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Research on Cost Management and Strategy Optimization of China's Energy Vehicle Industry under the Background of Double-Carbon Strategy

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Abstract: Based on China's current massive carbon emissions and guided by its sustainable development strategy, China implemented a "double carbon" strategy in September 2020 with the intention of reducing the country's carbon emissions in the future. In the automotive industry, new energy vehicles, which do not emit greenhouse gases while driving, have been emphasized, and many automotive companies have joined the ranks of research and development of new energy vehicles, and their market penetration rate is increasing year by year. Through literature analysis and survey methods, it is found that domestic automobile enterprises mainly face three problems: high manufacturing cost, difficulty in controlling the cost of power batteries, large investment in R&D, fierce competition in core technology, and price war to squeeze the market share of domestic enterprises. After analysis, this paper believes that automotive enterprises and the government can solve the problem by increasing the development of mineral resources to ensure the supply of minerals, sharing the R&D costs and improving the efficiency of R&D, and helping each other to protect the domestic market share of domestic enterprises. Thus, we can promote the realization of the “Double-Carbon” goal.

Keywords: “Double Carbon” strategy, new energy vehicles, cost management

1. Introduction

1.1. Research Background

Since the reform and opening up, China has achieved rapid economic growth and is now the second-largest economy in the world. Still, the price of such development is a series of problems, such as environmental pollution. In 2020, China's total carbon emissions will be 9.894 billion tons, accounting for 30.7% of the world, and it is undoubtedly the largest coal consumer. Based on the sustainable development strategy and the need for a new generation of industrial restructuring, China proposed a Double-Carbon Policy in 2020. And China will achieve "carbon peaking" by 2030, i.e., carbon emissions will not increase after reaching the peak, and "carbon neutral" by 2060, i.e., the amount of carbon emitted and absorbed will be equal.

In the context of the Double-Carbon policy, China's automotive industry faces a series of reforms, with "oil cars" and "trams" at the center of the reform. According to the estimation of the China Automotive Technology Research Center, the total life-cycle carbon emissions of China's automobile

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industry will exceed 1.2 billion tons of carbon dioxide equivalent in 2022, among which the life-cycle carbon emissions of passenger cars will exceed 700 million tons of carbon dioxide equivalent. The decarbonization process of passenger cars and the promotion of new energy vehicles are important to achieve the "Double-Carbon" target [1]. In 2022, China will sell 26.86 million vehicles, of which 6.7 million will be new energy vehicles, an increase of 90.3% year-on-year, and the increase in sales of new energy vehicles will undoubtedly be an important contribution to achieving the "Double-Carbon" target.

Compared to traditional energy vehicles, new energy vehicles are a new industry with much higher research and production costs than traditional vehicles, which has led China to introduce policies such as financial subsidies for companies producing new energy vehicles. However, due to the late start of the development of new energy vehicles in China, the low R&D technology capability and many shortcomings, as well as the fact that traditional energy vehicles firmly occupy a large market share, many companies producing new energy vehicles have higher production costs than sales revenue and end up losing money even with government subsidies. Therefore, it is important to study the cost management of the new energy vehicle industry, analyze more reasonable cost management methods, promote the development of new energy vehicles, and promote the realization of the "Double-Carbon" goal.

1.2. Literature Review

Xiao analyzed the cost-effectiveness and cost management model of new energy vehicles of Qilu Automobile Company and concluded that the study of small-scale automobile companies is complementary to promote the efficiency improvement of the new energy vehicle industry and at the same time, can accelerate the development of new energy vehicles.

Zhang adopts the whole life cycle cost management theory to divide the life cycle of new energy vehicles, considers the related costs one by one, and finally proposes insights into developing the new energy vehicle industry.

Zhang believes that controlling the cost of electric vehicles and promoting and using them on a large scale through a series of means is a major problem that still needs to be solved in the electric vehicle industry today. He also analyzed the factors affecting the cost of electric vehicles and proposed corresponding management measures to help develop the electric vehicle industry.

1.3. Research Gap

Most scholars have studied the cost of new energy vehicles in the past. In contrast, few scholars have studied the cost of new energy vehicles after China implemented the dual-carbon strategy in 2022 [2]. Based on the Double-Carbon policy, this paper analyzes China's new energy vehicles' cost composition and management mode and explores how to optimize the existing mode.

1.4. Research Framework

First, summarize the current situation of new energy vehicles, then analyze the existing problems and reasons, and finally propose corresponding optimization strategies.

2. Methods

2.1. Literature Analysis Method

The literature analysis method mainly refers to collecting, selecting, and sifting through a large amount of literature, picking out the literature that has a guiding effect on the research, integrating the central ideas of this literature into a complete logical structure as the main body, and adding new

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conclusions drawn through the research to this logic. Through the study of various literature, this paper summarizes other scholars' corporate cost management concepts and the general perceptions of new energy vehicles. On this basis, this paper integrates them into methods to conduct reasonable cost control and management of new energy vehicles to promote the sustainable development of the new energy vehicle industry.

