# Decoding the Ecological Symbiosis of NEV Enterprises Overseas: A Competitiveness Model Approach

**Xiaobing Wang[1], Yuan Chi[2], Lei Tian[1,*]**
[1]*Data Research Center, China Academy of Information and Communications Technology, Beijing, China*
[2]*School of International Relations, Renmin University of China, Beijing, China*
**Corresponding Author*

**Abstract: The global new energy vehicle market is reshaping by the accelerating evolution of the international trade system and the fast iteration of the vehicle intelligent system. During the reconstruction of the New Energy Vehicle (NEV) industry, the study aims to decode the symbiotic dynamics of the foreign NEV enterprises with local ones during the market entry process, especially the possibility for diversified oversea NEV enterprises to embed in the European market through ecological co-construction. Inspired by the competitiveness model, the study conducts quantitative and qualitative analyses on NEV companies with BYD, Huawei, Geely, SAIC, Tesla, Volvo, Volkswagen, BMW and Mercedes-Benz. For each company, data was collected from four dimensions: supply chain capability, market capability, regulatory ecosystem and intelligent ecosystem. The score of each company was calculated with 32 indicators, and a four-quadrant model was proposed to analyze the dynamics of competition and partnership with each quadrant representing a specific type of strategic interaction.**

**Keywords: New Energy Vehicle; Ecological Symbiosis; Competitiveness Model**

## 1. Introduction

The global New Energy Vehicle (NEV) market is reshaping by the accelerating evolution of the international trade system and the fast iteration of the vehicle intelligent system. Amid rising trade protectionism and intensified challenges such as varying market environments, policy regulations and cultural differences across different countries and regions, EV enterprises need to identify breakthroughs in international markets and enhance their globalization capabilities. Successful ecological niche construction requires enterprises to transition from being mere "environment adapters" to becoming "ecosystem engineers," achieving a strategic stride from product output to ecosystem empowerment. This study draws on the symbiosis theory from ecology to examine critical factors of NEV enterprises overseas using an optimized competitiveness model. Focusing on the regulatory ecosystem and intelligent ecosystem, it constructs a two-dimensional "capability-ecology" matrix framework and emphasizes that enterprises must embed themselves in rule-based symbiotic ecosystems while vigorously advancing intelligent innovation breakthroughs. The findings propose concrete pathways for NEVs to achieve a long-term sustainable development overseas, highlighting imperatives of compliance integration and technological transcendence in cross-border operations.

### 1.1 Regulatory Ecosystem (RE)

Previous research has argued that successful globalization requires enterprises to build sustainable and healthy global capabilities supporting overseas market development. Across the five stages of globalization expansion (see *Table 1*), the phase at which enterprises develop "globalization capabilities" marks successful internationalization. The development through different stages represents enterprises continuously complementing, enhancing, and refining their global capabilities. For China's enterprises, sustainable and healthy internationalization success depends on three core drivers: vision, strategy, and capabilities. The process of building global capabilities by enterprises is

 

the process of ecological embedding, creation, and transformation [1].

**Table 1. Stages of Enterprise Globalization Expansion**

| Stages | Features | Status |
|---|---|---|
| Global Sales | Products sold globally;<br>R&D, manufacturing, supply chain, and services located domestically | Domestic-centric |
| Global Operations | Local sales and service teams established;<br>R&D, manufacturing, and supply chain located domestically | Domestic-centric |
| Global Capabilities | R&D, manufacturing, supply chain, and financial risk control established globally | Balanced domestic and overseas |
| Global Talent | Local talent recruited;<br>HR structure established globally | Overseas-centric |
| Global Culture | Strong and distinctive corporate culture established;<br>Cross-cultural integration achieved | Integrated domestic and overseas |

