

YANTING GU

University of Padova

FIORENZA BELUSSI

University of Padova

RAJNEESH NARULA

University of Reading

**ENTERING EUROPEAN
COUNTRIES: ADVANTAGES
AND DIFFICULTIES FOR
CHINESE ELECTRIC VEHICLE
FIRMS**

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Entering European countries: advantages and difficulties for Chinese electric vehicle firms

Yanting Gu¹

Fiorenza Belussi²

Rajneesh Narula³

Abstract

The great support from Chinese governments to upgrade the automotive industry has propelled Chinese automotive firms into developing and producing electric vehicles in recent years. However, despite their emergence in foreign markets, the internationalisation of Chinese EV firms still needs to be studied more. This paper investigates the advantages and disadvantages of Chinese EV firms when they expand into European markets. Our study finally provides solutions to mitigate the disadvantages to develop their businesses in Europe better.

JEL Classification: L62, L94, M16, O33, Q55, R58

Keywords: Internationalization; Chinese electric vehicle firms; Advantages; Disadvantages

¹ Department of Economics and Management, University of Padova

² Department of Economics and Management, University of Padova

³ Henley Business School, University of Reading

1 Introduction

A dramatic shift in manufacturing electric cars is currently taking place worldwide, mainly in China, where the electric vehicle (EV) industry is growing faster than in western countries. Many Chinese automobile manufacturers conduct higher value-added activities and desire to internationalise and offer their innovative EVs in the global market.

Chinese auto manufacturers need to catch up to leading global automobile firms in terms of technologies for producing internal combustion engines (ICEs) and have stayed at a lower stage of the industrial value chain for a long time. However, the turning point of Chinese auto firms seems to arise nowadays since they have taken the lead in entering a new industry, the EV industry and grasped this “window of opportunity” to catch up with global auto leaders (Wang, et al., 2014). Moreover, many Chinese EV firms, such as SAIC, BYD, and Great Wall Motors, already possess superior knowledge about EVs than the traditional leaders in the automotive industry (Wang and Kimble, 2013).

The catch-up goal is closely related to the support of Chinese governments that encourage Chinese automotive firms to surpass leading automakers by first entering the EV industry. Several EV companies were established following the favourable policies of Chinese governments over the last years and have grown to one of the best-selling brands in the domestic market. Additionally, the goal of catching up is driven by the internationalisation motive of Chinese auto firms. They aim to achieve a historic leap from importing foreign cars to launching technological-advanced EVs abroad. Since 2020, many Chinese EV firms have been expanding overseas markets by exporting passenger EVs (the focus of this study) and building foreign subsidiaries. Europe is one of the main target markets due to the large market size (the second world's largest EV market), goals of replacing ICE cars with EVs in the long term, and considerable purchasing power.

The upgraded knowledge and resources accumulated in producing EVs are regarded as the ownership advantage for Chinese EV firms, which is the prerequisite to going abroad (Dunning, 1980). However, Chinese EV firms are currently accounting for relatively low market shares in European markets. For instance, BYD, one of the Chinese EV leaders, only delivered 1500 units of passenger EVs to Norway in 2021. The small scale of expansion might be driven by the unforeseeable challenges that Chinese firms will face. In this regard, the current situation

of Chinese EV firms in Europe raises our interest in investigating whether the ownership advantages of Chinese EV firms are sufficient to be successful in the European market and compete with local rivals, and what disadvantages they will encounter.

Prior studies have concentrated on discussing the advantages or successful mechanisms of the internationalisation process of Chinese firms (Ai and Tan, 2018; Liu and Li, 2002; Tan and Mathews, 2015), concluding that the success is dependent on the superior advantages over foreign rivals (Dunning, 1980). However, it tends to pay less attention to determining the driving factors that might impede the success of international investments by Chinese firms in foreign countries.

This paper aims to draw on the theoretical concepts of ownership advantage or firm-specific advantages (FSAs) from the OLI paradigm as the benchmark to figure out what advantages Chinese EV firms possess and what competitive advantages are lacking (i.e., disadvantages) in European markets. It contributes to the IB studies by comprehensively analysing the advantages and disadvantages of European Chinese EV firms. It develops a testable theoretical model for future empirical research. It also contributes to studying the early internationalisation of emerging market firms in a new industry. We conclude that the Chinese EV firms' competitiveness in Europe is attributed to employing advantages accumulated in China and overcoming the disadvantages in Europe. Moreover, this paper provides practical implications for business managers and policymakers in the EV industry.

The structure of the paper is stated as follows. We first discuss the research context of Chinese EV firms in Europe in Section 2. Then, section 3 explains the research methodology. Section 4 discusses the advantages and disadvantages of European Chinese EV firms. Section 5 provides the solutions to mitigate such disadvantages when Chinese EV firms expand into European markets. Finally, Section 6 concludes the paper.

2 Research background and literature review

As shown in Figures 1 and 3, most sales in China are dominated by domestic EV firms. To some extent, it reflects their significant brand recognition by domestic consumers. However, success in their home country could be a significant driver for them to invest abroad confidently.

According to Statista⁴, BYD owns the highest market share in the Chinese market, with a share of 17.5% in 2021, followed by Wuling HongGuang with 12.9%. As the only foreign EV firm, Tesla is the third-largest seller, reaching 9.4% of total sales. Tesla has achieved many sales worldwide (see Figure 3), but it takes only a small portion of shares in the Chinese market.

The emergence of Chinese EV firms is closely related to the support of the Chinese government. For instance, the ‘Mid- to Long-term Development Plan for the Automotive Industry’ issued by the Chinese government in 2017 encourages auto firms to use EVs and autonomous vehicles as breakthrough points to expand overseas markets and fulfil technological upgrading in the EV industry. In response to this plan, many EV firms are investing in Europe, Asia, and South America. However, in terms of the EV market in Europe, we found that the top-selling companies are from local firms, and leading firms in the traditional automobile industry (see Figure 2).

