

BYD and Tesla's competitive advantages and future development prospects

Jianing Yan

Macau University of Science and Technology, Macau, China

Abstract. With the increasingly serious shortage of oil resources and the increasingly prominent environmental pollution problem, electric vehicles emerge at the historic moment, and the future development prospects are broad. This paper will focus on the study of tesla and BYD, two electric vehicles, and analyze the future development trend and future competitive advantages of Tesla and BYD by comparing their stock prices, market shares, annual sales volume and annual production, raw material prices, global sales range and net profits, and provide reference for the development of tesla and BYD. Based on the current market situation and national policies, I believe that in the future, the market share of electric vehicles will far exceed that of fuel vehicles and become the mainstream of land transportation vehicles. Therefore, electric vehicles enterprises should seize the opportunity to find their own competitive advantages and take the lead in the field of electric vehicles to occupy a place.

Keywords: Electric vehicles; Tesla; BYD; market share; competitive advantages.

1. Introduction

With the further development of globalization, trade activities have increased greatly, so has the demand for transportation. However, the carbon emission of fuel vehicles is an important cause of environmental problems such as greenhouse effect and acid rain. As a result, electric cars have grown rapidly since 2008. With the deepening of the concept of green transportation and carbon emission reduction, as well as the deep consideration of the environmental pollution of fuel vehicles, the demand for electric vehicles as a kind of green transportation is increasing. More and more countries and enterprises attach importance to the development and promotion of electric vehicles. The development of new energy vehicle enterprises is affected by many factors, such as national policy, upstream material cost, research and development cost, patent number, fuel economy, subsidy policy, social influence, strong investment interest and so on. Under the combined action of internal and external factors, for enterprises in the new energy vehicle industry, how to find their competitive advantages, how to maximize the advantages, and convert them into annual sales and net profits is particularly critical.

This paper mainly studies tesla and BYD, two large electric vehicle enterprises. By comparing the internal development factors and external factors (stock prices, market shares, annual sales volume and annual production, raw material prices, global sales range and net profits) of Tesla and BYD, the data visualization method is used to analyze the future development direction and strategy of the two companies. It provides methods and new ideas for the sustainable development of electric vehicle enterprises.

This paper has the following contributions:

1. Contribution of research inspiration: By comparing typical automobile enterprises, the advantages and problems of their development are analyzed to provide important policy reference for the development of electric vehicles

2. Contribution from research perspective: Most research articles related to the development of new energy vehicles focus on macro analysis of the entire ELECTRIC vehicle industry. By comparing the cases of two enterprises (Tesla and BYD), this paper puts forward more targeted suggestions and provides realistic suggestions for the future development direction of the two enterprises.

2. Key data of BYD and Tesla

2.1 Stock price

Stock price represents a reflection of the future development of the company by shareholders. The price will rise if the company is optimistic in the future, while the price will fall if it is not.