From an ecological perspective, globalization expansion is primarily a process of embedding and finding one's own niches. Compliance and symbiosis are core elements in adapting to local regulatory ecosystems. On the one hand, enterprises should adopt proactive localization strategies to actively integrate into local ecosystems. Basically, the key to embedding into local ecosystems lies in understanding local culture, complying with policies and regulations, and participating in public infrastructure development [2]. This allows better alignment with local environments and market demands, facilitating the effective acquisition of high-quality local resources, thereby enhancing compliance management capabilities, achieving more stable and sustainable development. In-depth insights into local markets enable enterprises to provide better service experiences to local customers, build brand reputation and influence, and enhance customer satisfaction and loyalty, ultimately promoting business growth. Enterprises can better adapt to the local ecosystem by respecting local cultural differences and work habits as well as emphasizing talent development and recruitment, such as configuring efficient management teams for overseas businesses, and establishing flexible management structures. More importantly, it is essential to strengthen local partnerships with governments, manufacturers, retailers, financial institutions, and law firms for systemic resilience and value co-creation. Symbiosis stands as the ultimate goal for enterprises to enhance their global competitiveness. Borrowing evolutionary theory to interpret competition dynamics, enterprises aiming for sustainable development in new markets must identify their ecological niches within overseas ecosystems and develop differentiated capabilities, including precisely targeting market gaps and actively cultivating unique competitive advantages in niche segments. A differentiation strategy requires leveraging strengths and mitigating weaknesses, maximizing advantages and minimizing disadvantages, thus constructing distinct competencies. By doing so, enterprises can establish significant differentiation, gradually transitioning from partial advantages to comprehensive competitive dominance.

### 1.2 Intelligent Ecosystem (IE)

Amid the global automotive industry's profound shift towards intelligent transformation, vehicles are evolving from mere transportation tools to intelligent terminals satisfying diverse human needs similar to smartphones [3]. The China Association of Automobile Manufacturers highlights that in the trend of energy and intelligence transformation, China's automotive sector holds a favorable competitive position on energy in the first half transformation. For the next step, as the industry transitions towards intelligent transformation, software will be the main focus to meet consumers' evolving needs by enabling differentiated vehicle applications and innovative automotive business models. Therefore, China's NEV industry has now entered a new stage centered around intelligent driving. Cross-sector integration with drones, artificial intelligence (AI), and the Internet of Things (IoT) represents the inevitable path for future industry development [4].

Tesla is leading the industry's intelligent

 

transformation through its self-developed software systems, continuously driving advancements in high-level autonomous driving technologies. It adopts an end-to-end autonomous driving approach that integrates perception, planning, and control processes into a unified system. Sensor data collected by vehicles is directly input into a neural network, which subsequently processes and outputs autonomous driving commands [5]. Tesla's latest release, FSD V12, has eliminated the separations between perception and localization, decision-making and planning, as well as control and execution within autonomous driving systems, forming a unified neural network [6]. As policies continue to be steadily implemented promoting fully autonomous commercial operations, commercialization among automotive enterprises accelerates, and intelligent software has emerged as a critical competitive factor for EV enterprises, guiding future developments for in-vehicle platform developers and the whole automotive industry.

### 1.3 Decoding the Ecological Symbiosis

EV sales have increased significantly in Europe. Since early 2024, the total number of newly sold battery electric vehicles (BEVs) in Europe has exceeded 875,000 units. A McKinsey survey indicated that among European consumers who have never purchased an EV, 38% plan for their next vehicle to be electric. Over the past three years, more than 35 new automotive enterprises have begun selling pure EVs in Europe. It is expected that over 400 new EV models from global enterprises will enter the European market within the next three years. With the entry of China's automotive brands into the European market, the recognition of brands such as BYD, Li Auto, NIO, and XPeng has risen to third place compared to Europe's most popular brands like BMW, Mercedes-Benz, Renault, and Volkswagen. Among consumers considering purchasing high-end brands, 33% expressed willingness to buy China's brands in the future. Nevertheless, the recent EU decision to impose tariffs on EVs imported from China has marked significant uncertainties for the globalization process of China's EV enterprises [7].