Europe has become increasingly attractive for Chinese EV firms over recent years, a place that subsidises EV buyers and supports building charging infrastructures, especially in Nordic countries, Germany, the UK, and the Netherlands. However, there is a need for academic research on the Chinese EV firms that have invested in Europe since a few years ago. Therefore, we aim to study the situation of Chinese EV firms operating in Europe to understand their internationalisation process at the initial stage.

We suggest that the internationalisation process of Chinese EV firms follows the OLI paradigm because they have gradually accumulated sufficient technological capabilities to be used to go abroad.

FSAs refer to “knowledge bundles that can take the form of intangible assets, learning capabilities and even privileged relationships with outside actors” (Dunning, 1980; Rugman and Verbeke, 2003, p.127). Investing firms transfer existing FSAs abroad and use them to compete with firms in host countries (Dunning, 1980). FSAs include technological capabilities (e.g., patents, brand names, managerial expertise), knowledge of new technologies, and linkages with external organisations or individuals (Narula, 2014; Verbeke, 2009).

⁴ Retrieved from <https://www.statista.com/outlook/mmo/electric-vehicles/china#unit-sales>

Although Chinese EV firms are competitive in the domestic market and ready to compete in the global arena, it is largely unknown whether they could keep their advantages when entering new markets. Chinese firms might also need more competitive advantages in a different environment, despite owning some advantages in their home country (Guo and Miller, 2010). The questions of great interest that will be addressed in this paper are stated as follows:

What are the advantages of Chinese EV firms when they invest in Europe? What are the disadvantages they might face in Europe?

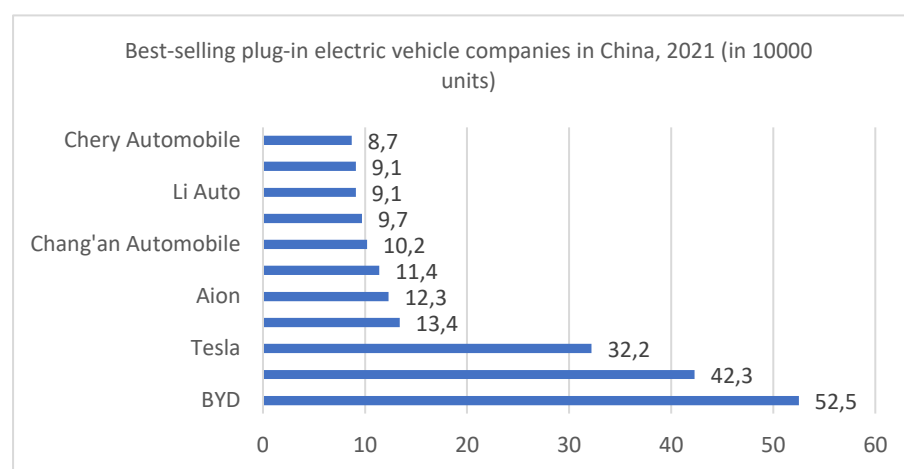


Figure 1 Best-selling plug-in electric vehicle companies in China, 2021 (in 10000 units)

Source: China Association of Automobile Manufactures

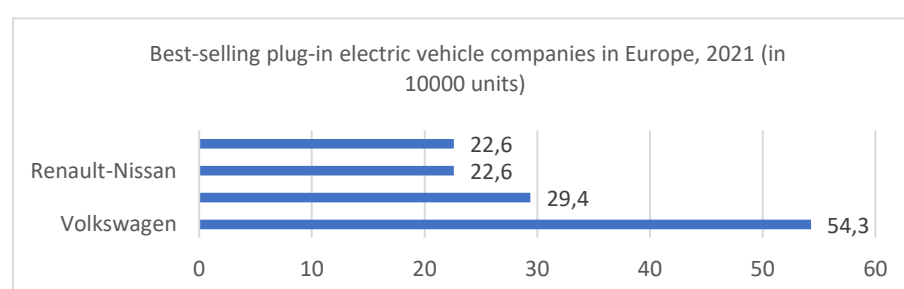


Figure 2 Best-selling plug-in electric vehicle companies in Europe, 2021 (in 10000 units)

Source: EV sales; Statista 2022

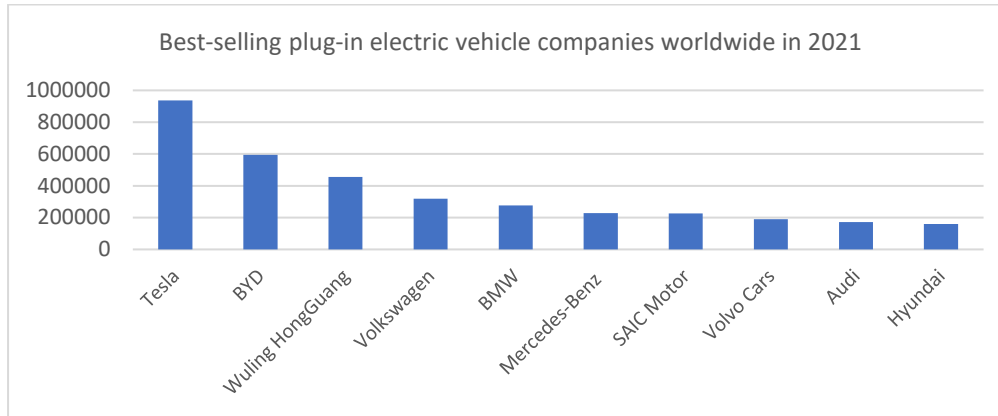


Figure 3 Best-selling plug-in electric vehicle companies worldwide in 2021

Source: EV sales; Statista 2022

3 Research Methodology

3.1 Research design

This analytical paper is based on the data collected from both secondary and primary sources. The data and information from secondary sources are the focus of the study, given the short history of Chinese EV firms' expansion into Europe. The primary data is used to confirm the secondary data and provide us with more supplementary information.

