

Whether Chinese New Energy Vehicle Can Beat Tesla in a Foreseeable Future

Jiajin An^{1,†}, Zhizhen Chen^{2,†}, Jichao Luo^{3,†,*}

¹ BSC Mathematics, University of Liverpool, Liverpool, L693BX, UK

² Mathematics, St Catherine's College, University of Oxford, Oxford, OX1 3UJ, UK

³ International College, University of Liverpool, Liverpool, L7 3FA, UK OEM

*Corresponding author. Email: psjluo8@liverpool.ac.uk

† These authors contributed equally

ABSTRACT

In today's world, the typical gasoline automobile is progressively being phased out in many nations due to their emission of carbon dioxide, which not only increases glacier melting but also has a multitude of other negative consequences such as the increased occurrence of extreme weather. In terms of petrol car replacement, new energy cars appear to be the only viable option. Tesla has topped the list of the world's most prominent new-energy vehicles (NEV) for decades. However, in recent years, Chinese firms such as BYD have been catching up with their yearly sales growth. More importantly, it is critical for a nation like China, which has a huge demand for automobiles and a population of 1.4 billion people, to take the lead in manufacturing. With this insight in mind, this study looked at six major criteria that have a significant impact on new-energy vehicles, compared Tesla and Chinese manufacturers in three categories, and offered some novel recommendations for how Chinese businesses might outperform Tesla.

Keywords: *New energy cars; Tesla; BYD; Automobiles.*

1. INTRODUCTION

1.1. Background

There is no doubt that global oil reserves are limited, and several major economies are facing severe energy shortages. At present, the development of the traditional automobile industry has been greatly threatened. The self-sufficiency rate of oil in the world's major economies is very low. The largest consumer market of oil vehicles is the United States whose self-sufficiency rate is only 33%. Japan, Germany, France and Italy, none of them achieve a rate high than 10%. Considering the increasingly unstable international situation, ensuring the security of the oil supply has become a difficult problem that every government must face. So, encouraging the development of new energy vehicles and reducing dependence on imported oil has been an important part that the government of every country need to consider when formulating the automobile industry policy.

The transformation into the new energy vehicles industry has become an inevitable choice for the sustainable development of the world automobile industry. Considering the rise of oil prices, some new

energy vehicles show a relative cost advantage. Some consumers abandon traditional vehicles they wanted to buy and opt for new energy vehicles with relatively low fuel consumption. Automobile manufacturers also anticipated the development space of new energy vehicles and began to carry out large efforts to research. The government also issued some preferential policies to subsidize the purchase and sale of new energy vehicles. The new energy vehicle industry presents a bright prospect.

1.2. Related research

Research on China's new energy vehicles and Tesla has become a hot topic, attracting the attention of many scholars. Some views are as follows. Zeng et al. examined all of China's existing new energy sources, including hydropower, nuclear power, wind power, and solar power. It went over each group's current condition and plans. According to the paper's quantitative study, thermal power remains dominant in China, although new energy deployed has outpaced thermal energy since 2011. In the future, according to Zeng, hydropower will be the most important source of fresh energy.

Furthermore, the Chinese government prioritized the development of new energy, with excellent results [1]. Gong et al. outlined the Chinese government's efforts to produce new energy vehicles from 1995, as well as assessing the status of new energy vehicle development. Despite the government's milestone, Gong highlighted that the obstacles posed by inferior technology and immature goods remain genuine. On the other hand, Gong believes that the new energy program signifies that the development of new energy vehicles has a promising future. Gong recommends that the Chinese government continue to provide financial and technical assistance [2]. Liu et al. analyzed the history of new energy vehicle development and outlined the challenges that China is now experiencing. Liu and his team provided a thorough introduction by offering numerical and analytical analyses of four technological pathways. China, in general, faces several hurdles, including stringent legislation, varying customer preferences, and demanding standards for new energy vehicles. Liu also mentioned that although development takes a long period, it is necessary [3].