Symbiosis theory seeks to explain how different species can coexist in an ecosystem with limited resources [8]. According to symbiosis theory, species coexistence probability is jointly determined by competitive asymmetry and niche differentiation. When interspecific competitive asymmetry exceeds critical thresholds, stable coexistence becomes ecologically unsustainable. Niche complementarity, manifested through evolutionary stable resource partitioning, significantly enhances species coexistence probability by reducing competitive overlap. Mechanistically, these niche-differentiation strategies function as stabilizing mechanisms that sustain equilibrium states in interspecific interaction networks [9]. Yamamichi et al. proposed a new model for ecological niche and competitive capability from an evolutionary perspective, integrating the dynamic evolution of invasive and native species during competition to predict the potential for stable coexistence [10]. Inspired by this model, we consider highlighting the concept of "Ecological Niche" in the case of the EV enterprises' globalization, which emphasizes the stable survival space formed by enterprises through resource integration and relationship reconstruction. This may function as a key to decoding the ecological symbiosis of EVs overseas.

## 2. Regulatory and Intelligent Ecosystems

Currently, China's leading NEV enterprises can be broadly categorized into two types. The first includes traditional automakers transitioning from conventional fuel vehicles to NEVs, such as BYD and Geely. The second comprises technology-driven enterprises that center their competitiveness on batteries, electric motors, and electronic control systems, while building intelligent driving capabilities and digital ecosystems—such as Tesla, Li Auto, XPeng, Huawei, and Xiaomi. This study focuses on the internationalization practices of BYD and Huawei to examine how EV enterprises pursue ecological symbiosis in the globalization process through regulatory embedding and intelligent ecosystem breakthroughs.

### 2.1 BYD's Niche Competition

#### 2.1.1 Three Phases Expansion Overseas

BYD's overseas expansion can be divided into three phases. The first phase began in 1998 when BYD strategically established its

 

European operational hub in Rotterdam, a strategic gateway to EU markets, initially providing lithium-ion battery solutions to leading consumer electronics multinationals like Nokia and Motorola. This market entry strategy exemplifies symbiotic niche embedding leveraging host market infrastructure and regulatory frameworks to systematically acquire transnational compliance capabilities while incrementally integrating into global battery value chains. The second phase was marked by BYD's entry into the commercial vehicle market in 2012. Collaborating with local governments, BYD captured opportunities during the transition in developed markets such as Europe, America, and Japan, mainly selling electric buses. The third phase commenced in 2021 with BYD entering the passenger vehicle market. Over three years, BYD's NEVs have expanded into 96 countries and regions worldwide [11].

2.1.2 Regulatory Symbiosis

BYD has been accelerating compliance development to achieve regulatory symbiosis. Since initiating its globalization journey in 1998, BYD has established a professional international team and a robust overseas dealer network, significantly facilitating BYD's integration into local markets [12]. To effectively embed itself within local ecosystems and identify suitable ecological niches, BYD implemented a strategy combining localized production with regional center radiation. For instance, it constructed a large-scale integrated production complex in Brazil to utilize local labor and resources to reduce tariff costs; in Thailand, it built Southeast Asia's largest EV production base serving the ASEAN market [13]. However, BYD's international expansion has been met with several challenges. In October 2023, the European Commission launched an anti-subsidy investigation into China's NEV imports, announcing preliminary findings in June 2024 to impose temporary anti-subsidy tariffs on China's EV imports. In December 2024, BYD's factory in Brazil faced labor rights protests and intensive inspections by local labor authorities. Amidst rising trade protectionism, BYD had to further accelerate its compliance strategies to ensure sustainable global market expansion [14].

2.1.3 Intelligent Dominance

BYD is actively positioning its intelligent ecosystem as a new engine for global competitiveness. Diverging from its historical vertically integrated globalization paradigm prioritizing end-to-end vehicle production and value chain control, BYD is executing a dynamic transformation toward ecosystemic globalization. This strategic pivot from product-centric exports to ecosystem orchestration enables architectural authority in next-generation mobility domains — particularly intelligent driving platforms and cross-border data infrastructure — through networked value creation and standard-setting influence.