3.2 Data collection and coding

To address the research questions, we collected secondary data from different channels, such as annual reports, magazines, companies' websites, industry reports, MarkLines, Zephyr, and primary data referring to the semi-structured interviews from six Chinese EV firms. The semi-structured interviews, with open-ended, exploratory questions, were employed, which allowed respondents to talk and provide their insights freely (Gao and Liu, 2012). The interviewees were managers from the subsidiaries of Chinese EV firms in Italy, Germany, Finland, and China. Interviewing managers from different countries and companies could provide relatively trustworthy and comprehensive information for addressing the research questions proposed in this study.

Ten interviews were conducted at five Chinese EV firms. The locations of the firms and the number of interviews for each firm are shown in Table 1. The length of the interviews lasted

ranged from 30 to 90 minutes. All the interviews were recorded and taken notes. The interviewees were asked to describe the motivations of Chinese EV firms entering Europe, their competitive advantages, shortcomings, and obstacles during the internationalisation process. 6 of 10 interviews shown in Table 1 were conducted in Mandarin, and transcripts were recorded in this language and then translated into English. All the analysis is based on English transcripts.

Chinese EV firms	Location	Number of interviews
Firm 1	China	2
Firm 2	China, Finland	2
Firm 3	China, Germany	2
Firm 4	Germany	1
Firm 5	Italy	2
Firm 6	Italy	1

Table 1 Overview of the interview data

Then, we put all the English transcripts from the interviews and other secondary data together. We first took a detailed analysis of the secondary data. Then, we checked it through the interview data to ensure the reliability of secondary data. This analysis was conducted for each of the six firms. Furthermore, we made a cross-case analysis (Eisenhardt, 1989) by comparing different EV firms and figuring out their similarities in the aspects of advantages and disadvantages.

4 Findings

In this section, we report the findings of advantages and disadvantages during the internationalisation process of European Chinese EV firms as follows.

4.1 Advantages of Chinese EV firms in Europe

4.1.1 *Innovative technologies in EVs*

The innovative technology can be evaluated by the number of patents registered by each firm (Wu, Ma, and Liu, 2019). We collected patent data of five Chinese EV firms⁵ (i.e., Great Wall Motors, SAIC, NIO, Xpeng, and BYD) and compared that with some main European competitors (i.e., Tesla, Hyundai, Volkswagen, Audi, and BMW). This comparison allows us to understand the differences in innovation capability in EVs between leading firms in Europe and China. The patent data was drawn from the Orbit Intelligence database (Orbit).

We focus on the effective patents granted or pending to be granted by European Patent Office⁶ in the EV field by selecting relevant International Patent Classification (IPC) codes. The IPCs codes for EV industry are B60L, B60M, B60K 1/00, B60W 10/00, B60W 20/00, and B60K 6/00.

Main IPC codes	Numbers of EPs (Chinese firms)	Numbers of EPs (Competitors in Europe)
H01M-010	26	31
B60L-053, B60L-058	25	31;10
B60K-006	22	12
B60W-010	21	27
B60W-020	15	11
B60L-050	8	12
B60L-015, B60K-001	7	5;12
B60W-030, B60L-003	6	4;10

Table 2 Distribution of EPs of selected EV firms in China and Europe based on IPC codes

The technological layout (see Table 2) of the top IPC codes for Chinese EV firms shows that European Patents (EPs) concentrate on the key components of EVs: (1) battery: H01M-010 (secondary cells), B60L-053 (methods of charging batteries and equipment), B60L-058 (methods or circuit arrangements for monitoring or controlling batteries or fuel cells); (2) propulsion and control systems: B60K-006 (propulsion systems), B60W-010 (for propulsion of purely electrically-propelled vehicles), B60W-020 (control systems specially adapted for

⁵ These firms are selected because they are key players who have started operations in Europe.

⁶ The patents protected and recognized by European Patent Office, which will enable Chinese firms to utilize them in Europe.

hybrid vehicles), and B60L-050 (electric propulsion with power). Furthermore, Chinese EV firms have obvious advantages in technologies of B60L-058, B60K-006 and B60W-020 over their European competitors. There are also a few differences in EPs in H01M-010, B60L-053 and B60W-010. It implies that Chinese EV firms have gained innovative technologies through in-house R&D in the major fields of the EV industry. It confirms the perception that Chinese EVs are at the same level as leading European firms and even stay at a higher level in the specific technological area (Cheng and Tong, 2017).

We received supporting views from managers of Firm 1 and Firm 6, who said:

The core technologies of EVs are electronic control, electric drive motors, and batteries, completely different from traditional cars. Originating from the government's medium and long-term strategy, China has been investing in the performances of EVs and batteries for many years. Electrification has given Chinese firms this technological advantage because they have used batteries and electric vehicles for a while.

In particular, battery technology is a significant advantage for Chinese EV firms. The manager of a Firm 1 explained that:

Although there are batteries manufacturers, such as CATL, Panasonic, and LG Chem, which are relatively well-known at present, most Chinese companies will only partially purchase batteries from foreign suppliers. Instead, they will add their own technologies to the battery. For example, the insulation, relevant materials, or temperature control management of batteries are well developed by the company. However, EV firms from western countries, like Tesla, directly purchase and use batteries from large suppliers. The technology of batteries developed by suppliers is relatively inferior to the technology developed by Chinese automobile firms.

Through applying for these patents, Chinese firms are continuously launching innovative products, which aim to solve the concerns of customers that negatively affect the acceptance of EVs (e.g., concerns about battery safety, low mileage problems and long charging time) (Wicki et al., 2022). For instance, the 'blade batteries' invented by BYD address these problems, being more competitive in safety and driving range than other batteries available in the market.