Ma et al. saw the program as primarily aimed at incentivizing people to purchase new energy vehicles. Ma devised a regression model to assess the efficacy of various government-instituted elements, both long-term and short-term. The long-term evaluation turns out to be more effective than the short-term review, and the tax-free effect has the greatest impact on the long-term effect. Ma urged the Chinese government to reduce the subsidies while improving administrative procedures [4]. Saxena and Vibhandik evaluated every aspect of Tesla's competitive strategy, and how the firm interacts with the market environment. Tesla's qualities and the strategy they used to position, diversify, enter and expand into the automobile industry is critically analyzed. Firstly, the author described the characteristics and market strategy of Tesla and its distinction from the rest of the competitive firms. Tesla's corporate strategy and competitive strategy are discussed in terms of product strategy and market strategy. On the other hand, the author used Porter Five Forces Model to compare and analyze the market competition environment with Tesla. Vibhandik indicates whether Tesla will continue to flourish or will be affected by emerging market challenges is a story bound to be followed keenly [5]. Mangram studied the development of the market, technology, and infrastructure, analyzes tesla's motor products and the competitive situation of new energy, in addition, Mangram using SWOT model analysis, tesla's

advantages and disadvantages, opportunities, and threats are summarized and formulated a series of marketing strategy, tesla's positioning is high-end luxury cars. Beyond that, Tesla must continue to focus on building brand recognition, optimizing its cost structure, and building an Apple-like sales/distribution infrastructure. Just as Apple revolutionized the experience of buying a computer, Tesla will revolutionize the experience of buying a car [6].

Alghalith, through SWOT analysis of Tesla cars, found that there is no denying that Tesla faces as many threats and weaknesses as its strengths and opportunities. Most car companies do not have to worry about competition from alternatives because of the lack of effective alternatives to cars. Nor do they have to worry about competition from new entrants because the barriers to entry are high. Finally, many car companies do not have to worry about pressure from consumers, because most consumers do not have high bargaining power. Car companies are mainly worried about competition from other car companies and pressure from suppliers. New companies need to be prepared to deal with harsh criticism, rapid turnover, and intense competition -- especially when they compete in a technology-dependent industry [7]. Na, through PEST model analysis, analyzes that the electric vehicle industry has a great space for development. Secondly, according to the analysis of Porter's Five Forces model, Tesla has a stable market position in the industry. In general, Tesla's advantages are significant, but Tesla needs to continue research and development to maintain product differentiation and technological advantages. Third, through the analysis of Tesla's market positioning, it still aims at high-net-worth people but should expand to the middle class in the future. Fourthly, Tesla fully understands customer needs, keeps innovating, solves customer pain points, and attracts many customers through direct sales [8].

As shown in Figure 1, Thomas and Maine examine the emergence of Tesla Motors and analyse its commercialization of electric vehicles through an in-depth case study. Drawing on both primary and secondary data, Thomas and Maine construct a performance trajectory depicting Tesla's entry into the automotive market and demonstrate that Tesla Motors has not followed a disruptive innovation strategy. Instead, Tesla's commercialization strategy is explained through the lens of Architectural Innovation and the Attacker's Advantage. Implications are provided for new entrants [9].

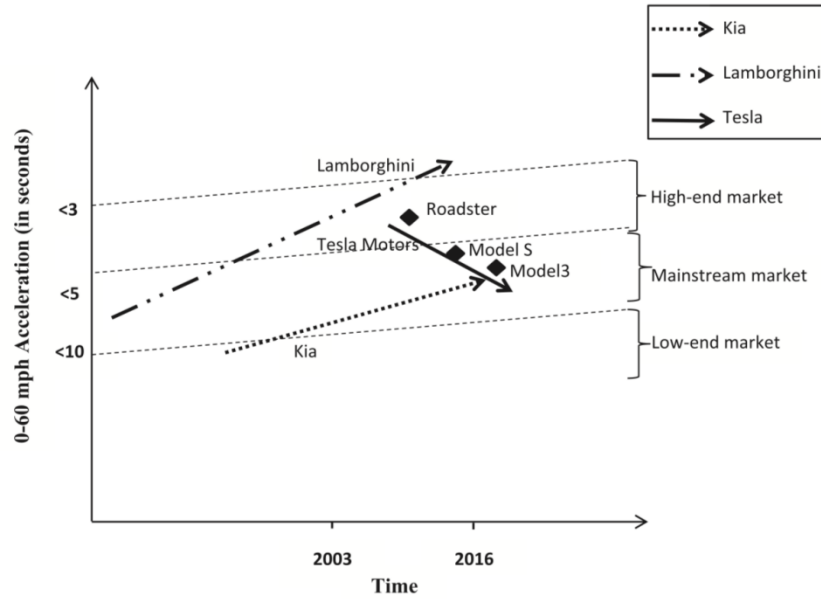


Figure 1. Different car models' 0-60mph acceleration of new entrants [9]