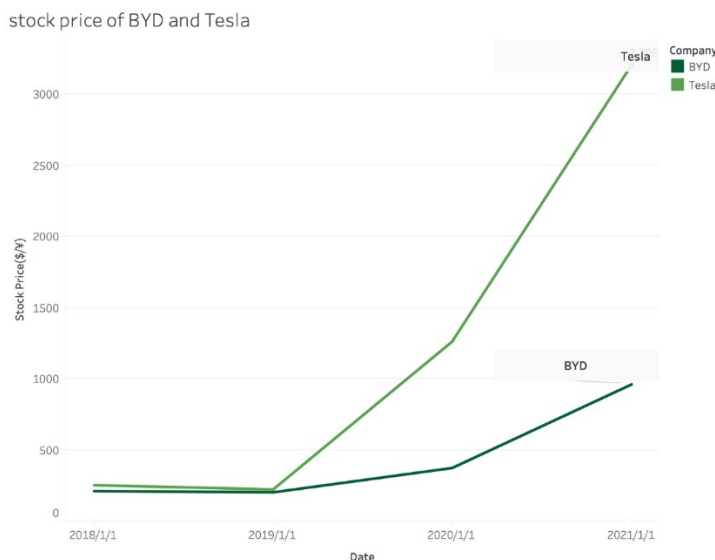


Figure 1. Stock price of BYD and Tesla
Data Source: BYD, Tesla's annual report

The line chart shows the stock price of BYD (¥ YUAN) and Tesla (\$ Dollar) from 2018 to 2021 for the nearly four years. Overall, BYD's and Tesla's stock prices are on the rise. Especially, by the middle of 2020, the prices began to share increase sharply, which illustrates that market value of BYD and Tesla, the electric vehicles industry facing a greatly rising phenomenon.

For the whole new energy vehicle industry, the reason for the stock price rise is that, with the launch of carbon neutral emission policy and cost control of lithium battery, the electric vehicle industry is developing rapidly, and the penetration of electric vehicles in the world is expected to exceed half in 2027. The reform of electrification and intelligence has promoted the reshaping of the pattern of traditional automobile industry chain, and the high-speed development stage of new energy vehicles is coming.

Comparing 2018 to 2021 shows that Tesla's stock price rose more than 16.95 times (1088.755/64.233), while BYD's rose approximately 4.68 times (295.668/63.1718644). It shows that in the future, the field of electric vehicles still has great space for development and growth, and BYD and Tesla have opportunities for sustainable development. The two companies also have different strengths that keep their share prices high.

BYD: The reasons for BYD's rising share price can be also analyzed from its own perspective. BYD business across the car, battery, IT, semiconductor and other fields, has the world's leading battery, electric control, and the core technology, as well as the world first dual-mode technology, automobile in aspects such as dynamic performance, safety and energy consumption of multiple cross, products continue upward force, the new energy car sales performance is strong. At the same time, compared with the traditional battery, BYD blade battery has super safety, super life, super endurance, super low temperature performance and other technological innovations, making it cheaper and more profitable. Moreover, the continuous expansion and exquisite layout of BYD's industrial chain can significantly improve its ability to control core technologies and risks, ensuring the company's long-term development.

Tesla: Tesla's electric vehicle business and ancillary business both show great potential for development. Investors typically pay a small premium for the low probability of big potential in the future for companies with such emerging ancillary or service-oriented products. Tesla's current

valuation reflects that its electric vehicle business will remain dominant. Meanwhile, much of Tesla's stock price is based on its first-mover advantage in battery technology and supply chain mastery. Tesla's first-mover position theoretically fosters an insurmountable lead in battery IP and supply chain that will lead to cost reductions.

Therefore, based on Tesla and BYD's advantages in production technology and batteries, investors are optimistic about the future development of BYD and Tesla, so the stock prices of the two companies continue to rise sharply.

2.2 Raw material

Electric vehicle companies' raw material related technology and access to ease of development in the industry is crucial. Electric vehicles mainly include upstream lithium battery and motor raw materials, mid-stream motor, electric control, battery and downstream vehicle, charging pile and operation of three links.

The total cost of motor, electric control and battery of new energy vehicles accounts for about 60% of the vehicle cost. The pie chart shows that in the field of electric vehicles, power batteries account for 40% of the total cost and are the components with the largest value, which is crucial to the impact of electric vehicles. From the perspective of function, this determines the basic performance parameters of electric vehicles, such as endurance, power and so on. Therefore, the battery cost of new energy vehicles is an important part of the vehicle, and the change of battery cost directly affects the cost and sales of electric vehicles.