4.1.2 Fast development of software

The goal of furnishing EVs with intelligent software is another characteristic that distinguishes the traditional automotive industry from the new one. A manager from Firm 3 commented that:

This change concerns digitalisation and low carbonisation in car manufacturing, which has not been seen in the automotive industry for a century. Moreover, the emergence of Tesla in China lets Chinese auto firms observe the opportunity in EV manufacturing. With a large number of local battery manufacturers and strong knowledge bases in the software industry, Chinese automobile firms have put the traditional auto industry on the edge of a revolution.

Chinese IT services, internet, electronics, and telecommunication companies, such as Tencent, Huawei, and Alibaba, have grown rapidly in the technologies of big data, computing platforms, and creating data centres. They become competitive globally. They have driven the development of China's entire software industry chain and drawn attention at the national level. Chinese governments encourage training programs in colleges and universities and support developing cutting-edge technologies in this industry through several favourable policies and plans (e.g., Five-Year Plan).

The accumulated knowledge in the software industry provides a solid foundation for developing the Chinese automotive industry. A manager from Firm 2 added that:

In many Chinese EV companies, some employees are experts in the software industry. This successfully interprets the new direction of software-defined EVs' development. It also gave birth to Chinese companies applying technological concepts, such as autonomous driving, AI technology, and image recognition technology, to car manufacturing.

At the research and development phase, they integrate user research and extensive data application scenarios to advance the intelligent functions of EVs and better suit consumers' usage habits and preferences.

A manager from Firm 3 also argued:

The intelligent software installed on the car, such as technology for connectivity, big screen, entertainment, immersive voice control system, and lights, brings users a great experience during driving.

The era of EVs has been in the trend of becoming an electronic consumer product, using more software in the car. As supported by a manager from Firm 1:

The software will be an integral part of the car in the future. Still, traditional auto firms in Europe with the idea of changing traditional cars to electric vehicles need to be fixed in this direction.

Another important factor for Chinese EV firms is their ability to continuously update the software, which ensures the iteration of functions and EVs' updates. A manager from Firm 1 gave an example of OTA upgrading technology:

Remote online Over-The-Air (OTA) technology upgrade is the focus of the future development of EVs. OTA can be understood as a remote wireless upgrade technology. It aims to realise remote software management through the interface of mobile communication.

Executing software upgrades is essential to gain competitiveness in China and globally. However, for European cars, the establishment of the industrial software chain came later than in Chinese companies.

A manager from Firm 3 also said:

Chinese companies released the second generation of products or platforms, but at this time, European companies still need to catch up to Chinese companies.

4.1.3 Providing customer-centric services

Another advantage is about providing superior user experience and interaction with customers. Managers from Firm 2 and Firm 3 argued:

Chinese auto companies are at the forefront of the world regarding user interaction (user-centric) in building user communities in the Internet era.

This is driven by the use-centric business philosophy rooted in Chinese EV firms. Some investors in Chinese EV firms are telecommunication companies, so the entire concept of auto in China is related to the ideas brought in by the investors. For instance, they focus on improving user experience by providing various services through mobile applications (APPs). Each Chinese EV firm has launched its APP and mobile software that provides users with digital services. We receive additional explanations from a manager of Firm 3:

The APPs are like social platforms where customers can communicate and inquire about sales issues and technical questions by sending messages directly to the APPs. Except for that, for instance, NIO created a niohouse, a full-featured user experience centre. It is not just a place to sell cars, but a venue like a club. Users can come here to relax and chat. This a social app that builds a user community. Traditional manufacturers in Europe are far away from users.

4.1.4 Substantial financial power

Chinese EV manufacturers have strong capital to execute related business activities in China and foreign countries. One of the financial sources is to collect capital from stock markets. Several start-ups (e.g., Li Auto, Xpeng) were successfully listed in the foreign stock exchange market, after receiving capital from several financing rounds.

Another crucial financing source is the Chinese government. The Chinese government has issued plans to support the production and development of EVs and upgrade the automotive industry for a long. For instance, ‘Decision on Accelerating the Cultivation and Development of Strategic Emerging Industries (10/2010)’ and ‘Mid to long-term Development Plan for the Automotive Industry (04/2017)’ propose that using EVs and autonomous vehicles as breakthrough points to enter and grow overseas and lead industrial upgrading. To do so, Chinese governments largely support the industry growth in several ways, such as by decreasing electricity expenses, subsidising the electric car manufacturers, and helping build charging facilities. Chinese EV firms could cooperate with the local governments to gain capital support.

4.1.5 The shift toward mass production

Chinese EV firms have already gained experience in manufacturing EVs at a large scale, compared to European rivals. From MarkLine database, the production capability of Chinese EV firms is higher than that of lead auto firms in Europe in 2021. Great Wall Motor produced 1,265,269 units in China, BYD produced 737,502 units, and NIO, a newly established company, even manufactured 92,921 EVs. The mass production in China provides firms with sufficient

finished EVs ready to be exported abroad. However, Volkswagen has produced 1,734,973 cars in Europe, with EVs only accounting for 20% of the total output. This is the same case for other players in Europe. EVs only took 10 % of the units produced units (781,612) in Audi. As a manager from Firm 4 stated:

Building EVs is pretty new in Europe. For BWM, and STELLANTIS, if they invest billions in those technologies, they will have manufacturing plants for those technologies. It takes time to change to a complete EV. This also has a social impact in Europe because many workers still work in ICE manufacturing. They cannot switch in one day to an EV.