Guided by its core strategy of "equal access to intelligent driving", BYD aims to achieve full-stack in-house development, vertical integration of the supply chain, and a tiered deployment of computing power. These measures, encompassing components, algorithms, and computing power, not only enhance BYD's autonomy and market competitiveness, but also lay a solid foundation for the long-term development of its intelligent driving technologies [15]. Its intelligentization strategy focuses on building a future-oriented, integrated ecosystem combining vehicle, software, data, and service. The widespread implementation of its intelligent driving equality strategy will reshape the automotive market competition and industry chain logic, positioning China to transition from EV leadership to intelligent vehicle dominance.

## 2.2 Huawei's Intelligent Breakthrough

2.2.1 Regulatory Dilemma

Huawei emphasizes technology exports and platform construction to embed in global industrial regulations. However, Huawei has encountered a multilayered geoeconomic regime characterized by strategic containment policies, most notably the US-led cross-domain suppression encompassing technological decoupling and systemic exclusion from critical infrastructure partnerships [16].

Since 1996, Huawei initially targeted emerging markets such as Russia, Latin America, Southeast Asia, the Middle East, and Africa for communication product sales. Subsequently, Huawei established localized sales and operational teams in countries including

 

Russia, South Africa, Brazil, and Mexico. From 1999, Huawei gradually set up research and development centers in India, Sweden, and Japan, progressively building supply chain systems in the UK, France, Singapore, Romania, and Hungary, enhancing global business support capabilities. To establish overseas centers, Huawei actively recruited and utilized local talent, participating in standard-setting to better align its technologies and products with the requirements of international markets [17].

Huawei's global expansion faced a significant turning point in 2019 when the US imposed comprehensive sanctions citing national security concerns, restricting critical technology exports and pressuring global partners. Google terminated the supply of GMS services, which severely impacted Huawei's smart device business in European and American markets. This technology-regulation disruption weakened Huawei's ecological adaptability in overseas smart device markets, exposing vulnerabilities in its global regulatory embedding strategy [18]. As such, breaking through regulatory limitations became Huawei's inevitable strategic choice to maintain its international market presence. Nowadays, Huawei operates in over 170 countries and regions, serving more than three billion users globally, establishing itself as a crucial participant in the global telecommunications sector [19] and continues to seek strategic maneuvering space within global regulatory systems.

2.2.2 Intelligent Breakthrough

Huawei has expanded its strengths in communication, cloud computing, and artificial intelligence into the intelligent automotive sector. Since releasing the first Advanced Driver System (ADS) 1.0 in 2021, Huawei continuously iterated and optimized its technologies, introducing advanced versions such as ADS 2.0 and ADS 3.0. These improvements significantly enhanced autonomous driving safety, stability, and cost control, demonstrating Huawei's innovation abilities in sensor fusion, computing power optimization, and algorithm architecture. By continuously refining hardware configurations, Huawei reduced overall system costs and enhanced market competitiveness.

Through partnerships with multiple automotive manufacturers, Huawei has established a diversified ecosystem centered around intelligent driving. Huawei's deep collaborations domestically and internationally facilitated intelligent driving technology adoption and proliferation through three primary cooperation modes: (1) Component Supply Model: providing automakers with intelligent driving components such as sensors and computing platforms to help enhance the overall performance of their intelligent driving systems; (2) Huawei Inside Mode (HI Mode): collaborating with brands like Avatr (Changan) and Arcfox (BAIC) to jointly develop smart vehicles through complete intelligent driving solutions; (3) Smart Selection Mode: deep involvement in vehicle design and manufacturing processes, as well as supporting market promotion and sales, exemplified by AITO (Seres), Zhijie (Chery), Xiangjie (BAIC), and Zunjie (JAC). In models such as the AITO M5 and M7, Huawei's high-level ADS systems have gained widespread user recognition, with 70% of customers opting for advanced ADS packages. Collaborations with leading automakers not only solidified Huawei's authority in core areas like intelligent driving and cockpit technology but also accelerated the intelligent transformation of traditional automotive enterprises. In this light, Huawei's intelligent ecosystem breakthrough signifies a strategic restructuring from product globalization to platform globalization, enhancing global ecological synergy through system integration under regulatory pressures [20].