proportion of the cost of electric vehicles' raw material

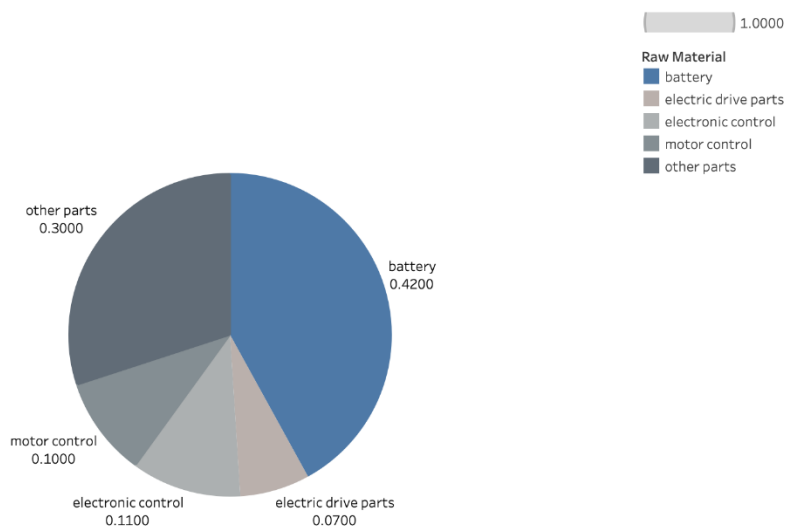


Figure 2. Proportion of the cost of electric vehicles' raw material
 Data Source: New Era Securities Research Institute

In terms of BYD, one of the few electric-car companies to have self-sufficiency in power batteries. Its battery technology is mainly lithium iron phosphate battery. BYD has the world's top level in the research and development of lithium iron phosphate batteries. As a very mature type of lithium battery, the biggest advantage of lithium iron phosphate battery is more stable and safer. Especially for the nascent market for electric vehicles, safety is even more important to users than advanced technology. In March 2020, BYD officially launched the lithium iron phosphate blade battery, announcing that its battery range reached the same level as the ternary lithium battery. At present, the energy density of the first generation of blade battery products has reached 140Wh/kg and the volume energy density has reached 230Wh/L. It is expected that the energy density can reach more than 180Wh/kg and the volume energy density can reach 300Wh/L in 2025.

According to BYD's data in 2020, the reshaping of the battery pack has reduced the cost of the blade battery by 30% compared with the ordinary lithium iron phosphate battery and increased the energy density per unit volume by 50%, equivalent to the original 300,000 electric car, which can

now be reduced by 36,000 yuan (based on the battery cost accounting for 40% of the vehicle). It used to run 400 kilometers on a full charge, but now it can run 600 kilometers.

Panasonic and CATL are Tesla's main battery suppliers, mainly using 18650 ternary lithium batteries with a diameter of 18 mm and a length of 65 mm. They have a cylindrical design, high energy density, good stability and consistency. Its battery is characterized by light weight, small size and fast charging and discharging. Compared with BYD's lithium iron phosphate battery, Tesla is also very suitable for large-scale industrial production, which can greatly reduce the production cost through scale effect. Ternary lithium batteries are more advanced. It can be seen from Table 1 that the battery can reach a charging power of more than 145kW, which has obvious advantages compared with the maximum charging power (100-120KW) of the two domestic EV companies.

From the table below, we can see that Tesla Model S takes the lead with a charging speed of 16.3 km/min.

Table 1. The ranking of tesla electric vehicles is based on the quick charging index and the vehicle's WLTP mileage.

Battery electric vehicle model	Battery size	Battery chemistry	Battery supplier	WLTP range	Fast charging capability		
					Power kW	Time min	Speed km/min
	Brutto kWh			km			
Tesla Model S Long Range Plus	95	C-NCA	Panasonic/Tesla	652	250	28	16.3
Tesla Model X Long Range	95	C-NCA	Panasonic/Tesla	580	250	28	14.5
Tesla Model 3 Long Range (US)	82	C-NCA	Panasonic/Tesla	614	250	32	13.4
Tesla Model 3 Standard Range Plus (CN)	55	C-LFP	CATL	440	145	25	12.3

So when it comes to power batteries, both BYD and Tesla have a strong competitive advantage and a bright future.

