

Research on the impact of Tesla's technology patent opening on China's new energy vehicle industry

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Abstract. China has been facing severe air pollution problems in recent years. Since China relies heavily on the industry sector that produces air pollution, China has to make progress on other sectors to alleviate air pollution pressure. The development of Alternative fuel vehicles, especially electric vehicles (EV), is considered the next top strategy to deal with environmental problems. Besides China, the world is transitioning from conventional vehicles to electric vehicles. And a few companies have had major breakthroughs. Tesla, the leading EV company, opened its patent to worldwide EV producers. How this will influence China's EV industry is worth noting. In this paper, the impact of Tesla's action is studied. This article uses comparative analysis to evaluate Tesla's contributions to China's EV market. The result is that Tesla contributes partially to China's EV industry. This paper develops a series of policies to help address this issue based on findings.

Keywords: China, Tesla, Technology patent, new energy vehicle industry.

1. Introduction

1.1 Research background

Technology advancement has made the world a better place. Humans have built incredible civilizations since ancient times. The invention of transportation tools, such as cars, trains, and airplanes, makes humans travel longer and faster. The invention of communication equipment like the cell phone and internet makes human communication more convenient. At the same time, the faster-growing technology is taking more natural resources and emitting more GHG (greenhouse gas) than at any time in human history. Hannah and Max state in their articles that before the industrial revolution, the emission of CO₂ was very low, and after that, it grew substantially. The overwhelming consumption of natural resources has made fewer resources available to humans. Based on data provided by world meters, the existing oil reserve can only support human activity for 47 years [1].

In such conditions, the development of alternative fuel vehicles is imminent. EV (electric vehicle) is one of the most popular sections of alternative fuel vehicles. Substituting EVs for the current auto market is a long-run task that requires advanced EV technology. Tesla is the widely accepted leading company in the EV industry. It owns many advanced patents and technologies driving the whole industry forward. In 2014, the breaking news announced Tesla that it would not go on lawsuits against companies using Tesla's patents for good use. This can be explained by Tesla opening its patents in the EV industry to companies who drive the EV industry forward. This is a crucial moment for the whole world since the EV industry was growing in the initial section.

China is one of the largest auto markets globally, and it produced 2.812 millions of vehicles in 2016. This development brings benefits to Chinese people and creates environmental problems. In 2017, 239 out of 338 major cities experienced serious air pollution problems [2]. The rise in car ownership contributes to the current environmental pollution [3]. The conventional vehicle is less environmentally friendly, and in contrast, EVs save more energy and pollute less GHG [4]. The Chinese government also clearly states that China will develop its alternative fuel vehicle industry to avoid reliance on oil imports and air pollution [5]. From the notice of the State Council on Alternative

fuel vehicle industry development plan, the Chinese government states its position on the EV industry and admits that China has huge achievements in the EV industry. Although China has the highest EV sales, China is facing several challenges: innovation in core technology is weak, infrastructure on EVs is not advanced, and the market is very competitive. Tesla's patent opening is worth noting in such a condition since the Chinese government states that China's innovation in technology is weak. The free patents are unquestionable good gifts for China's EV industry.

1.2 Literature review

Zhang and Qin summarized PEV policies in China's central government and each different local government. It states that the central government and local governments need to cooperate further in the future to develop this industry. Moreover, the future focus should be on charging stations and other infrastructure construction, R&D, Battery recycling, and purchase regulation [6].

Xu analyzed that the EV industry is only a small portion of the whole auto industry, and Tesla's purpose is to contribute to the development of the whole EV industry. Opening patents can make the whole industry better off. The vigorous and competitive market could make the industry develop. The single monopoly giant Tesla could only worsen the industry [7].

Kuang and Wen analyzed that Tesla opened its patents because it wanted to build a good figure publicly. Tesla did not share the core technology, and there will be more advanced technology in the short future; Tesla may have a unique business model such that technology did not play a key role. Du and his colleagues found that Tesla's products, Tesla EVs' critical technology, can be found in their patents [8].