Khan conducts a study that applies qualitative research methods to evaluate the entrepreneurial roles and leadership styles of Elon Musk in Tesla motors. The results unfold Musk's leadership attributes and shows that they match with all the traditional leadership approaches. Khan gives a guideline for the new entrepreneur and will provide some distinctive ways of improvement in existing entrepreneurship as well as for management literature [10]. Cheong and Hu investigate how the choice of competition of the simultaneous pursuit of collaboration and competition dynamically impacts both the participating firms and the other self-developing ones in the same market. A conceptual framework of mathematical models obtained from multi-period analysis of an exemplar case of competition, the two concurrently ongoing competition partnerships in the US electric vehicle (EV) market, the Tesla Motors-Daimler AG alliance and the Tesla Motors-Toyota alliance and the other firms which are not involved in competition [11].

1.3. Objective

This paper used an PESTEL model to examine the new-energy vehicle sector from six different perspectives, taking into consideration any current industry. These six factors, which include politics, economics, society, technology, ethics, and law, all united to demonstrate how new energy vehicles are unique and necessary for anybody working in the business or outside of it. There are many aspects that might impact the growth of new-energy vehicles, as demonstrated in the article below, which provides a straightforward method of thinking about how to develop for a manufacturer to become the top of the industry.

2. PESTEL

2.1. Political

The coherence of American policies cannot be guaranteed. For example, the anti-establishment group represented by Trump and the establishment group represented by Biden have a huge swing in their policy support for the new energy automobile industry. The industrial layout for the new energy electrification era has yet to be completed. The coherence will have a huge impact on whether the United States can maintain its dominant position.

Due to different political systems, China has more stable policy support for the new energy industry based on the predetermined strategy of "Made in China 2025" and a more positive attitude towards the industrial upgrading of various industries.

2.2. Economic

Due to the impact of the epidemic, the United States frequently adopts direct subsidy fiscal stimulus programs to increase income and support household consumption, which has a short-term stimulus effect on the new energy vehicle industry.

As production and economic activities resume after the epidemic, China is more inclined to make efforts from the enterprise side, such as cutting taxes and fees for small and medium-sized enterprises, providing special loans with financial discounts, and issuing targeted subsidies. It is helpful to provide lateral help in important areas such as infrastructure, production and employment.

2.3. Society

The topic of reducing carbon emissions is becoming increasingly urgent as the world's attention shifts to climate change. Electric vehicle development is accelerating as carbon emissions are minimised as more individuals prefer electric vehicles over gas-powered vehicles as their daily source of transportation. Customers can easily understand how utilising electric cars might reduce vehicle prices considerably because the cost of energy used by electric vehicles is much cheaper than the cost of gasoline used by oil-fired vehicles to travel the same distance. However, battery life and charging are two major development barriers for electric vehicles. The battery life of electric automobiles, for example, has a limited maximum limit with current technology and fluctuates significantly depending on ambient conditions such as temperature. Additionally, charging duration and the number of charging piles are key causes of aggravation. However, as the electric car market matures, these roadblocks will be removed.

2.4. Technology

The electric vehicle is a high-tech industry. A battery system, motor system, and electrical control system are all part of the fundamental technology. Batteries are the most important of these technologies since they affect the range of a single charge and the cost of constructing a vehicle. Current battery capacity, charging time, and capacity are all technical issues that must be addressed. Secondly, the car's motor system is powered by high-voltage motors. In motor technology, torque, compressive strength, stability, durability, and other parameters are crucial. It works in the same way as a powerplant and, like the battery system, is an important part of a pure electric vehicle. Besides, while batteries and motors are necessary, the electric control system is more complex and acts as the energy vehicle's brain. Its main job is to take the driver's instructions and carry them out. In addition to controlling the speed and rotation direction of the driving motor, the motor controller also performs energy recovery functions.

2.5. Ethics

One of the key factors holding back the development of new energy vehicles is the potential for ethical issues. The data security issue and the ethical issue in emergency scenarios are the two key issues. People in European nations value their privacy rights, while more people in China think highly of convenience. They have zero tolerance for businesses that disclose their personal information and are eager to fight for their rights and interests. The Trolley Problem is an ethical dilemma that arises in emergencies. While there does not appear to be a good answer to this challenge, the pattern that the new energy vehicle may react to must be pre-set.

