusion that financial subsidies could raise the enterprise value of companies which involved in the new energy automobile industry chain, effectively encourage an increase in enterprise R&D investment, directly lessen the financial pressure on businesses, reduce the risk associated with R&D investment, and raise R&D confidence [8]. So in our case, subsidies under policies can offset development costs to some extent, and the money that the enterprise needs to pay is reduced, which may improve the enthusiasm of enterprises for the research and development of new energy vehicles.

In recent years, because of China's strategic planning and policy support for new energy vehicles, the annual production and sales volume of new energy vehicles have reached 7.058 million and 6.887 million, respectively. In 2022, they continued to produce and sell at the highest rates in the world for the eighth year in a row. The penetration rate of new energy vehicles was also increasing, reaching 25.6% in 2022 [9]. China's subsidy policy has had a positive influence on the development and sale of new energy vehicles.

3.2.2. Provide Technical Support in R&D

In China, Xu Qianxian, deputy director of the Department of High-tech of the Ministry of Science and Technology, said at the 2021 China Automotive Industry Development (TEDA) International Forum. The Chinese Ministry of Science and Technology will adhere to the development direction of electrification, intelligence and networking. Implementing the national key research and development plan for new energy vehicles is organized with a focus on the industrial chain, supply chain, key link innovation chain, from the energy power, electric drive system, intelligent driving, vehicle network integration, support technology, and vehicle platform to continue to support the development of new energy vehicle key technologies, support, and lead the high-quality development of China's new energy vehicle industry [3].

Official government organizations conducting research and development of new energy technologies can help the energy transformation of automobiles get down faster and reduce the research and development pressure of automobile companies.

4. Respond to the Impact of Environmental Policies on the Company's Performance--Take Toyota for an Example

Until now, there are some motor companies which have already produced energy-efficient cars for a long time. Analyzing their performances can provide insight into the market's acceptance of fuel-efficient vehicles. From this, more automotive companies in the midst of the energy transition can have a forecast for the future. If the old companies are not doing well, even government provides a great amount of support, developing automotive companies may not choose to respond to environmental policies.

As the world's oldest mass-produced hybrid car manufacturer, Toyota's company performances are very useful for other companies.

4.1. Energy Transformation of Toyota Motor Corporation

Toyota unveiled its "Toyota Environmental Challenge 2050" initiative in 2015. By lowering CO2 emissions from factories and cars, the approach seeks to establish a social environment in which people and nature can coexist. Toyota was proud of its petrol-electric hybrid vehicles, but China's new energy subsidy policy didn't give them more help. A small number of fuel cell vehicles were covered by the relevant subsidy support schemes, which were mostly for pure electric and plug-in hybrid electric vehicles.

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In the face of increasingly fierce competition in the new energy vehicle market, FAW Toyota was aware that in order to maintain long-term competitiveness, it must have new actions. Toyota published a new energy challenge plan for the years 2020 to 2030 at the end of 2017. In this new plan, Toyota has made a series of plans and prospects for pure electric vehicles that have been ignored. From the popularization of pure electric versions of all vehicle lines to increasing the sales of electric models, more than 10 pure electric models have been launched in China. Since then, Toyota has started the transition from oil hybrid vehicles to pure electric vehicles [4]. Dow Jones & Company provided the information that Toyota will launch its next generation of battery-electric vehicles in 2026[10].

From this example, it can be known that even large car brands need to constantly innovate and improve in order to remain competitive in the market. And environmental policy, by raising standards, can incentive car companies to make further energy transitions.

4.2. Financial Performance of Toyota Motor Company in Recent Years

Financial performance of the company is one of the indicators that reflects the performance of a company. This part analyzes the financial performance of Toyota Motor Company when the company is making the automotive energy transition, which can reflect the market's acceptance of new energy vehicles to a certain extent and guide the company's future development direction.

The figure below is the financial data of Toyota Motor Company from 2015 to 2022. It demonstrates that from 2015 to 2017, when the company was transitioning from oil vehicles to hybrid electric vehicles, the gross margin rate, operating margin rate and net margin rate all increased at first, but fell down after that. Then, from 2018, company started to sell pure electric vehicles, and the following financial data showed a rising trend in general, as well as fluctuations in the middle [11].

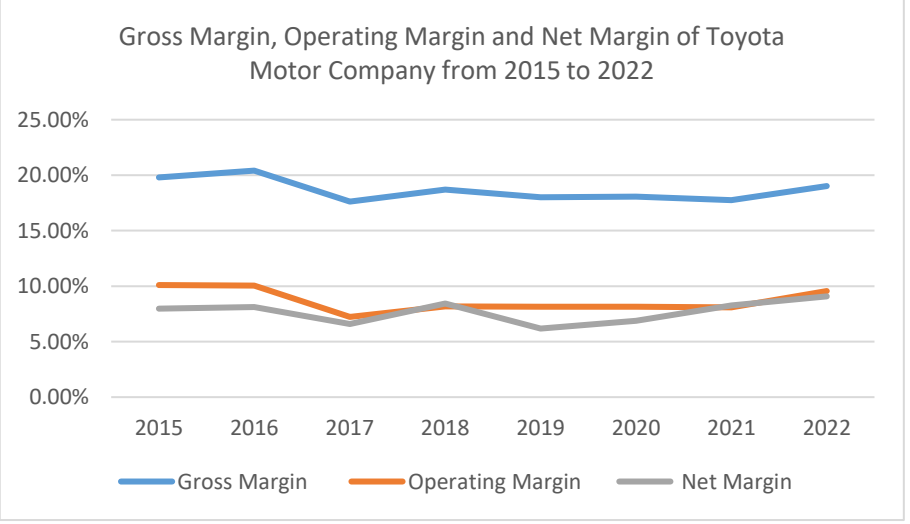

Figure 4: Gross Margin, Operating Margin and Net Margin of Toyota Motor Company from 2015 to 2022.

From figure 4, it can be seen that energy transformation Can increase the company's earnings. But there are also some unstable factors, such as President of Toyota, Koji Sato, mentioned that in 2022, materials prices soared and the business will boost existing R&D and capital investment spending by about 3 trillion yen, which can cause a big cut in revenue [5].

By the above analysis, Toyota can get profit growth while switching to energy sources in response to environmental policies. It can provide a reference for the direction of development of other

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automobile companies, and increase the confidence of other automobile companies in the development of energy conversion.

5. Conclusion

Under such serious environmental problems, all countries are trying to make some policies to reduce environmental pollution. For the automotive industry, it is important to improve fuel economy, reduce polluting gas emissions, and use clean energy.

In this study, the paper found that many of the policies stimulate innovation in the automotive industry from two aspects, customer aspect and company aspect. Customers who are more eager to purchase new energy vehicles have greater demand for them, a larger market for them, and higher sales of those vehicles, which encourages more automakers to produce and market new energy vehicles. As for companies, governments provide technical and financial support, which can reduce R&D costs and transformation risks for automotive companies. In terms of the Toyota's development and financial situation, we can find that after the new energy transition in response to environmental policies, the company's situation is moving in a positive direction. From the analysis of this article, we can draw a conclusion that responding to environmental policies can have a positive impact on car companies.

But the study has significant limits as well. Because new energy vehicle development is still in its early phases, it is unclear whether the energy transition will make the auto industry viable. This can only be determined with the help of additional future research and data. Besides, this paper does not consider the influence of some external factors, such as battery development and charging pile setup.

It is hoped that more information and data can be obtained for analysis in future studies.

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