

The Influencing Factors of the Export Competitiveness of New Energy Vehicles

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Abstract:

Global exports of new energy vehicles (NEVs), have entered a period of rapid expansion, reshaping the competitive landscape in both developed and emerging markets. This paper examines the factors influencing NEV export competitiveness in China, Germany, and Japan. Using a mixed-methods design, combining a literature review, indicator-based benchmarking, and original surveys of importers and dealers, the paper analyzes the impact of industry fundamentals—such as battery cost and capacity, technological innovation, range, fast charging, patents, and policy environments—on export performance. The results indicate that declining battery costs, increasing patent intensity, and improved destination infrastructure are significantly associated with increases in export volume and quality-adjusted unit value, while tariffs and certification frictions can inhibit shipments. Qualitative analysis revealed market segmentation through interviews: developed markets prioritize brand, safety, and Advanced Driver Assistance Systems (ADAS) features, while emerging markets emphasize price, range, and maintenance costs. This study provides a coherent indicator system and policy and enterprise-level recommendations to enhance the export competitiveness of new energy vehicles amid rising trade barriers and widening standard divergence.

Keywords: Export competitiveness; influencing factors; new energy vehicles.

1. Introduction

Global trade of new energy vehicles has seen a sharp rise in the recent past due to the falling costs of batteries, severe regional climate policy, and advances in production of new varieties that can be sold across borders [1-3]. The sharp growth is restructuring the value chains of the automotive sector – from raw materials sourcing and extraction, battery production, up

to vehicle assembly, software and after sales services. Thereby reshuffling such chains among the most successful countries [4,5]. For export-oriented nations, this kind of activity in NEV exports promotes greening of the industrial sector, contributes to highly skilled labor creation, and speeds up the spread of low-carbon technologies in foreign markets. Outline, explain and give insight in the research

problem. Export competitiveness concerning EV pushes a multilevel relationship with various endemic forms. Due to the nature of the assets the advantage of an entity should be sustainable such that it is long lasting and for this to happen it necessitates first, access to strategic minerals and smelting capacity; second, optimization of battery configuration vis a vis vehicle type; third, state-of-the-art technologies such as the ability of the battery to produce charge over long distances, manufacture chargers up to 800 volts, take less power or use power more efficiently, connect to the driving assisting applications and adapt the driving as an individual rather than universal discipline/requirements. Fourth adjustment of the diverse nations standards and requirements such as safety, carrying out recycling activities, security of networks and services or control over releases to the environment in the vehicle – to an extent at which certain poles lead to creation of equilibrium and fifth provision of seamless transport system and postmortem services on the total ownership cost in the end [6–8]. Aspects of change may be selectively positioned and installed within the markets that are most significant in terms of exports in the face of growing trends in trade compliance and convergence in rulership policies.

One may refer to some facts from the past. Prior literature reveals an increase in learning curve related to diminishing overall battery expenses and overall concerns with improvements in critical support systems. The progressive dependence on intellectual property rights and software to solicit demand in the automotive sector, the positive impact of purchasing incentives in reducing carbon emissions and the adverse impacts of carbon related charges on trade have been more and more discussed in the literature [1,3,6,9,10]. However, negative consequences of trade barriers taking the form of customs duties as well as liability due to environmental credentials, and yet other measures aimed at protecting EPDs do check the past statement. Competitiveness beyond the country walls is usually compared by RCA, TSI, UV-circles quality ladders and the changes in the composition of exports with CMS composition which breaks down the export change into three main parts, that is world demand, market composition and residual competitiveness [11].

The paper contributes: internal corporate decisions (technology forecast, national prospect, IP program), external policy making and project organization purposes (harmonization of standards prevailing in an international partnership environment, negotiation of FTAs, chain-wide avenues of innovation), and activities of business associations (development of international testing and certification facilities, help in shaping international technical regulations and standards) [7,8,12,13].