2.3 Market share

Market share is the market share, which refers to the proportion of Electric vehicle sales of Tesla or BYD in the electric vehicle industry, reflecting the market position of Tesla and BYD in this industry. The higher the market share, the stronger the competitiveness of the enterprise in the industry.

The following three charts illustrate the global market share of EV companies over the past three years.

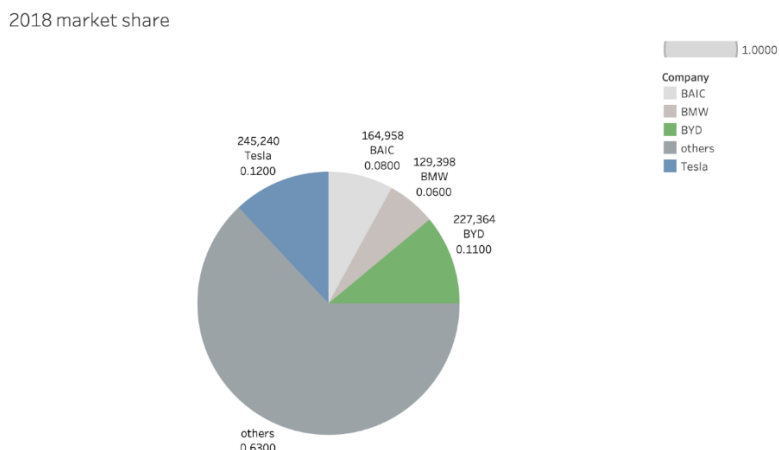


Figure 3. Market share of EV in 2018 (Data Source: EV-sales)