Moreover, Chinese car companies are now leading in the quality and number of platforms especially built for producing EVs. A manager from Firm 1 described that:

A platform is similar to a production line. Building a car from a platform will be very expensive. Chinese companies are currently making every effort to build pure electric platforms to produce EVs. However, the European platforms are mainly built to produce ICEs, and the tendency is to change the production lines of ICE to produce EVs. Therefore, it is different from finished vehicles built through pure electric platforms.

In addition, the stronger production capacity of Chinese firms is driven by the formed industrial cluster in China and its efficient operational process. Many Chinese EV firms have been founded within a cluster in several connected provinces (especially in the east and south of China), involving many suppliers, R&D centres, assembly plants and firm headquarters. For instance, SAIC, headquartered and conducting R&D activities in Shanghai, has batteries, engines and traction motors suppliers in Anhui, Jiangsu, and Zhejiang (3 provinces very close to Shanghai), where also EV models are assembled. In this way, SAIC could fulfil phases of integrating research, purchasing, and manufacturing in several connected regions, saving transportation and communication costs. Abilities to integrate raw materials from different locations and mass manufacturing are crucial in the automotive industry.

4.1.6 Closeness to suppliers

Another advantage is the closeness to the most important suppliers, from whom to acquire raw materials and negotiate the purchasing prices. In doing so, Chinese EV firms could obtain competitive prices from them, reducing manufacturing costs.

We analyse suppliers' features who provide key components of EVs: drivetrain system/motor, traction motors, battery management systems, and lithium-ion batteries. From MarkLines, we found that many suppliers of the EV industry are Chinese firms. For instance, the ratio of Chinese battery enterprises over global battery suppliers is much higher in battery management systems, which is 172 Chinese suppliers over 232 global suppliers. Some of them have even become international battery suppliers. Amperex Technology Co., Ltd (CATL) and BYD, were among the top 5 suppliers in the world in 2021, holding 42% of the market shares. Indeed, CATL is continually supplying Chinese EV firms and several firms in Europe, such as BMW, and Volkswagen, through Li battery manufacturing sites in Erfurt, Germany.

Regarding other components, for example, among 324 suppliers of traction motors, 240 of them are Chinese firms. They are preferred by Chinese EV makers. Great Wall Motor and Chery purchase traction motors from Shanghai Automotive Edrive, BYD from FinDreams Powertrain, and FAW from Zhuzhou CRRC Times Electric.

The manager from Firm 4 also discussed that:

The raw materials are quite cheap because most of them come from China. Chinese EV companies' supply chains are currently complete in the domestic market. European companies need to catch up in making efforts on EVs, so the cost of R&D and value chain integration is higher, resulting in higher production costs. European firms' business about procurement, R&D, and talent in EVs has to start from zero.

Furthermore, we found that some suppliers are subsidiaries of Chinese EV firms (e.g., BYD semiconductor founded by BYD) or become subsidiaries through domestic acquisitions or joint ventures. For instance, with Qinghai Salt Lake Industry and Shenzhen Zhuoyucheng Investment, BYD jointly invested and established a joint venture to explore Qinghai Salt Lake resources, to develop lithium batteries. In doing so, BYD holds the reserves of rare earth metals for battery production (Narins, 2017). The other examples can be seen in the acquisition of Beijing Chusudu Technology by SAIC to access autonomous driving solutions; Great Wall Motor acquired Hebei Tongguang Semiconductor to develop the silicon carbide. In so doing, Chinese EV firms hold shares in suppliers, which facilitates them to access and control raw materials.

4.1.7 Qualified products

Several Chinese models have reached the car standards existing in Europe and better driving performance compared with those in Europe under similar prices. The managers from Firm 4 and Firm 6 stated that:

In China, there is an improved quality of electric cars. Most of the products match the European quality regarding customers' expectations, materials, assembly quality, etc. They reach 90% of EU product quality in car products. For instance, the safety standards get very similar to European ones in China. So many Chinese car firms are ready to fulfil the car regulations when they come to Europe.

However, car manufacturers in Europe are struggling to reach the entire electrification domain, fulfil the regulation, and be competitive in product quality. A manager from Firm 2 told us that:

EVs have just started in Europe, and local firms are still learning and following the existing EV companies. So, their product strength is relatively weak, such as battery life, product upgrade capability, etc.

Chinese firms have relatively lower costs of producing EVs (i.e., lower costs from purchasing to manufacturing). Consequently, these low costs allow Chinese EV firms to expand their product lines without many concerns for capital. As a result, they are providing a relatively rich product portfolio with various EV models inside. For instance, except for BEVs, Chinese EV firms also actively launch PHEVs, another type of EV focused on satisfying long-range needs.

Relatively speaking, European cars produce fewer sorts of EVs. For instance, Volkswagen only has 3 EV models called Golf, ID.3 and ID.4. Audi currently has e-tron GT, Q4 e-tron, Q8 e-tron and e-tron. European firms' inferior EV diversity is related to their undetermined corporate positioning. European firms and their suppliers are still relying on producing ICEs, which will cause losses if transferring production lines and suppliers to offering EVs. Combined with innovative technology, and high-quality and diversified electric vehicles, Chinese EV firms could provide competitive products in European markets.

4.1.8 Awareness of building charging infrastructures

Chinese EV firms have superior charging technologies. One of the main concerns in purchasing EVs in Europe is the number of charging stations. Several fast-charging stations or battery-swapping stations were established in China. However, traditional carmakers in Europe do not have enough awareness and motivation to increase charging quality. The manager from Firm 3 said:

Many Chinese companies prioritise solving mileage anxiety, such as building charging piles and replacing power stations.

Some EV models can be charged for five minutes to drive 200 kilometres through ultra-fast charging piles.

Swapping power stations is an advanced technology for Chinese EV firms and has reached the world's leading level. Nowadays, Chinese EV firms are actively deploying infrastructure construction in Europe by applying such technology. The manager from Firm 3 described that:

Chinese companies use self-developed high-efficiency power modules to greatly improve batteries' charging and discharging efficiency in swap stations. It is faster than charging. Fast charging takes up to 30 minutes. In swapping power stations, the staff will pull out the chassis battery and replace it with a new modular battery within 5 minutes.