2. Global Export Patterns and Competitive Characteristics of New Energy Vehicles

2.1 Competitive Dynamics of Major Exporting Countries

As a result of the development and application of the entire spectrum of its technological and managerial capabilities, from batteries, through electronics, to the construction of whole cars, China has captured the pricing pure electric transport market and is even targeting the segment of the market that is classified as luxurious. These vehicles include solutions like the BYD Yuan PLUS (ATTO 3) and the Wuling Hongguang MINI EV models which have begun gaining traction internationally. There are also more expensive models like the NIO ET7 and the Li Auto L9 with longer electric range, shorter charging time and quite new ADAS/OTA functionality which are going to be sold in Europe as well. The reach of these Chinese exports extends to most Southeast Asia countries and some in the horn in Latin America such as Chile and Ecuador. In anticipation of this event, Germany, with its strong tradition of quality engineering and premium manufacturers, exports high-end models, such as the BMW's iX and Mercedes-Benz's EQE. Core markets of the concern are Europe as well as the countries from northern America; this is backed with well-knit distribution network and adherence to all the laws and regulations and operative in the region. But their export is still tied to regional or wholly European supply chains such that, relative to China's platform-oriented competitiveness, their cost management and flexibility in adapting to low-priced markets is quite weak. Those based on exports from Japan follow a different pattern, in other words the strengths of Japan are hybrid technology and trust in brand over some of the notable exports. This is useful for China's electric vehicles whose main markets are concentrated in the East and Southeast Asia; for instance, dependability and efficiency including consistent services have established the baselines hence market ratios have hardly moved. Despite this, there was a gap in the growth of demand in relation to the two countries, because the introduction of purely electric cars in China was more progressive than in Japan. In the EU and the US, most buyers as well as regulators focus on strict technical and environmental norms, and safety aspects, as well as consumption of luxury goods and technologies such as driver assistance, all of which support higher per unit prices of models which meet those standards. On the other hand, Volume Oriented Emerging countries such as Southeast Asia, Latin America and the Middle East will do harmonised strategies which could see the provision of easy to use, cost-efficient, energy efficient and environ-

mentally friendly public utility and consumers durables. Other factors, such as cost and capabilities of electric vehicles depend on the charging infrastructure and charging infrastructure in these markets are either non-existent or inadequate, as a result, the product range, and the choice of distribution channels have to be adjusted. In summary, China excels in scale, cost, and rapid iteration while making inroads into the high-end market. Germany defends the high-end market in its home region but must expand coverage of the mid-range price range. Japan maintains its hybrid dominance while cautiously expanding the scale of electric vehicles. ‘Unit development ability’ factor in the diamond is also central in exporters’ competitiveness, as it is explained by the location bound, institutionalist theory in which location of the firm within a given cluster determines how competitive the firm is, hence an exporter within low clusters of development may not be able to export as much as it would if it were located within the higher clusters of development.

2.2 Distribution Characteristics of Export Market

In countries with a developed economy like those in Europe or North America, the main parties are buyers and regulators; they are the ones who determine the importance of technical standards and environmental requirements. With the introduction of the so-called EU type-approval procedures and European safety requirements, environmental considerations, as well as all the related requirements for recovery and sustainable exploitation of goods and raw materials, and the topical cybersecurity and software update requirements have set much higher demands to development, testing and certification of vehicles and forces product engineering and documentation. Vehicle safety and pollution control stipulations in North American markets work quite as a gate-keeping mechanism. Customers in these areas have more value for branded goods and high-end characteristics such as ADAS and autonomous driving technology, increased driving range with shortened charging time, and diminished vehicle noise along with infotainment systems. Consequently, it is models which are considered secure in terms of safety, which have considerable value for their software, and are neutral environmentally, that perform the best when it comes to selling abroad, however the cost of such units will be higher.

Contrarily, mature markets in Southeast Asia, Latin America, Middle Eastern countries focus on the quality of the product, cost and everyday life usage. In these states, consumers are more elastic to the price of electric cars, credit availability is taken into serious consideration, and the system of public charging stations is yet to be widely spread in every place, so that current charging and later

support services at home and office seem vital. In so far as a great number of highly urbanized countries situated in these regions are concerned, winning products typically come with a reasonable range, the emphasis on low maintenance, robust heat control, and simple useful specifications that are easily compatible with local terrain and weather. In the case of the readiness of both dealers and after-sales service, the levels of channel execution—availability of parts, extent of service, the possibilities of local resourcing for example, CKD / SKD to cope with tariff and lead time—are frequently higher compared to breakthrough opportunities. In simpler terms, general practice of more developed markets is that such aspects as safety, quality, brand and software are rewarded, whereas emerging markets would rather valorize such factors as ease of use, costs and service life and therefore exporters are advised to adjust the mix of products and operating models.