Hence, this article analyzes the reasons behind Tesla's public patents. In addition to the so-called noble feelings, even as strong as Tesla, it still cannot simply overcome these obstacles on its own. They will benefit greatly from the efforts of potential suppliers to advance the technology. Therefore, publishing patents is also equivalent to helping suppliers reduce investment risks, thereby paving the way for Tesla's future. The logic goes like this: If Tesla's patents are more likely to be adopted by other automakers because they are free, then EV technology is more likely to become mainstream, and by sticking to that belief, component suppliers (including energy companies) are more likely to invest in electric vehicle technology rather than competing hydrogen fuel cell vehicle technology [9].

1.3 Research gap

Most of the articles focused on Tesla's industry advantages and competitive strength, and many media news also reported on Tesla's public patents. For a while, Tesla has become synonymous with selfless dedication. But few have analyzed the nature behind Tesla's public patents. We need to know that there is no cost to opening one's technology. Instead, the company's reputation and industry saturation are the keys.

1.4 Research framework

First, explore the competitive advantage of the new energy vehicle giant Tesla. This explains why Tesla's technology patents are important to the domestic new energy industry.

Then we need to explore Tesla's opportunities for China's new energy industry to analyze the development direction and driving forces behind China's new energy industry.

The next step is to analyze the practical effect of these technology patents on the domestic new energy industry.

Finally, evaluate the challenges brought to China's new energy industry after Tesla disclosed technology patents. This process requires a lot of Tesla's technical public reports and data.

2. Method

The method of comparative analysis is beneficial for showing some characteristics more intuitively. For example, after getting a bunch of data information, people usually feel confused about the fields

they have not understood. But if comparable data and information are added, the relative advantages and relative disadvantages will emerge.

When using the comparative analysis method, pay attention to the comparability between the comparative indicators, which is a necessary condition for the good use of the comparative analysis method. Otherwise, the problem cannot be properly stated.

For example, to explore competition in the auto industry, the theme should focus on the car company itself rather than something else. If the same indicators are compared between enterprises, pay attention to the comparability between enterprises.

Selected cases. There are many cases reflecting abstract theories, and the most commonly used channel in various media, such as case books and newspapers, magazines, television broadcasts, etc.

3. Results

3.1 Development status of China's new energy vehicle patent technology

Tesla uses Internet thinking to redefine the car with software and intelligence through new electrical and electronic architecture, thereby creating phenomenal smart electric products and accelerating the transformation of the entire automobile industry. China's new energy vehicle industry has ushered in a year of landmark breakthroughs in 2021 since Elon Musk disclosed technology patents. According to the latest data from the China Automobile Association, "Total sales of electric passenger vehicles in China in 2021 will increase by 169.1% year-on-year to nearly 2.99 million units, accounting for about half of global electric vehicle sales. 15% of the vehicles sold in China last year were so-called "New Energy Vehicles" (NEVs) – a mix of battery electric vehicles and hybrid vehicles" [10]. Behind such huge consumption, power is the result of technological progress. Compared with the Chinese car brand BYD, which has formed far more models than Tesla after years of accumulation, Tesla has achieved leadership in the Chinese market with only a few models, and the speed is amazing. There are no clear figures on how many Chinese NEVs companies have used Tesla's disclosed technology patents. But now, an upstart Chinese NEVs manufacturer has publicly admitted that it will use Tesla's unveiled technology as its core power.

The Chinese new energy vehicle company is XPeng Motors. Several capital partners co-founded this young new energy vehicle company founded in 2014. Among the top three new car manufacturers, XPeng Motors is the only car company that has always adhered to the intelligent route from the beginning to the present. Heli Automobile Company wants to transition technologically through program extension compared with NIO Automobile Company, which hopes to build a luxury system ecosystem through "services". Only XPeng Motors, since its establishment in 2014, has always believed that the smart car track and a strong battery industry chain are the future direction of the new energy vehicle revolution. Therefore, in core technology, XPeng imitates almost the same battery pack structure as Tesla. Nearly every new automaker since Tesla has used the same long, flat battery pack design, mounted between two axles on the car's floor. XPeng has also copied the battery pack design's battery modules to provide cars with stable, high-power, and high-efficiency batteries [11]. Facts have proved that the sales volume of XPeng Motors has also ushered in a rapid increase. In addition, XPeng is also preparing to follow Tesla's new neural network learning system progress, self-developed D1 chip, and supercomputer Dojo with supercomputing power. These will improve the experience of autonomous driving technology and help cars gradually upgrade from traditional means of transportation to the third-largest mobile smart terminal after computers and mobile phones.