2.6. Law

Since 2001, China has granted subsidies and tax-free policies for new energy vehicles, with many more policies to come. European countries began assisting with new energy vehicles decades before China, and the government continues to provide an increasing quantity of subsidies and a larger percentage of tax exemption each year. In comparison, Chinese subsidies are on the decline, maybe as a result of the diddle subsidies incident in 2016, whilst European subsidies are steadily growing.

3. TESLA'S COMPETITIVE ADVANTAGE

3.1. Technology

Tesla's FSD chip enables the firm to completely exclude third-party suppliers from the core technical sector, speeding up the development of self-driving technologies. The FSD processor has high performance, and the FSD computing platform can handle the computational obligations of fully autonomous driving after updating the software through OTA. With a fully built hardware system, software and hardware are better matched, and Tesla is better at software development, which substantially improves autonomous driving performance.

Tesla's BMS technological breakthroughs are at the core of the electric car battery and the battery management system's batteries (BMS). Tesla has kept the critical technology of managing many battery cells. To boost the pack's capacity density and the battery management system's safety, Tesla partially encloses a small number of cells in a cell container containing coolant. The Tesla V3 can handle peak charging power of up to 250 kilowatts. Recharging at supercharger stations is quick, taking just a few minutes. Tesla Motors features a variety of cutting-edge technologies in addition to those above; in terms of power, intelligent technology is still expanding and improving.

3.2. Marketing

Firstly, Tesla adopt a direct sales model which is traditionally better suited to products with short development cycles and low development costs. Instead of selling through dealers (mainly 4S shops), whose disadvantage is that there is a gap between development and sales and product development is not sensitive to market demand. Direct sales, on the contrary, original equipment manufacturer (OEMs), a company who produce and sell products to other companies, can deeply and vertically control the development, production and marketing of products, which can ensure the consistency of brand culture.

Secondly, Musk has personally created extraordinary crossover value from Space X to Hyperloop. The

personal IP is bound with Tesla, which arouses the attention and discussion of public opinion, empowers the endorsement of brand trust, enables it to occupy the mind of users with preconceptions, and sets up the high-end image of the brand. This kind of marketing not only conforms to the logic of fission, but also obtains core users, further enhances the brand's trust, and successfully establishes a high-end, fashionable and innovative automobile image in the automotive industry. Tesla's marketing behaviour also brings users a sense of security and identity beyond their needs and eventually creates an ever-expanding circle with common value recognition in the early marketing.

3.3. Supply Chain

Upstream mineral resources, middle stream core components, downstream OEMs, and after-sales service are the four sectors of the new-energy vehicle supply chain. One of the main reasons why Tesla has been in the European market is because it has invented a completely new manner of merging the electric cell. Tesla's installation rate of critical midstream components has been steadily increasing, which might be because the company places a high value on the new energy car market. On the downstream side, OEMs have changed their business models to focus primarily on consumer demand, which has been the case in Europe for quite some time. Finally, because governments oppose carbon dioxide emissions, businesses are forced to limit carbon emissions on their own, forcing OEMs to develop new sales methods.

4. WHAT DO CHINESE CAR COMPANIES DO?

Suppose Chinese manufacturers want to challenge and exceed Tesla in technology in the present electric car industry. In that case, they must focus more on the range, electric management, and cost control. To begin with, one of the most significant drawbacks of electric cars is the battery life issue. Major battery makers must work hard with current technology to tackle battery technical issues. Extreme settings, such as cold temperatures and high altitudes, are also a key focus of the endeavour. Furthermore, chip technology has a jam issue. To deal with the increasingly severe worldwide competitive environment and supply stability, expanding the autonomy of chip R&D and manufacturing, as well as the localization of critical technologies, is vitally vital and required. In fact, Tesla 4680 batteries will be mass-produced this year by Chinese power battery manufacturers such as CATL and EVE Energy. Furthermore, Tesla will purchase and use batteries made by BYD.

Convert the traditional Dealer-to-Consumer business to a Direct-to-Consumer one. Rather than directly dealing

with customers and selling items via dealers and middlemen, confronting users has become a business strategy, allowing customers to acquire more transparent prices and a more easy shopping experience. This helps offer a continuous and steady brand experience. This strategy may provide a closed-loop system for immediate feedback on items and services, as well as boost data channel retail management capabilities.

Make use of the domestic new energy industry's increasing advantages. Allow both the brand and the users to develop together. Convert users into fans, and the variety of brand communication items is enlarged by combining the packaging of the brand concept with the distribution of open source technology's advantages. Enterprises no longer provide one-way services and value transfer but instead provide a platform for users to collaborate and create.