3. Core Factors Influencing the Export Competitiveness of New Energy Vehicles

3.1 Industrial Base

Export competitiveness in NEVs ultimately rests on the industrial base: first, the up above upstream resource-security—locking in adequate, low-cost materials lithium cobalt and nickel recycling loops are also welcome smoothest battery input spikes, and helps prevent delivery bottlenecks; second, the middle core components of the supply chain—since the biggest burden is the cost of battery construction, morphing within the cell chemical architecture (LFP/LMFP/NMC), energy capacity, utilization of the cycles, failure of analytical techniques on the design basis during the development of the product, maximum power same volume and weight of the battery heat management, the 800V direct current for rapid charging wires as well as the 130W ultraslim enhances and maximizes the battery performance against these black boxes through Economy of Scale.ue components – advances in this section \$/kWh: they help to enable cost savings in the segment of battery production even further while facilitating such performance enhancements. Third, lastly, the vehicle manufacturing operations and supply-chain management – several assembly lines with a capacity for millions of units – concealing a potential to share costs in the millions range – gaining corporate synergies, utilizing the same platform, establishing paralleled and integrated supplier relationships, building parts warehousing in the regions, and (in some cases) local assembly modes lower the unit sunk costs, the lead time in completing the contract and even after the completion of the task, the compliance and customer service requirements for the subject.

Coupling dependable inputs with competitive high-performing battery value chain composed of secure inputs + competitive high-powered enhanced batteries as well as in case of an assembler or integrator, taking the necessary step to implement innovative strategies that ensure flexibility of the process makes it possible for the exporters to rethink the perception of an expansive price-skimming policy and even venture into the markets, that are characterised with competitive atmosphere in regard to prices (SEA/LATAM/Middle East), by competing in internet of things bases where they can offer more unique and targeted product propositions in the airspace achievable in these intelligent markets oriented themselves on technology and value. On the contrary, any gap or fault in these strategies is manifested as increased costs, extended lead times, and reduced competitiveness.

3.2 Technical Innovation

Moreover, this deepens the difference in the brand perception in the market and strategic positioning of a company for a long-term period. Companies that can push the frontiers of battery chemistry, charging infrastructure, and autonomous driving technologies with each new product are more likely to succeed and lead the way in the industry. On the other hand, there is another approach to the development of innovation – acquisition of patents and certain types of research that do not have to be limited to industrial espionage by the efforts of the state. Such patents and innovations would be actively utilized not only for the enhancement of technology but also as merchandise in international strategic and tactical diplomacy. However, with the help of industrial policy and when on a global market firms have numerous features in the form of special regimes, and there is potential to protect markets that are blocked by other possibilities. The impact is much deeper as this information assumes that the ability of a company to innovate is not only relevant to technology, but it has an overriding connection to trust of consumers, acceptance in the market among other things that make the entire EV industry possible.

3.3 Policy Environment

As regards the effectiveness of domestic policy in building China's NEV industry, an essential mark is laid by the overall support given by the government. The utility of such early-stage actions as—putting up subsidies for the purchase of these vehicles, along with lower taxes on vehicles, helped cut down quantitative consumer costs and consequently increased levels of consumption as well as the attraction of sizeable production. With these tools, the price differences between such electric vehicles and the traditional fossil-powered cars have also gone down, A moreardslike of racing softwares are provided by the

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More recently, the “dual-credit policy” is deemed to have been a good policy, which forces automobile manufacturers to fulfill the goals of specific share of NEV credits. In order to fulfil the credit obligations, the firms seek to encash the benefits by increasing their international sales instead of focusing solely on the domestic market [14].

Alignment of policy and regulation at the international level as well as other dimensions. Global activities of the authorities in the countries of the main trade partners of China are directly connected with the country's prospects of export of NEVs. Market entrance standards include the norms of the Scheine technical regulations, certification and other procedures, maximum export participants and the expected duration of export flow. The inclination towards protectionism in international commerce has added a new element of complexity. Use of such devices as anti-dumping investigations, carbon tariff measures, and other nontariff barriers on the rise are making it increasingly expensive and uncertain to operate. Such changes underline the reason why it is important to play the game of international trade within prescribed rules and actively engage in trade negotiation.

4. Suggestions

4.1 Enterprise Level

Accelerating operational activities is a requisite of manufacturing competitiveness. Global technological progress is pertinent in business hence resuming activities with a different approach is necessary. This implies that businesses should place a stronger emphasis on the deployment of new innovations, including technologies like solid-state batteries, hydrogen fuel cells, high-level autonomous driving systems technologies, among others. Success in these technological spheres is expected to help the companies to outposition themselves at the stage of the already existing Hawaii engineering public cooperation. Moreover, companies competing in today's globalized markets should minimize replication and put more effort into filing international patents from the onset to avoid challenges such as dealing with foreign legal systems.