## 3. Competitiveness Model

### 3.1 Indicator Optimization

This study upgrades the competitiveness model for EVs overseas by further enhancing classification and refining indicators [21]. This model evaluates EVs competitiveness from four dimensions: supply chain competence (SCC), market competence (MC), regulatory ecosystem (RE), and intelligent ecosystem (IE), as suggested in *Table 2*.

**Table 2. Overseas Competitiveness Model for NEVs**

| Category | Primary Level | Indicator |
|---|---|---|
| Supply | Raw Material | Raw Material Cost; Stability of Raw Material and Component |

| | | |
|---|---|---|
| Chain Competence (SCC) | Procurement | Supply |
| | Production & Processing | Self-Manufacturing Rate of Core Components (battery, chip, motor) |
| | Product Performance | Vehicle Hardware Quality |
| | Global Layout | Establishment of Production Bases in Europe |
| | Logistics & Transportation | Logistics and Transportation Cost; Stability of Transportation Channels |
| | R&D | Technological R&D Capability |
| Market Competence (MC) | ROE | Return on Equity |
| | ROI | Return on Investment |
| | Cash Flow | Cash Flow |
| | Market Share | Market Share |
| | Shipment | Global Shipment Volume |
| | Sales and Service | Sales and Service Network Coverage; Supporting Infrastructure; Brand Influence |
| Regulatory Ecosystem (RE) | Embeddedness | Negative Impact of Geopolitical Factors; Compliance with European Laws and Regulations; Cultural Compatibility with European Values; Proportion of Local European Talent |
| | Niche | Business Differentiation |
| Intelligent Ecosystem (IE) | Platform Performance | Health of Developer Ecosystem; Degree of System Integration; System Intelligence Level; Degree of System Integration; Software Support Services; Feature Richness |
| | Platform Security | Cybersecurity Level; System Operational Stability |
| | Platform Cost | Development and Usage Cost |
| | User Service | User Satisfaction |
| | Technology Performance | Level of Autonomous Driving; Level of Driver Assistance Systems |

### 3.2 The "Capability-Ecology" Matrix

The globalization competition of EV enterprises can essentially be understood as a two-dimensional competition centered on capability and ecology. To systematically analyze the strategic paths of EV enterprises' globalization, a "Capability-Ecology" two-dimensional matrix (see *Table 3*) using Competitive Leadership and Ecological Synergy is constructed to explain the multiple possibilities for enterprises to compete, coexist, or be excluded from markets.

**Table 3. The "Capability-Ecology" Matrix**

| Competitive Leadership | Ecological Synergy | Globalization Mode | Symbiotic Status |
|---|---|---|---|
| High | Low | Output-oriented Globalization | Exclusive Competition/ Dominant Replacement |
| High | High | Dominant Globalization | Differentiated Symbiosis/ Dominant Replacement |
| Low | High | Collaborative Globalization | Complementary Symbiosis/ Embeddedness Failure |
| Low | Low | Dependent Globalization | Peripheral Competition/ Embeddedness Failure |

Competitiveness Differences represent enterprises' competitive leadership in terms of their resource allocation capabilities particularly in supply chain and market advantages, which can determine their potential to dominate market competition. Ecological niche differences, refer to the degree of adaptability to regulatory and intelligent ecosystems, which can determine enterprises' potential for long-term coordination within global ecological systems. The interplay between these two dimensions shapes the enterprises' globalization modes and symbiotic status (see *Figure 1*).

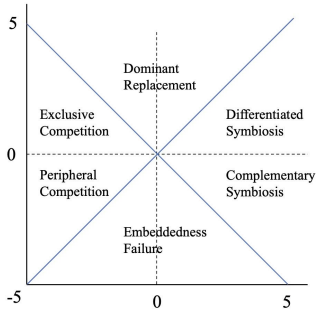


**Figure 1. Symbiotic Dynamic Pathways**

 

Firstly, if an enterprise possesses strong competitiveness and high ecological synergy, it is expected to gradually take the lead in the market and establish a distinct ecological niche, realizing dominant globalization and potentially achieving differentiated symbiosis. Such enterprises not only export products but also have the ability to export technical standards and data platforms with institutional discourse power, positioning themselves as key architects of the global ecological system.