2019 market share

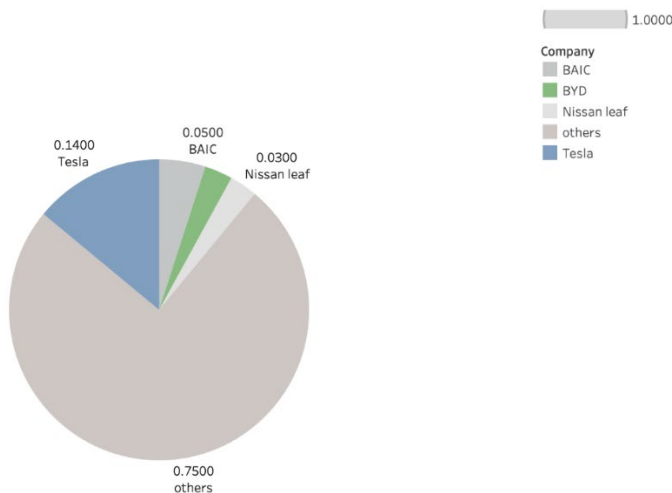


Figure 4. Market share of EV in 2019
 Data Source: EV-sales

2020 market share

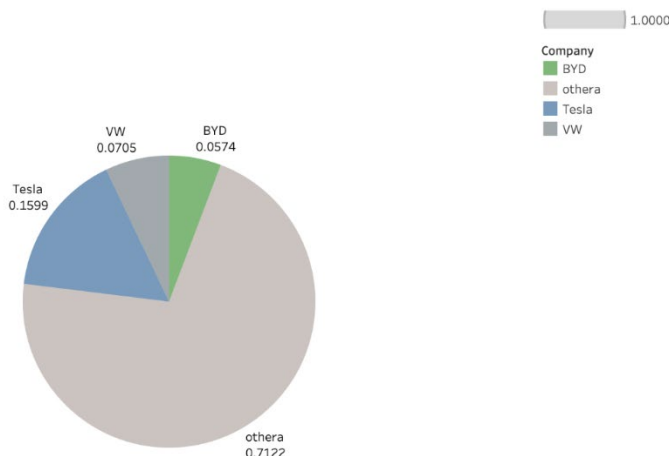


Figure 5. Market share of EV in 2020
 Data Source: EV-sales

Industrial concentration of existing enterprises and resistance to changes in existing markets lead to strong entry barriers for electric vehicles such as Tesla to the automotive industry, such as design capabilities, manufacturing facilities and distribution networks, which deter new entrants (Porter, 1980; Helfart and Lieberman, 2002). But Tesla didn't give up. Instead, it proved that electric cars can perform almost as well as gas-powered cars, while reducing the environmental impact of gas-powered cars' carbon emissions. As a result, more and more car buyers are embracing electric vehicles. With nearly 400,000 pre-orders for Tesla Model 3, the mainstream market widely accepts electric vehicles for the first time (Lambert, 2016)

The chart shows that Tesla ranks first in the sales of electric vehicles all the year round, occupying 12%, 14% and 16% market share respectively from 2018 to 2020, and its market share is increasing year by year. The change in market share indicates that Tesla has a good development trend in the future and still occupies a leading position in the world electric vehicle sales.

Tesla can occupy a large market share for the following reasons: key performance attributes - acceleration and range, technology and production capacity, and the relationship with customers. Acceleration as a key performance attribute serves to divide mainstream automotive customers into three main markets: low-end, mainstream and high-end. Tesla Motors released its 0-60 MPH Sports car in 2008, and launched its 0-60 MPH Tesla Model S in 2012, positioning the acceleration

performance attribute at the high-end market. 2. Tesla cars are known for their long range all-electric vehicles, distances the vehicle can travel without refueling or recharging. 3. Tesla regards engine design, development and production, and body design and production as its core competencies and keeps them in-house. For all these reasons, Tesla has always been the leader in market share.

From the pie chart, it can be seen that from 2018 to 2020, the market share of Tesla electric vehicles increased year by year, and they were all the largest new energy vehicle enterprises. Tesla has advanced battery technology and a large customer base, so it is highly likely to occupy a larger market share in the future, and thus achieve greater development.

BYD took the second place in the electric vehicle market in 2018, accounting for 11%. Its market share declined slightly in 2019 and 2020, but it is still the world's leading enterprise in electric vehicles.

2.4 Annual output and annual sales

Automobile production is the number of cars produced by the company in a year, and automobile sales is the number of cars delivered or sold by the company in a year.

From the table below, we can see that from 2013 to 2018, tesla's annual sales volume increased year by year, and in 2018, the annual sales volume exceeded 200% of the previous year, indicating a huge increase in annual production.

With more and more attention paid to environmental problems and subsidies and support given to electric vehicles by national policies, more people begin to pay attention to and understand electric vehicles when buying a car. Therefore, the electric vehicle industry has been developing rapidly in recent years. Not only Tesla and BYD, but also the entire electric vehicle industry's annual production and annual sales have been steadily increasing, with a significant increase in 2018 and 2019.