Furthermore, one of the most crucial factors deserving attention is the enhancement of global territorial coverage. Companies will need to examine the unique patterns of the markets they pursue, specifically, such issues as customer requirements and preferences, statutory issues and legal matters, as well as the extent of technological preparation; and then develop custom-made approaches.

For example, the upscale under market is suited for the sales of luxury brands such as high-end cars. Conversely, affordable compact cars and people carriers could make more sense in several emerging economies. This would help the firms to compete without standard market rules and, on the contrary, to address the target areas with the available potential in most cases.

4.2 Government Level

From the government's point of view, it is important to concentrate on things, such as promoting the cooperation of industrial chains and this necessary characteristic. When forming special support measures aimed at the battery technology acceleration for the purpose of widespread use of electric vehicles, consideration should also be given to creation of new products of different producers helping in the main development of renewables along the EV mineral value chain. All these measures are expected to not only allow for the preservation of the single market but also the upgrading of electric vehicles industry.

In seeking to mitigate trade barriers attacks from external factors are the strategies of diplomacy that must be conducted immediately. With this in mind, it is necessary for China to engage in pursuits that will promote peaceful and mutually beneficial relationships with countries, through bilateral and/or multilateral agreements such as the signing of the 21st Century Silk Road, to open up conducive conditions for its NEV's in foreign markets safeguarding it from protectionism. In order to take advantage of the trend of free trade agreements, such as the Comprehensive and Progressive Agreement for Trans-Pacific Partnership, to promote the objective of increasing cross-border trade, it is desirable that tariffs be reduced wherever possible or even wiped out completely and there be economic cooperation and a unified market. In view of such risks, it is clear that it is extremely necessary to do some work to prevent the dangers which carbon tariffs and other upcoming trade rules will bring about.

4.3 Industry Level

One of the critical issues facing the development of Chinese new energy vehicle exports is effective bilateral collaboration at the level of industries. In this respect, the industry associations are expected to take the lead by creating a number of coordination tools that will embrace car manufacturers, components suppliers and R&D institutions. They will offer a great opportunity to synthesize the best practices, risk assessment, risk control, and the current situation of foreign trade geography, new technical barriers and other information. This will save the industry from undertaking the same efforts in research and development, fighting on prices too much, and create cross-impact which will sans of industries increase the competitiveness

of each of the actors.

But of higher importance is the necessity to comply with international norms. An opportunity to participate actively in the making of global rules, as, for example, those regulating charging interface, GHG emissions or alcohol reference limits in the body of the standards, such as China's VSL94 also knowing those when doing car certification, etc., can help China increase its influence in the world regulatory space. In addition, it is also highly important for the country to promote the possibility of cross-acceptance of standards for Chinese and foreign products in order to facilitate both the lifting of the cost burden on the market players with regard to the compliance with the standards, which are much more stringent than necessary, and, more importantly, the wide acceptance of the new technology abroad. It follows that effective institutional engineering at the industry and microeconomic levels, in particular the adoption of international best practice standards, will help in embedding China's position as a contributor to the latest technology for NEVs and also a governing system aimed at driving that industry's development on the global scale.

5. Conclusion

The focal point of this study was the analysis of the dominant characteristics stabilizing the market for China's NEV in terms of its exportability, concentrating on the role of technological innovation, policy environment and deploying business strategies. The research found that as of corollary high battery capacity, fast recharging rates, and smart systems have continued to play an important function in the highly detailed structure of entire competitiveness- enhancement framework. Without such contradiction, substantial levels of R&D as well as internationalization of patents ensure market access over a period of time. August company policy tools like grants, tax rebates and the double-credit system with a view to stimulating the industry have worked, while new perspectives employment in international trade especially within protectionist policies on other hand create additional problems.

In order to operate successfully in this intricate environment, it is necessary to develop multi-level strategic measures. On the corporate level, businesses should further intensify the scope of technological R&D, enhance the quality of their patent assets, and craft market strategies that address local demand conditions. In the sphere of state policies, it is recommended that systematic regulatory measures be adopted to involve all chains and that those chains be properly integrated. In other words, it would be an effective measure to suggest the application of regulations for the control of the chain processes.

Looking into the future, the outcome of promoting China's NEVs overseas will greatly depend on the proper

adjustment of technological changes, policies in support of technological development, and level of foreign market development. Since there are many intelligent people in this country, both developers and businessmen, and its government is capable of coherent technology policy and initiative, China has good chances not only to stand but also to contribute to the transition to ecologically sustainable transport in different parts of the world.

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