Secondly, if an enterprise has strong competitiveness but low ecological synergy, it tends to adopt an output-oriented globalization approach. While it may rapidly capture market share in certain regions, its weak ecological embedding—characterized by a lack of localized adaptation mechanisms—often results in institutional friction and standard exclusion, likely leading to exclusive competition. Notably, in cases where competitive advantages significantly outweigh ecological synergy, the globalization process may evolve into a scenario of dominant replacement. These enterprises may supplant existing market players driven by their overwhelming capabilities, but simultaneously face risks of market resistance and regulatory conflict.

Thirdly, when an enterprise exhibits weak competitiveness but high ecological synergy, it can pursue a collaborative globalization strategy by establishing complementary ecological frameworks through local partnerships, shared intelligent platforms, and regulatory adaptability, thereby achieving complementary symbiosis. Although such enterprises are not the dominant players in the ecosystem, they can secure a stable ecological niche through differentiated embedding and coordinated networks.

Finally, if an enterprise is weak in both competitiveness and ecological synergy, it may lean toward a dependent globalization model and fall into a disadvantaged position of peripheral competition. With limited ecological participation and weak institutional alignment, such enterprises are highly vulnerable to market elimination. Furthermore, when competitive leadership falls significantly behind ecological synergy, an enterprise may fail to integrate into the ecosystem due to insufficient resources or structural capability gaps, ultimately resulting in embeddedness failure.

In summary, the globalization of enterprises is a dynamically evolving process along the Capability–Ecology pathway. Competitiveness serves as the foundation, while ecological embedding and differentiated ecological niches contribute to sustained expansion and symbiosis.

## 4. EV Enterprises' Competitiveness and Symbiotic Mode

### 4.1 Data Collection

This study selects eight representative enterprises as samples: Tesla BYD, Geely, Huawei, Volkswagen, BMW, Mercedes-Benz, and Volvo. For each enterprise, data was collected across four dimensions: SCC, MC, RE, and IE, comprising a total of 32 indicators. To ensure a rational assessment, the indicators were categorized into two types: quantitative indicators and ordinal qualitative indicators. Quantitative indicators (e.g., global shipment volume) were derived from structured data sources such as the Wind database, Markline database, corporate annual reports, and published research. Ordinal qualitative indicators (e.g., brand influence) were evaluated based on a combination of structured data from the above sources and unstructured data including expert assessments and reviews from authoritative media outlets.

To ensure data accuracy and consistency, missing values within quantitative indicators were imputed using mean substitution. Subsequently, all 32 indicators were standardized through mean normalization. Each normalized indicator was converted to a numerical value within the range of [-1, 1], where values approaching 1 denote stronger performance and values near -1 indicate weaker performance. The standardized indicators were aggregated within each dimension to calculate the four-dimensional scores for each enterprise.

### 4.2 Data Analysis

4.2.1 Overseas Competitiveness

China's overseas competitiveness score of EVs is calculated as OCEV = SCC * w1 + MC * w2 + RE * w3 + IE * w4 with weights of 25,15,30,30 points and the result is shown below (see *Table 4*).

**Table 4. The China's Overseas Competitiveness score of EVs (OCEV)**

| | SCC | MC | RE | IE | Total |
|---|---|---|---|---|---|
| BYD | 1.6 | -0.7 | -4.8 | 5.2 | 1.2 |
| Huawei | -7.2 | -2.5 | -9.9 | 16.1 | -3.6 |
| Geely | -3.7 | -3.5 | -1.4 | -4.8 | -22.5 |
| SAIC | -12.1 | -2.4 | -10.1 | -4.8 | -29.5 |
| Geely +* | -2.2 | 1.2 | 2.5 | -2.6 | -1.1 |

**Geely +: Following Geely's acquisition of Volvo Cars in 2010 as the majority shareholder, both entities formalized an operational independence agreement for Volvo. The score referenced herein reflects post-merger consolidated data under this governance framework.*

First, BYD is leading on SCC, showing strong vertical integration capabilities and cost control advantages. Its battery, motor, electronic control are three core components to achieve complete self-research and self-production, automotive manufacturing has the whole chain capacity, its large-scale production system, R&D investment and technology accumulation provide a solid industrial foundation for its intelligent transformation. BYD focuses on in-depth collaboration with local governments and suppliers. Through its model of "localized production + regional center radiation", the company has successfully achieved ecological embedding and differentiated symbiosis in multiple markets, demonstrating strong institutional adaptability and responsiveness to local policy environments.