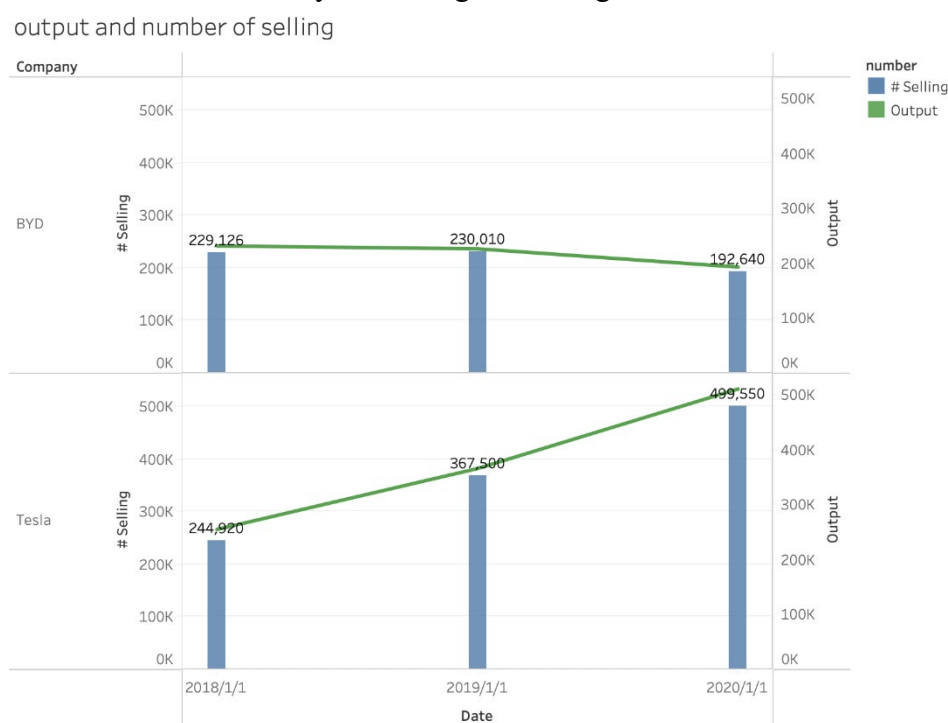


Figure 6. Output and number of selling
 Data source: www.huaon.com

In 2018, the annual production and sales data of BYD and Tesla were roughly the same. In 2019 and 2020, tesla's annual sales volume increased significantly, while BYD basically maintained the original level.

But there was a slight decline in the production and sales of finished vehicles in 2020, with a year-on-year decline of 5.08% and 3.62% (2020 financial report). Some investment banks analyzed that

the large-scale public health safety crisis that broke out in 2020 was a heavy blow to the entire automobile industry, and not only BYD's sales declined, almost all electric vehicles company are affected to some extent. However, as the domestic public health crisis eases, it is expected that the auto industry will gradually recover to the previous level.

2.5 Net profit

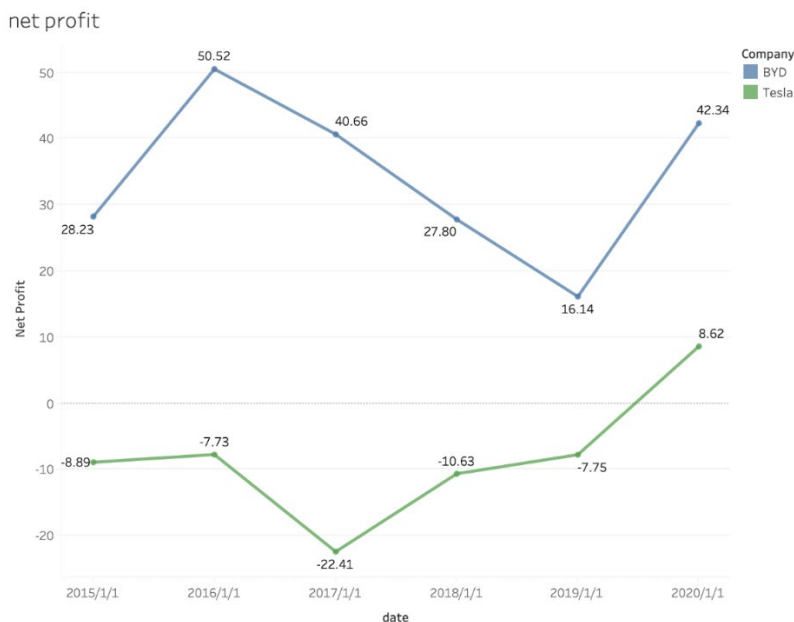


Figure 7. Net profit of BYD and Tesla

Although Tesla's net profit is negative, it has shown growth in recent years, reaching \$8.62 million in 2020. From the results of the three quarters of 2021 that have been announced, the performance of international auto companies is generally good, especially in the net profit.