2.2. Survey Method

The survey method is a fairly common research method. After the researchers determine the research objectives, they directly seek to collect data and related materials about the research objectives. They analyze, compare and process these data in a series of mathematical processes and finally draw conclusions with universal laws. This paper will collect various statistical data on new energy vehicles, such as production and research costs, integrate them one by one, and finally form effective conclusions on the cost management of new energy vehicles.

3. Result

3.1. Research Status

After implementing the Double-Carbon policy, the carbon reduction task in China's automotive industry has greatly increased. Traditional energy vehicles use a lot of fossil fuels, which produce a lot of greenhouse gases and consume more energy. In contrast, new energy vehicles use non-fossil fuels to generate electricity, which is more low-carbon and environmentally friendly and consumes less energy than fuel vehicles. Therefore, under the Double-Carbon policy, the development of new energy vehicles with more low-carbon will be the main trend of the future development of the automotive industry. In the past decade, China's equipment manufacturing industry has gained a lot in car ownership; its figures have increased significantly from 120 million units in 2012 to 417 million units today. In addition, new energy vehicles' production and sales volume has ranked first worldwide for seven consecutive years [3]. With the support of the Double-Carbon policy, new energy vehicles, which do not produce carbon emissions during the driving process, are bound to be taken care of by many parties. Companies developing new energy vehicles will also receive more care and subsidies in the policy.

However, China's new energy vehicle industry started later than foreign countries, and the overall gap is not small. Tesla, the largest foreign and world's largest new energy vehicle company, and BYD, China's largest new energy vehicle company, are significantly better than BYD's new energy vehicles in terms of electric consumption, range; and other aspects of the three electric systems, i.e., electric motor, power battery, and electric control system; and in terms of intelligence, such as operating system and intelligent network connection, BYD is also distanced from Tesla [4]. This series of gaps will lead to the sales of domestic new energy vehicles, such as China's domestic tram power battery does not meet the standards of other countries, will face international green trade barriers, and can not achieve export sales. A large number of the domestic market share is occupied by foreign car companies such as Tesla, squeezing the survival space of new domestic energy car companies, resulting in sales of cars that can not make up for the income of research and development and production. As a result, the revenue from the sale of cars cannot cover the cost of R&D and production, which has crushed a large number of small and medium-sized auto enterprises.

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3.2. Existing Problems and Reasons

3.2.1. High Manufacturing Cost is Difficult to Control Cost of Power Battery

The biggest concern about new energy vehicles is the range, which relies on the power battery, which is the bulk of the manufacturing cost of an electric car, accounting for nearly 40% of the cost of the entire vehicle. However, in manufacturing, raw materials required for power batteries, cobalt, lithium, nickel, and other metal minerals in the country are extremely scarce. Hence, domestic power batteries rely heavily on imports, resulting in frequent cost changes. Previously in an auction in Australia, a lithium mine shot a sky-high price of $ 2,240/ton [5], which can be seen in these scarce metals. The price of the market is expected to change significantly. This has led to uncontrollable production costs.

In addition to the cost of power batteries, the cost of chips should not be underestimated. According to data, a new energy vehicle needs at least 1000 chips, and the price of automotive chips has risen tremendously in the market. Some bad businessmen even inflated prices, resulting in some car chip prices rising by more than 30 times [6], which extremely affects the production cost of cars, especially small and medium-sized car companies; it is difficult to afford such expensive manufacturing costs.

3.2.2. Large Investment in R&D and Fierce Competition in Core Technology

In today's era of automotive intelligence, the most important thing is the core technology and innovation ability, which is the key for automotive companies to stand out in the industry competition. Hence, the cost of investment in research and development is also a huge expenditure for producing new energy vehicles. According to statistics, BYD's R&D expenditure in the first three quarters of 2022 amounted to 10.87 billion yuan, SAIC's 12.66 billion yuan, and Great Wall Motor's 8.544 billion yuan, most of which were spent on developing cars up to intelligence [7]. This shows that the industry's leading enterprises attach great importance to R&D investment. However, other small and medium-sized enterprises do not have such abundant funds but still follow these leading enterprises to invest most of the funds in R & D. As a result, the developed products are not as good as those of leading enterprises. The funds become a sunk cost, resulting in losses more than worth the loss.

3.2.3. Price War Squeeze Domestic Enterprises Market Share

In September 2022 and the three months after that, Tesla, the world's largest new energy vehicle company, made several price cuts, setting off a price war. And a week after Tesla's price cut in China, its average daily sales in the Chinese market increased to 76% year-on-year, taking up a large market share [8]. Under such competitive pressure, a number of domestic new energy car companies had to reduce prices at the same time or face the risk of being eliminated from the market, which led to a considerable part of the already poorly financed enterprises can no longer be able to afford the cost, have withdrawn from the market, becoming victims of industry competition.