Second, Geely+ scored the highest on MC, showing strong market acceptance and differentiated positioning capabilities. BYD remains in a catch-up position in the market. Its model Qin PLUS performs well as a cost-effective option in the mainstream market, but premium models such as U8 have yet to achieve substantial market scale or user recognition. Overall, BYD's penetration in the high-end market remains limited, and further efforts are needed to enhance brand awareness and gain acceptance among premium user groups.

Third, Geely + also scored the highest on RE, reflecting its strengths in institutional adaptation and localization cooperation. This is largely attributed to the positive impact of its acquisition of Volvo, particularly in the EV sector. In contrast, Huawei and SAIC have faced constraints due to cross-border data flow restrictions and geopolitical pressures. Since the imposition of US sanctions, Huawei has encountered significant challenges related to regulatory blockades and data compliance across several markets.

Fourth, Huawei is leading on IE. While BYD also possesses independent R&D capabilities, it remains in a catch-up phase. Its technology ecosystem still requires further refinement and integration, especially in areas such as high-end intelligent driving, interactive experience and user ecosystem.

In general, in the context of the increasingly complex pattern of global competition among EV enterprises, the ability in terms of regulatory ecosystem is directly related to whether the enterprise can adapt to the target market. From BYD's localized production model to Huawei's attempts to navigate regulatory dilemmas, it is true that only by embedding for survival and dislocation for development can enterprises obtain long-term and stable market channels. IE represents the enterprise's potential for future technological dominance and platform-based growth. The development of intelligent driving systems, user interaction mechanisms, and data platforms is not only a matter of technical competition, but also a strategic layout for building a closed-loop ecosystem of "data-algorithm-service". The intelligent breakthrough strategies of both Huawei and BYD highlight the decisive role of this dimension in shaping the ability overseas.

4.2.2 Symbiotic Mode

By applying a two-dimensional matrix to analyze the idea of rule embedding and intelligent breakthroughs in the process of EV enterprises going overseas, it can be found that BYD leads the overseas market through supply chain advantages and occupies a position of dominant substitution. However, in the face of the rule dilemma brought by EU sanctions, if BYD fails to respond effectively or to achieve differentiation and symbiosis, it may be squeezed into the whirlpool of exclusive competition–which can neither compete with

 

Tesla, nor match the BMW, Volkswagen and other enterprises. Therefore, intelligent transformation is essential for BYD to realize strategic symbiosis. On the other hand, Huawei urgently needs to work with OEMs to improve its SSC and MC, develop complementary and symbiotic paths for overseas expansion, and leverage its IE advantages to achieve synergy and symbiosis (see *Figure 2*).

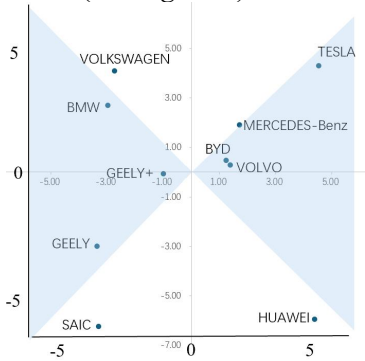


**Figure 2. Overseas EV in a Symbiotic Mode**

### 4.3 Discussion

Drawing from the "Capability-Ecology" matrix to understand the globalization patterns and symbiotic dynamics of NEV enterprises, it is held that globalization constitutes a multi-layered process characterized by competitive interaction and complementary cooperation.