3.2 Analysis of problems existing in China's new energy vehicle technology

Although a series of emerging Chinese electric vehicle companies such as XPeng and NIO have achieved significant improvements in automotive batteries and automotive systems through Tesla's patented technology in the past few years, they still compete with Tesla in the Chinese market. There is not a small gap in sales.

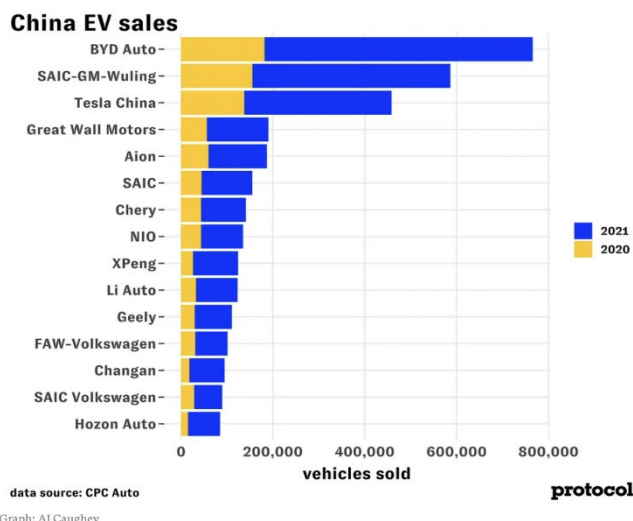


Figure 1. China EV sales

Tesla also set a record for sales in China, as shown in the chart above. Tesla already has a certain irreplaceable brand value in China, like in the United States. “The US electric car maker sold more than 320,000 vehicles in China last year. Notably, Tesla’s Shanghai factory delivered 480,000 vehicles in 2021, about half of its global deliveries.” [10]. In contrast, many new Chinese energy brands, including XPeng, have been left far behind. This also makes people suspicious. Why can’t Chinese electric cars follow Tesla’s sales after using Tesla’s technology patents?

This phenomenon is indeed strange on the surface. When these electric car companies in China have adopted Tesla’s technology patents to some extent, they are still unable to compete with them in terms of sales. The factors that affect sales are mainly the embodiment of brand value and the actual quality of the car. So, analyzing the reasons behind these became a major research goal.

Through research, it was found that Tesla has absolute control over its research and supply chain. This has led to Tesla predicting its future demand better than any other auto industry.

From the perspective of big data, many domestic auto industries are restricted by government policies and cannot simply enjoy China’s low manufacturing costs like Tesla. In addition, because China’s electric vehicle industry is in an emerging stage of development, many manufacturers cannot control their supply chain resources like Tesla. This has resulted in them not ordering chips and parts fast enough, thus holding them back in production and company operations.

Tesla’s ability to design components in-house gives the automaker the flexibility to tweak parts and deal with supply chain issues that hit other automakers harder. Sla increased its deliveries by 87% to a new all-time high in 2021, and its stock price rose more than 13% on Monday [12].” I have to say that this is a scary figure, 87% of deliveries are enough to support Tesla Pull to establish brand majesty among its peers. The harvest of sales is naturally reasonable. Tesla can get rid of its dependence on manufacturers and develop car chips independently, allowing Tesla to replace chips in short supply with chips that are not in short supply even when a crisis comes, thus achieving a virtuous circle. In addition to this, “Tesla has launched its 100th Supercharger station and its 1000th Supercharger station in Shanghai. Tesla also opened 6 Supercharger stations in Beijing at the end of August, making it in the Chinese capital. The total number of super-charging stations has increased to nearly 800 [13].” These auto industry frameworks, which are unique to Tesla, give consumers full confidence, which is unique confidence in the brand’s future. This is something that China’s new energy industry cannot achieve temporarily. Although the Chinese government tries its best to promote and take care of domestic electric vehicle companies, some related infrastructure construction cannot be carried out due to changes in brand interests. Ordinary consumers have doubts about the cost and infrastructure of Chinese new energy brands and have psychological barriers to purchasing incompletely developed new energy vehicles. China is a country that sees car ownership