4.2 Disadvantages faced by Chinese electric vehicle firms in Europe

4.2.1 Inability to transfer several patents to Europe

The most important disadvantage for Chinese EV firms in internationalisation arises from the fact that Chinese car manufacturers have not registered their patents in an international context. A manager from Firm 1 noted:

EV's technical barriers are very low so technological advantage can be easily covered.

Unlike ICE, the engine has a high barrier and consists of many parts, and it is difficult to be imitated.

To evaluate the firms' technological level in China, we collected the number of Chinese patents from Orbit. We used the same IPC codes for the EV industry and selected Chinese firms, as presented in Section 4.1.1. Table 3 shows the respective number of patents authorised in Europe and China. We notice the difference is quite large for each selected firm, and most of

the patents registered in China were not transferred directly to Europe. This might be related to the different rules and standards for application existing between European countries and China.

Furthermore, from the results emerging from the reading of Table 4, Chinese patents are widely distributed in some technologies of the EV industry (see the explanations in Section 4.1.1), such as B60L-053, B60L-058, and H01M-010, which are mostly not converted in Europe. We emphasise the importance of overcoming such shortcomings and protecting the existing patents under different legal systems to avoid the loss of ownership of the inventions in other locations.

Company name	Number of patents in Europe (EPs)	Number of patents in China (CNs)
SAIC	12	363
Great Wall Motor	17	450
NIO	124	563
Xpeng	4	61
BYD	182	1700

Table 3 Difference in the number of patents in Europe and China

Main IPC codes	Number of Chinese patents
B60L-053	57
B60L-058	37
H01M-010	30
B60L-050	12
B60W-010	11
B60K-001	10
H02J-007	9
B60L-003	9
B60L-015	9
B60H-001	8
B60W-020	6

Table 4 Distributions of the main Chinese patents

4.2.2 Lack of brand awareness

Another disadvantage is the lack of global brand awareness among local customers. Chinese EV firms have to build their reputation from scratch in Europe. According to JATO, the top 25 best-selling traditional car brands in Europe in 2021 were Volkswagen, Peugeot, Dacia, Renault, Toyota, Hyundai, and Stellantis. The same brands were producing EVs cars. Thus, customers willing to purchase EVs cars prefer to choose familiar or well-known companies (Chi, Yeh and Yang, 2009).

It is difficult to convince conservative European customers to buy new Chinese EV firms. A manager from Firm 5 proposed the following statement:

Consumers in Europe are quite conservative. For instance, German customers make a distinction between everything that is made in Germany and imported products. Historical market shares of made-in-Germany cars reach around a stable 70% per year. Thus, in this country, foreign manufacturers have to win the resistance from the consumers.

“Made in China” products are generally characterised by cheap and low-quality: there is a negative image among European customers (Wang and Gao, 2010). Traditional Chinese automobiles were never successfully sold. This has created a negative expectation also for Chinese electric cars. European customers have the perception that firms in Europe are providing better products.

4.2.3 Lack of knowledge about European markets

Customer’s knowledge is important, including preferences, needs, and expectations of EVs (Helveston et al., 2015; Huang and Qian, 2018; Lieven, 2015). Chinese firms would have to rebuild data centres in the targeted European markets to collect more information. As the manager from Firm 5 added:

It is challenging to gather customers’ data since Europe is the place that highly protects the privacy of consumers around the world.

Limited knowledge about premium markets The first dimension to be considered is the limited knowledge about premium markets. In the European automotive market, except for the

mainstream product in the auto industry (e.g., Reno, FIAT with enough safety and basic quality) and luxury products (e.g., Ferrari, Lamborghini), there is the premium segment which is not present in the Chinese market, and that is ignored by Chinese automakers to a large extent. There are quite few EV firms that are starting to learn how to open premium markets in China and replicate this business model in Europe. As a manager from Firm 4 explained:

The premium market is a very high profitability market. The premium volume in Europe is very relevant for whatever products. It is also very profitable in the auto market.

A manager from Firm 4 provided additional insights into this point:

The main story about China is only made by mainstream and luxury products (status, brands, and show-off products). In Europe, we have something in-between, called premium products. For the premium brands, such as Audi, BMW in Europe, China do not exist. They are just the best of the possible technologies within the mainstream combined together to offer a premium product.

Lack of understanding of customers' preferences A second dimension relies on the lack of knowledge of customers' preferences. Chinese customers are different from European ones in the automotive industry because they have different buying and driving habits. The key differences mainly come from the preferences for products' size and acceptance of digitalisation.

Large EVs are preferred by Chinese customers, but smaller cars are in line with the needs of European customers for daily life. Two managers from Firm 3 and Firm 4 noted:

The vehicles they got in China are much bigger than the ones we used to drive in Europe. In China, finding people driving a 5-meter car is normal, because it shows social status and richness. In Europe, almost nobody is driving a 5-meter car. We have crowded cities like Roma, Madrid, and Munich, and you cannot really drive a 5-meter car.

Ignoring the dimension of smaller cars is a cultural feature. A huge culture change is necessary for Chinese EV producers if they want to conquer European customers. A manager from Firm 4 argued:

In the Chinese culture, small cars are cheap and not well made, medium cars are better, and big cars are well made. Chinese markets provide super small or huge SUVs, but they

lack something in between. Chinese firms lack the knowledge on how to produce those kinds of vehicles.

As discussed by a manager working in Firm 4:

In the compact car, you still have to be cost-wise, and, from the technological point of view, you have to offer the same safety, comfort and performance as big cars. It is much more complicated because you have less space.