There are primarily two methods for Chinese manufacturers to surpass Tesla: by strengthening their advantages or compensating for their flaws. China has a large storage capacity for rare earth resources, which impact the efficiency of electric motors, accounting for more than one-third of the world's total. Increased investment in scientific research might have a significant impact on improving the efficiency of mineral resource utilization. There is evidence that the installation rate of important components in the middle stream is stable, which might have an impact on China's development. A better option could be to gradually increase the amount of installation. On the downstream side, Chinese OEMs appear to have figured out how to sell and are sticking to the pattern of focusing mostly on customer demand. Finally, due to China's infrastructure growth, there is a big amount of aftermarket supply, allowing it to cope with the challenges that a surge in new energy vehicles could bring, as well as laying the groundwork for quick development of new energy vehicles in China.

5. CONCLUSION

With the rapid development of the new energy vehicle industry, the remarkable achievements of Tesla in this field has aroused the world's interest in their secret achieving success. This research tries to seek some methods for those latecomers in the new energy industry from China to beat Tesla in the market. In the first part, this research compares the development prospects of China and the United States in the new energy vehicle industry through the PESTEL method, which shows the advantage of China in political and economic by its stable policy and larger market. In addition, Tesla has strong strength in new energy vehicles, but in fact, China's new energy vehicle technology is not behind the United States, and even some technologies have surpassed the battery. In the second part, this research showed the achievement of Tesla in technology, market strategy and supply chain. In the third part, this research provider

suggestions in the same three-part for the latecomer. Though the study has tried to assess the success secret Tesla, many things can be done in future works, yet the latecomer in the new energy vehicle industry in China can take some lessons from this research as well as Tesla's innovation in technology, market strategy and supply chain to improve the practice in their future competition with Tesla.

REFERENCES

- [1] Z. Ming, X. Song, M. Mingjuan, Z. Xiaoli, New energy bases and sustainable development in China: A review. *Renewable and Sustainable Energy Reviews*, vol.20, 2013, pp.169–185. DOI: 10.1016/j.rser.2012.11.067
- [2] H. Gong, M. Q. Wang, H. Wang, New energy vehicles in China: policies, demonstration, and progress. *Mitigation and Adaptation Strategies for Global Change*, vol.18, no.2, 2012, pp.207–228. DOI:10.1007/s11027-012-9358-6
- [3] Z. Liu, H. Hao, X. Cheng, & F. Zhao, Critical issues of energy efficient and new energy vehicles development in China. *Energy Policy*, vol.115, 2018, pp.92–97. DOI: 10.1016/j.enpol.2018.01.006
- [4] S.-C. Ma, Y. Fan, & L. Feng, An evaluation of government incentives for new energy vehicles in China focusing on vehicle purchasing restrictions. *Energy Policy*, vol.110, 2017, pp.609–618. DOI: 10.1016/j.enpol.2017.07.057
- [5] N. Saxena, & S. Vibhandik, Tesla's Competitive Strategies and Emerging Markets Challenges, vol.18, no.3, 2021, pp.57–72.
- [6] M. Mangram (2012). The globalization of Tesla Motors: a strategic marketing plan analysis, vol.20, no.4, 2012, pp.289–312, DOI: org/10.1080/0965254X.2012.657224
- [7] N. Alghalith, Tesla: Innovation with Information Technology. *International Journal of Business Research & Information Technology*, vol.5, no.1, 2018, pp.37–50.
- [8] N. Jing, Research on Tesla's Customer Care Innovation. 2020 Management Science Informatization and Economic Innovation Development Conference (MSIEID), pp.469–478. <https://doi-org.liverpool.idm.oclc.org/10.1109/MSIEID52046.2020.00097>, DOI: 10.1109/MSIEID52046.2020.00097
- [9] V. J. Thomas, E. Maine. Market entry strategies for electric vehicle start-ups in the automotive industry – Lessons from Tesla Motors. *Journal of Cleaner Production*. 2019, DOI: 10.1016/j.jclepro.2019.06.284
- [10] M. R. Khan, A critical analysis of Elon Musk's leadership in Tesla motors. *Journal of Global Entrepreneurship Research*, 2021, DOI:10.1007/s40497-021-00284-z
- [11] T. Cheong, S. H. Song, & Hu, C. Strategic Alliance with Competitors in the Electric Vehicle Market: Tesla Motor's Case. *Mathematical Problems in Engineering*, 2016, pp.1–10. DOI:10.1155/2016/7210767