as a sign of status and success. As a result, car buyers still prefer classic, internationally recognized models – but the truth is that many NEVs have yet to earn that designation.

4. Discussion

Based on the information analysis above, there are some implications for improving the EV market in China and promoting EV purchases in China.

4.1 Research and Development

From the supply side, the first thing that China needs to do is to spend more on research and development. The government and EV enterprises must understand that in the Solow-swan model, the long-run economic growth is driven by technological progress. The other political incentives may play important roles in short-term economic development; however, the final products must be of good quality so that consumers can accept them in the long term. Chinese EV enterprises need to spend more sources on developing better Batteries, safer Self-driving systems, and so on.

4.1.1 Government

In the market economy, the government's role is to maintain a fair and efficient market and aid those who need help. There are two methods for the Chinese government to do. Firstly, the Chinese government should give more tax incentives to the corporations doing research and developments on batteries and self-driving systems. Second, a fund specifically for research on chemistry and material can be set up. The fund can provide capital to enterprises that meet certain requirements. Third, the government should encourage research on basic science. The Ministry of Education can establish a specific research program on universities.

4.1.2 Enterprise

In the past forty years, Chinese companies have made fortunes. However, the comparative advantage of Chinese companies is the cheap labor and China's huge market. The novel business model could generate huge wealth since China has the largest market globally and cheap cost of the labor force. Thus, fewer Chinese companies spend sources on research and development and have fewer patents than most US and EU companies. The traditional way of doing business has to be abandoned. Chinese companies should spend more resources on R&D. In the past, Chinese companies spent more money on taking market share. While the market entry is low and there is no advanced technology to keep the market share, there are low profits for the whole market. After spending more on R&D, the companies can take EV industry market share with their technology. Foreign companies must have more advanced technology to compete in China's EV market. This will benefit companies with advanced technology since they gain from the market, but the consumers will also benefit. There will be cleaner and cheaper EVs with a longer range to consider.

4.2 Policies incentives

4.2.1 Insurance on accident vehicle

Since 2015, China reduced its subsidies on EV purchasing gradually. This does not stop Chinese consumers from purchasing EVs. The sale of EVs in 2021 will reach an unprecedented number. There are 3.5 million EVs sold in 2021, which is 2.57 times the sales of 2020. However, there is an increasing concern about the quality of EVs. The EVs have been spontaneously explored in China in recent years. Governments, enterprises, and consumers are all highly concerned about the safety of EVs. Since EV is in its beginning step, safety events are inevitable. The government needs to make policies for EV insurance that insurance companies need to compensate for spontaneously explored EVs. The expenditure on this insurance is shared with the government, EV enterprises, and consumers. Moreover, the government should spend more on insurance to promote the selling of EVs. As the market grows larger and technology matures, consumers need to spend more on these insurances.

This insurance could limit consumers' worry about the safety event of EVs so that there will be more incentives for EV purchasing.

4.2.2 Eliminating price competition

Government should eliminate price competition. As more participants enter the markets, the availability of goods becomes rich, and companies gain market share lower the price of EVs. Tesla's Model 3 has experienced several price reductions. Its original price in China was 364 thousand yuan; after six price reductions, the price of model 3 in August 2020 was 250 thousand yuan. The price changes hurt sales of EVs in China. Traditionally, the Chinese believe that cheap products are always linked with poor quality. As price decreases frequently and dramatically, Chinese consumers may regard EVs as inferior goods, and the sale of EVs will plunge. The other group who does not link cheap products to inferior goods will stop purchasing because they believe there will be more price reductions in the future. It is not a good time to purchase an EV. From the perspective of the supply side, the price reductions of Tesla will lead the other EV enterprises to make price reductions to lower their profits. This action will further hurt companies' R&D capabilities. To build up consumers' purchasing faith, the government needs to prevent companies like Tesla from having price competition.