Moreover, Chinese customers are pleased with EVs equipped with big screens, entertainment services, and voice assistants, but European customers might need a vehicle to satisfy their daily work. As mentioned by a manager from Firm 5:

EVs cars are more expensive than traditional cars. In Europe, people that can afford the expensive EVs are those of the generation of 50s to 60s. But they are less digital. In contrast, the Chinese target groups are young people or the middle class, which is huge in China, and they are familiar with intelligent technologies.

Lack of knowledge of the European driving style The last dimension relates to the lack of knowledge about the European driving style. Chinese EV firms do not know the differences in the driving system between China and Europe, which implies the design and manufacturing of a completely new product. The manager from Firm 4 gave a specific example:

China has a top speed limit, which is 120 km/h. Most of them are driving in country roads, or in the city, but the roads are huge. They never go above 120 km/h. In Europe, for instance, in Italy, France, and Germany, we are used to driving at a higher speed. This means that the suspension setups, the braking setups, the handling, and everything related to car comfort, noise and so on, are different.

Taking together, based on the findings discussed above, we suggest that launching the same product they have in China directly to Europe will put Chinese EV firms in a disadvantageous position.

4.2.4 Less flexibility in products and unattractive price

The products of Chinese EV firms are only influenced by large domestic market demand, and they export the same products abroad. The manager from Firm 5 added that:

Chinese firms work within a local mentality.

To avoid mistakes, Chinese firms have to become more flexible and faster become accustomed to local needs.

One way to convince customers is to offer products at lower prices. The low-cost strategy of Chinese EV firms is implemented in the Chinese market, but it is not applicable in the European markets. Chinese EV firms do not enter the market based on attractive prices but on the total quality of EV models. For instance, Aiyas's selling price is around 51,000 euros in European destinations (e.g., France, Germany, and Denmark), which is higher than their European competitors. Some firms also have a high selling price in China, so when they export abroad, they try to replicate the same behaviour in Europe. The manager from Firm 5 added about the German market:

Germany is by far the biggest market for Chinese firms. Germans are conservative, and they want to buy made in Germany products. Made-in-Germany brands were able to keep 70% of total market shares over the years.

4.2.5 Lack of design knowledge

Compared to Chinese carmakers, the ways in which European firms are making designs are better.

A manager from Firm 5 stated that:

The hardware components are not well developed by Chinese firms, such as braking systems, and car body. The integration of components is not well done.

A well-designed car is crucial for customers, as argued by managers from Firm 2 and Firm 6:

The quality of the car body, seats, tires and other things has nothing to do with the core. Technologies of EVs are often the points that consumers mainly look at because they are more visible. However, Chinese firms are still producing inferior products.

Currently, there are only very few companies that have set up design studios overseas to acquire related knowledge.

4.2.6 Lack of international managerial expertise

Most Chinese EV firms lack international managerial knowledge about opening new operations in foreign countries, particularly in the case of newly emergent firms that are at their early stage of internationalisation and do not have relevant experience in investing in Europe.

Looking at the Zephyr database, we discover that some Chinese EV firms have experienced international takeovers or joint ventures. For instance, SAIC acquired a Korean company, SsangYong Motor, in 2006; Great Wall Motor invested in German hydrogen filling stations developer, H2 Mobility Deutschland GmbH & Co KG. Nevertheless, the skills of managing acquired firms or joint ventures might differ from the way of coordinating foreign subsidiaries, factories, or R&D centres.

4.2.7 Lack of European manufacturing sites

The productions of Chinese EV makers are mainly based in China. For example, BYD has its own vehicle production lines in several regions of China. The plant lines located across different regions in China aim to guarantee the supply to the domestic demand. For some Chinese EV firms, this strategy is applied to produce coaches, buses, or trucks in foreign countries. SAIC has built production bases in some Asian countries, BYD in India, USA, Brazil, and France, and Great Wall Motors in Thailand, Malaysia, and Brazil. Nevertheless, none of those production lines is dedicated to passenger EVs.

In contrast, Tesla has built an assembly place in Germany (called Tesla Gigafactory Berlin-Brandenburg) and the Netherlands (called Tesla Motors, Tilburg Assembly plants) to produce and supply local markets. According to the manager from Firm 5:

If EVs cars are manufactured in Shanghai, it could take three months to get the car by shipping in Europe, but if it is produced in Europe, it only takes few weeks.

Manufacturing might not be necessary for most Chinese firms at the initial stage of internationalisation because they just started their business in Europe with few units demanded by European customers; however, this is relevant from a long-term point of view. The manager of Firm 5 noted that:

In the auto industry, investment return might take 12 years, which is the average life cycle of every auto platform. When RMB devaluates, they will lose competitive advantages in Europe.

It is a big challenge for them to open factories in Europe. Setting up a new plant is costly and risky. Also, the higher labour, land, and manufacturing costs may cause additional costs for European Chinese EV firms.

4.2.8 Building selling and after-sales services from scratch

In Europe, EV cars could be sold through retailers, dealers, and few brands also directly support purchases from official websites. The ways of selling and distributing are almost the same in China. However, Chinese EV firms still face disadvantages when selling products in Europe. First, Chinese newcomers have to create a dealership network from zero. Second, even if some Chinese EV firms start collaborating with local dealers, it does not mean that their sales will be successful. As mentioned by a manager from Firm 2:

Dealers are selling multi-brands, and they care less about the survival of brands.

The manager of Firm 5 gave an example:

For instance, some Chinese firms imitate the Tesla model, which could be difficult for them.

It is because they understate customers' acquisition costs to establish their brands, such as investing locally, advertising, and getting knowledge of local markets.