Tesla (Dollar) remains in a strong position, reporting total revenue of \$13.757 billion in the third quarter, up 57% from a year earlier. The company's net profit was about \$1.618 billion, up 389% year on year; Overall operating margins rose to 14.6 percent, delivering the best net and operating profits ever. The U.S. is Tesla's biggest market, with revenue of about \$6.414 billion in the third quarter.

BYD's net profit was positive and showed a downward trend from 2016 to 2019. In 2019, the net profit dropped to 1.614 billion YUAN, but rebounded to 4.234 billion yuan in 2020.

2.6 Sales in global

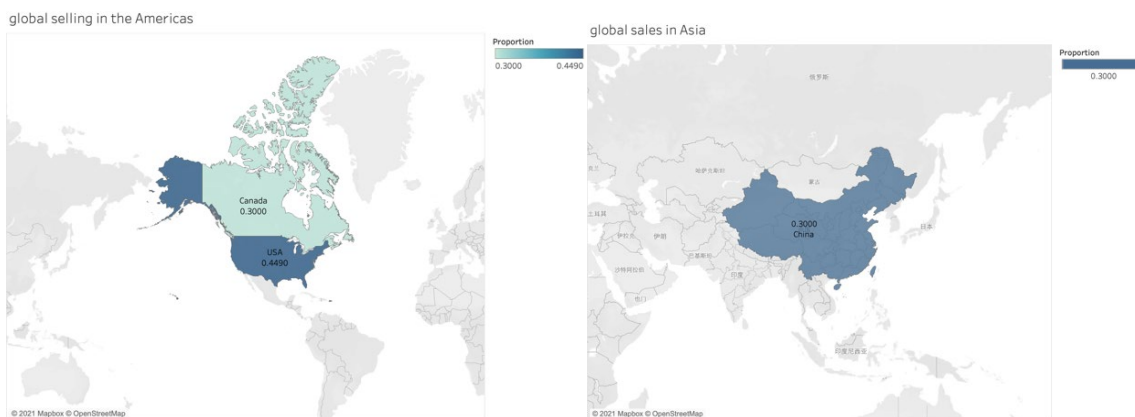


Figure 8. Sales of EV in global

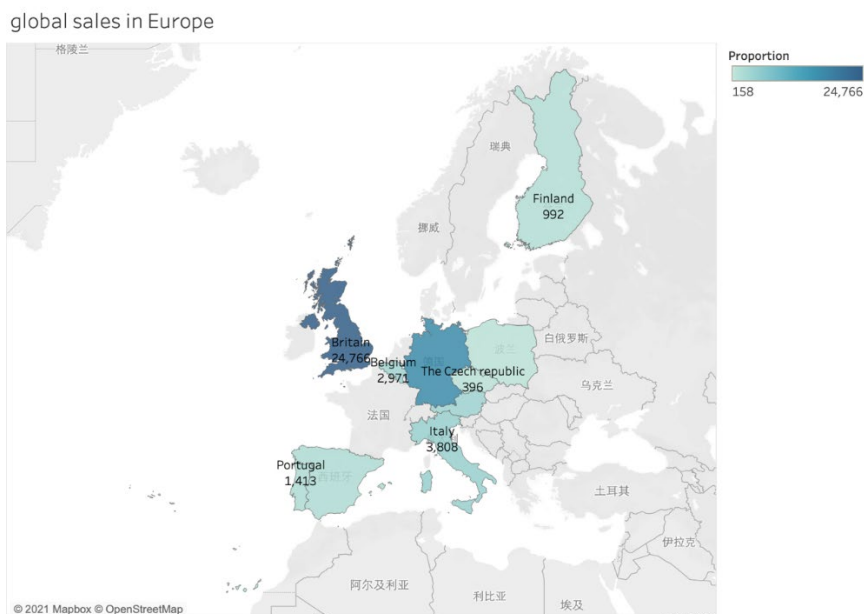


Figure 9. Sales of EV in Europe

Tesla sells cars to many countries and regions around the world, among which the United States, China, the United Kingdom, Germany, Canada, the Netherlands, Norwegian and France are tesla's large customer base. Tesla accounted for 44.9% of sales in the US, 30% in China and 5.4% in the UK.