5. Conclusion

5.1 Summary of Key Findings

This study focuses on the impact of Tesla opening its patents. Whether China will benefit from Tesla's patent opening is a big deal. Tesla's position and contribution to the new energy vehicle industry are obvious in extensive surveys and data. The opening of Tesla's technology patents is equivalent to contributing a boost to the new energy industry to facilitate the future promotion of new energy vehicles and even the auto industry's transformation across the ages. China, as a potential future supermarket, will naturally benefit from it. But Tesla's patent opening is not entirely benevolent on the surface because of Tesla's approach and Musk's spirit of technological innovation. There are concerns about prospects. Tesla's future development requires the rise and development of the entire new energy industry, so sharing Tesla's patents will encourage other car companies to adopt common standards, thereby accelerating the arrival of the new energy era led by Tesla. Under this concept, China's new energy vehicle industry can learn from relevant patents to obtain the technology and industrial model required for the development. At the same time, the Chinese government has adopted policies to encourage and substantially encourage investment in the electric vehicle market, thus allowing China's new energy market to emerge and gain a promising future force. Even though there are still many technical and industrial chain obstacles, these are a necessary part of the rise of China's new energy vehicles. The benefits of Tesla's development in China and believed that Tesla's development in the Chinese market further economic and social benefits for a brand, which had important guiding value for Tesla's development. In order to continuously strengthen Tesla's market position in the Chinese market, Tesla must actively adopt diversified, competitive strategies, such as price competition and talent competition. Tesla's marketing strategies in the Chinese market proposed that only by actively mastering local culture and fully analyzing the market development environment of new energy electric vehicles can Tesla launch better business strategies. However, most research is mainly qualitative, and quantitative research through data collection is insufficient.

5.2 Research Implications

The development of China's new energy industry is still in the initial stage. There are only a handful of cities where new energy vehicles have been truly promoted throughout China. Electric vehicle companies in the market are relatively small and lack the support of core technologies. But China's new energy market has huge commercial potential. On the one hand, China's consumption concept is running in with the new energy market. Even though many problems need to be solved, it

only takes time to solve them because adapting to new consumption concepts takes time to give the process a deeper meaning. Common key technical barriers for new energy vehicles include vehicle integration technology, electric drive technology, energy storage technology, high-voltage electrical technology, and fuel cell technology. For the Chinese market, it is not impossible to break through these barriers and realize the rise of Chinese new energy companies. China's market demand will reach a terrifying value in the future, indicating that China's new energy investment market has immeasurable commercial value.

5.3 Limitations and future research

Tesla opened the patent in 2014. That year, NIO and XPeng were established, and sales of electric vehicles in China increased significantly. It's easy to link the state of China's electric vehicle market to Tesla's opening. The study also suggests that Tesla influences Chinese EVs, but probably not the most important factor. There is no clear data on battery EV sales as a percentage of total EV sales. Meanwhile, the research in this paper mainly uses secondary data from industry reports and official websites. However, the research results have certain limitations due to the lack of primary data.

Furthermore, the electric vehicle market is driven by both the demand and supply sides. Technological improvements play a role in the production of electric vehicles. However, purchases are largely determined by the customer's willingness to pay in the short term. The contribution of technology can only be seen in the long run. And in the long run, Chinese producers are also likely to make significant progress, making it difficult to assess Tesla's contribution to the Chinese EV market. Therefore, it is necessary to study Chinese EV manufacturers' core technologies. At the same time, future research should be carried out through field research and interviews on new energy vehicles to obtain first-hand data and ensure that the research results are more authentic and reliable.

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