Furthermore, Chinese EV firms also face disadvantages in providing after-sales services. First, they do not set up after-sales centres directly in Europe. Even though EVs are thought to be easier to repair than ICEs, the after-sales service points are still important for customers to contact sellers and provide certain warranties for maintenance and customer satisfaction (Shokouhyar et al., 2020). Tesla has offices for after-sales and maintenance services located intensively in Europe; Hyundai Motor manages thousands of aftersales points that support the brand in Europe. Also, Chinese EV firms could not provide European customers with the type of intensive networks for charging created by their European rivals. The development of infrastructure closely depends on the linkages with local partners. For instance, Volkswagen collaborates with Tesco and Podpoint, a supermarket and a charging company). These examples are not imitated by Chinese EV firms.

Currently, Chinese EV firms generally lack local selling networks, after-sales services, and adequate infrastructures. However, BYD (NIO) started to connect its distributors in Norway (for supporting marketing, sales, and after-sales services), and build strategic partnerships with local charging companies.

4.2.9 Relationship with host countries

Chinese EV firms might face the restrictions established by the government of host country on local operations. For example, In the past, Chinese government restrictions on western auto firms (e.g., Volkswagen) force them to form a joint venture with local firms in China to produce cars locally. The construction of the Tesla Gigafactory in Germany took three years to be finally approved by the German government. Other concerns, such as potential trade barriers, tariffs, or additional taxes, could impact the development of Chinese EV firms. Hence, the disadvantage comes from the challenges of connecting and establishing relationships with governments in host countries.

Additionally, Chinese EV firms might lack knowledge of institutions in host countries, such as language, legal system, local practices, rules, or standards of EV quality (Collinson and Narula, 2014; Eden and Miller 2004; North, 1990).

5 Some proposals to mitigating Chinese disadvantages

First, for the inability of transfer patents: Chinese EV firms need to have a better understanding of existing patents that are granted in China but not in Europe and know which patents are required to be approved in Europe with priority. Then, Chinese firms need to increase the grant rate of these patents, especially those regarding the EV industry. Before applying for European patents, firms could study the European standards and rules for legalising patents received abroad.

Chinese firms could improve product exposure to local customers through online and offline channels, such as presenting products in EV exhibitions, shopping malls, online streaming, and advertising on social media platforms (Opreana and Vinerean, 2015). In this way, firms could establish brand recognition.

Additionally, brand awareness may be developed for firms with low-cost EVs in less-developed regions. To decide on the specifically focused segment, Chinese EV firms should understand the features of the market segments they targeted (e.g., potential customer groups). They had to conduct more market research about customers' preferences. Chinese firms can co-sell their products with a local firm that owns a high brand reputation among the clients. Also, paying attention to word-of-mouth among customers is an additional way of promoting products (Chevalier and Mayzlin, 2006).

Moreover, Chinese firms should make specific investments related to the European market to obtain intangible assets (e.g., customers' driving habits). For instance, Chinese automakers could consider adjusting the car's width for the European market.

In terms of unattractive pricing, the low-cost strategy could be adopted to compete against traditional lead automakers in Europe. In this regard, Chinese EV firms could be more advantageous if they provide customers with well-performed products but lower prices than their European competitors.

Chinese firms can use the experience of other successful Chinese firms, in terms of operation, management, and the way in which coordination between the headquarters and foreign subsidiaries is organised. Another way to overcome this obstacle is to hire managers and employees who have worked in host countries (Schaefer, 2020).

In order to accumulate knowledge about the host countries, Chinese EV firms could consider investing in local production bases through joint ventures (e.g., like Fiat's strategy in Turkey) or acquiring OEM (original equipment manufacturing) plants (Athreye et al., 2014).

The shortcoming of selling and after-sales services in Europe can be mitigated by developing relevant resources in Europe, e.g., selling through online streaming platforms and linking with trustful local distributors, retailers and charging companies. There are several ways in which firms get connected to external players. Specifically, Chinese EV makers could establish partnerships or strategic alliances with other companies (Todeva and Knoke, 2005). This strategy is also quite appropriate for infrastructure development: forming a strategic partnership with a European-based charging solutions provider to develop charging construction jointly. Another way is to acquire a domestic dealer website or a distributor.

Aftersales service office could be quickly built even if EV firms do not have a local factory. Firms can transfer spare parts of EVs to the local distributor or their own service office.

Last, Chinese EV firms should consider investing in countries willing to collaborate with China. Also, lacking knowledge about the institutional environment in Europe could be solved by involving individuals who are familiar with the local institutional context. Another way of overcoming this issue is to gain institutional knowledge (Javernick-Will and Scott, 2010) by their managers.

In sum, even if Chinese EV firms address these disadvantages in their expansion into Europe, it cannot guarantee they will obtain competitive advantages over rivals in Europe and compete against them successfully.

6 Conclusions and policy implications

Although Chinese EV firms obtain advanced technologies in several field of EVs, like the superior level of battery, they still face challenges in internationalising and competing with lead automotive firms in Europe. In this paper, we analyse the sources of advantages and disadvantages of Chinese EV firms when expanding into the European market. It contributes to the literature on the internationalisation and innovation of Chinese firms entering the EV industry, and the policies suggestions to firms and countries that aim to largely develop their businesses in the EV industry. We finally provide some ideas to overcome these disadvantages and foster the internationalisation process in Europe.

This paper will contribute to understanding the FSAs, using the OLI paradigm, emphasising the competitive advantages of Chinese EV firms. Additionally, the study complements the growing literature on the challenges of internationalisation by studying a new industry and explaining its beginning international expansion deeply.

Managers of Chinese EVs should regard European countries not as inaccessible markets, but as places that could help Chinese firms to increase their competitiveness as global EV carmakers.

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Footnotes

1. Retrieved from <https://www.statista.com/outlook/mmo/electric-vehicles/china#unit-sales>
2. These firms are selected because they are key players who have started operations in Europe.
3. The patents protected and recognized by European Patent Office, which will enable Chinese firms to utilize them in Europe.