BYD has also begun expanding overseas in recent years, selling to more than 50 countries or regions around the world, but China remains its main target market. BYD's new energy passenger car business is officially laid out in the European market. The first batch of 100 BYD Tang EV was assembled in Shanghai port on June 7th, and officially set sail for shipment to Norway. It is expected to be delivered to the first batch of local customers in August. This shipment marks BYD's new energy passenger car business formally layout in The European market, and Norway becomes BYD's first place to enter the European pure electric passenger car market.

3. Conclusion

Since the 2010s, the development of electric vehicles has stepped into a new stage. In the context of carbon neutrality, the market is more and more optimistic about the development of electric vehicle enterprises such as Tesla and BYD. Therefore, the stock prices of Tesla and BYD, especially in recent years, have increased significantly. In terms of annual sales volume, the production and sales volume of Tesla and BYD have been on the rise since 2018, and the growth rate is especially obvious in 2019. In 2020, there will be a slight decline due to the impact of the epidemic. However, it can be seen that the market still maintains an attitude of continuous growth expectation and demand growth for Tesla and BYD.

In terms of market share, Tesla has an advantage over BYD. Tesla has a large customer base and advantages in production capacity and technology. Tesla's battery suppliers, Panasonic and Ningde, have advantages in cost and quality of raw materials, while its engine design and patents on other parts have laid a foundation for its large sales. But BYD also has unique advantages in production technology and capacity. For example, BYD is the only electric vehicle company that provides batteries independently.

Globally, Tesla and BYD's combined operating revenue and net profit are in the normal range. Electric cars are mainly sold in China, the United States, Canada and some European countries.

To sum up, the prospects for the future development of electric vehicles, as far as Tesla and BYD are concerned, are very good. Tesla and BYD should give full play to their unique competitive

advantages, strive to occupy a larger market share, develop feasible and high-quality plans, and vigorously develop.

This article can provide some suggestions:

1. For enterprises win-win cooperation is the optimal way to sustainable development, tesla and byd should establish and strengthen strategic cooperation in maintaining their advantages at the same time, mutual complement each other, such as in terms of battery raw materials, tesla and byd can learn from each other each other's strengths, complementary advantages and make a battery energy density to achieve higher and better security.

2. Tesla and BYD should have a clearer positioning for the enterprise, formulate a clearer plan to develop and highlight competitive advantages, and strive for differentiation strategy.

3. At present, the world is highly concerned about environmental pollution. The proposal and deepening of the concept of energy conservation, emission reduction, environmental protection and carbon neutrality has promoted the development of the electric vehicle industry and made the future development potential of electric vehicles huge. Therefore, ev companies should timely observe the market pattern and changes, and enter the target market at the appropriate time. At the same time, Tesla and BYD should strengthen cooperation with governments and countries to obtain policy and financial support.

References

- [1] Information on :<http://stock.10jqka.com.cn/20200430/c621318664.shtml>
- [2] Information on: New Era Securities Research Institute
- [3] Information on: <http://www.199it.com/archives/tag/ev-sales>
- [4] Information on: www.huaon.com
- [5] Information on: <https://www.ev-volumes.com/>
- [6] Cao J, Chen X, Qiu R, et al. Electric vehicle industry sustainable development with a stakeholder engagement system [J]. *Technology in Society*. 2021, 67: 101771.
- [7] Wassiliadis N, Schneider J, Frank A, et al. Review of fast charging strategies for lithium-ion battery systems and their applicability for battery electric vehicles [J]. *Journal of Energy Storage*. 2021, 44: 103306.
- [8] Thomas V J, Maine E. Market entry strategies for electric vehicle start-ups in the automotive industry – Lessons from Tesla Motors [J]. *Journal of Cleaner Production*. 2019, 235: 653-663.