4. Discussion

4.1. Increase Mineral Resources Development and Secure Mineral Supply

The price of minerals is the key factor affecting the manufacturing cost of new energy vehicles. Because whether it is a powerful battery or chip, reducing the manufacturing cost of these core components of new energy vehicles is an important measure for the development of the whole industry, and the main raw material of these core components is from mineral resources. The current high mineral prices are daunting to many emerging enterprises. In order to promote the development of China's new energy vehicle industry, the government must vigorously research and develop mineral technology and enhance the domestic supply of minerals to reduce the cost of minerals purchased by

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domestic new energy vehicle enterprises. However, the improvement of technology cannot be easily achieved overnight. Under the current situation of insufficient supply of mineral resources in the market, domestic enterprises and foreign mineral supply chains should reach a friendly cooperation relationship, thus supplying raw materials from abroad at lower prices, such as getting some control of overseas supply chains through equity investment, so as to stabilize supply prices to a certain extent when mineral prices change and better protect Mineral supply. In addition, mineral prices are constantly fluctuating, so companies in the industry need to keep an eye on mineral prices and increase their inventory of mineral resources regularly to enhance their ability to resist mineral price fluctuations, to achieve the purpose of cost control.

4.2. Shared R&D Costs and Improved R&D Efficiency

Most of the production cost of a new energy vehicle comes from the manufacturing cost of power battery and other components, and improving the R&D capability of enterprises will be able to use raw materials more effectively, develop better quality batteries, improve the quality and capacity of batteries and the charging efficiency of batteries, make the power battery have a stronger range, and manufacture batteries in a more efficient way, so as to achieve the purpose of reducing manufacturing costs. However, many domestic small and medium-sized automotive enterprises are already short of funds and can not invest too much money in research and development. Blindly following the leading enterprises to conduct research and development will not be worth the loss. Therefore, these enterprises can cooperate through joint ventures to produce power batteries and other components and share the costs equally. Without the financial pressure, enterprises can better play their own unique, innovative ability to develop better quality components and reduce future R&D costs.

In addition, in terms of power batteries, domestic enterprises can also recycle the batteries while carrying out continuous technological innovation to continuously improve the battery range and reach a closed-loop material use throughout the life cycle [9]. This can also reduce manufacturing costs and save R&D costs to a certain extent.

4.3. Chinese Domestic Industry Companies Protect the Domestic Market Share Jointly

The Chinese market has considerable interests. Foreign auto companies often use price cuts to initiate price wars to gain domestic market share so consumers will buy more products. Such fierce competition will make many small and medium-sized enterprises unable to bear the losses caused by lower prices, which can only lead to deficits in step-by-step price cuts and eventually being forced out of the industry. When foreign auto enterprises occupy the domestic market share, the market share of most domestic auto enterprises will be squeezed, and the loss is in the interest of all domestic auto enterprises. Therefore, in order to protect their own economic interests, the upstream auto enterprises in the industry can consider giving concessions to the middle and downstream enterprises to a certain extent, reach a cooperative relationship, and sign an agreement in a price war to jointly stabilize prices against foreign enterprises. The government can also increase part of the subsidies for small and medium-sized enterprises by means of fiscal expenditure to encourage the development of domestic enterprises and establish certain trade barriers by raising tariffs and reducing the number of imports to protect the domestic market share and maintain price stability [10].

5. Conclusion

5.1. Findings

In the context of China's Double-Carbon policy, low-carbon new energy vehicles will be the focus of development and will be in a high growth phase with a much faster penetration rate. With the

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popularity of new energy vehicles, the future market environment will become increasingly friendly, and the industry's value will increase. So many auto companies will enter the industry, hoping to occupy a part of the market share and benefit from it.

However, the biggest variable in the new energy vehicle market is still the price fluctuation of raw materials and minerals and the epidemic that has just passed, in which the epidemic has led to the bottom of China's fiscal spending, and in 2023 China will stop the financial subsidies for the new energy vehicle industry. The subsidies will be withdrawn to bring a new round of market price adjustment, the industry competition will intensify, and the head enterprises will be more concentrated. For the rest of the automotive companies to survive and achieve profits in such a tough market environment, reasonable cost management tools are essential.

Therefore, these automotive companies need to increase the inventory of raw materials such as minerals to resist the risk of price fluctuations in manufacturing costs and joint ventures with other companies for scientific and technological innovation in R&D costs. Recycle power batteries after use to save costs and establish cooperation with each other to protect the domestic market share when invaded by foreign companies to achieve sustainable industry chain development, which is important for realizing the Double-Carbon policy goal.

5.2. Limitations and Future Study

This paper focuses on the cost of new energy vehicles in the context of the "double carbon" policy, but does not study the other policies and factors that affect the development of new energy vehicles in detail. At present, consumers still prefer to buy traditional cars, especially in northern China, where the range of new energy vehicles is much lower than that of traditional cars in winter, so the factors and preferences of consumers in choosing the type of cars should also be taken into account in the profitability of auto companies. These are some of the limitations of this paper, and are also areas that need to be improved in the future.

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