First, two fundamental logics underpin the symbiosis of EV enterprises overseas. The first logic is ecological niche differentiation, wherein enterprises seek distinct market positions. For instance, European automakers primarily focus on luxury and high-performance EVs (e.g., Audi e-tron GT), leveraging brand loyalty and occupying mature consumer niches. In contrast, China's EV enterprises focus on cost-effective market segments (e.g., BYD Dolphin) and intelligent technology branding (e.g., Huawei AITO), achieving "ecologically differentiated niche embedding." The second logic involves complementary cooperation, manifested through technological exchanges and supply chain integration. In terms of technological exchanges, China's firms provide battery, chipset, and autonomous driving technologies, while European enterprises contribute expertise in chassis tuning, vehicle design, and brand premium capabilities. For example, Volkswagen cooperates with Horizon Robotics to develop autonomous driving chips; BYD collaborates with Tesla to promote unified industry standards. Regarding supply chain integration, China's automakers may have to accelerate localized production, potentially creating a symbiotic mode characterized by "European assembly + China's core components."

Second, EV enterprises overseas can adopt several distinct symbiotic modes: (1) Supply Chain Nesting Model: European automakers purchase China's batteries and chips, while China's automakers adopt European chassis designs, exemplified by CATL supplying batteries for BMW's iX3 and BYD using Mercedes-Benz's design in its Denza model. (2) Capacity Sharing Model: China's automakers lease idle European factories for production, or European automakers manufacture vehicles for China's brands, exemplified by BYD's acquisition of Ford's German plant and Geely's collaboration with Renault to develop hybrid vehicles. (3) Market Coordination Model: Enterprises collaboratively develop emerging markets (e.g., Eastern Europe, Africa) to avoid direct competition in Europe, exemplified by potential collaboration between BYD and Stellantis in Latin America. (4) Acquisition Model: China's EV enterprises acquire equity or controlling stakes in European automotive brands to accelerate market access and integrate local expertise, thus gaining regulatory and branding advantages through capital integrations, exemplified by Geely's acquisition of Volvo and its investment in Daimler [22]. (5) Joint R&D Model: China's and European enterprises establish joint ventures to develop next-generation battery or autonomous driving systems.

Future interactions between China's and European EV enterprises may evolve into a competitive yet symbiotic relationship particularly in supply chain and technological collaboration characterized by "European design + China's intelligent manufacturing", although intensified market competition is expected. The critical determinant of success lies in the collaborative acceleration of the electrification transition by China's and European enterprises.

## 5. Conclusion

This study constructs a multidimensional evaluation framework for assessing EV

enterprises' overseas competitiveness through an ecological perspective, encompassing four dimensions: supply chain, market, regulatory ecosystem, and intelligent ecosystem. By systematically analyzing the dynamic paths overseas based on a two-dimensional Capability-Ecology matrix, we reveal that enterprises' paths to sustainable and healthy internationalization success are influenced not merely by competitive capability advantages, but more fundamentally by their ability to construct differentiated ecological niches and achieve effective synergy with regulatory and intelligent ecosystems in target markets. Proactive identification of ecological niches and enhancement of ecological collaboration may facilitate the strategic shift from capability-driven to ecological symbiosis. Therefore, it is recommended that governments and industry associations establish dual-dimension evaluation frameworks incorporating capability and ecology, and provide guidance on globalization strategies and early prediction of ecological risks for enterprises overseas.

The regulatory ecosystem not only requires enterprises to adapt to institutional environments in target markets but, more crucially, to adopt the strategic logic of "niche-based symbiosis," which refers to locating their distinct ecological niches within diverse regulatory frameworks. Enterprises should seek collaborative opportunities and foster mutually beneficial symbiotic relationships, integrating into local industrial chains, policy networks, and standard systems. Governments and industry organizations should actively participate in global negotiations, especially formulation processes concerning digital economy and cross-border data rules, with an effort to secure influential roles in global rule-making, thereby creating favorable environments for overseas enterprises.

The intelligent ecosystem has become a core determinant for future competitive dominance, representing enterprises' capacities in technological platform construction, user ecosystem collaboration, and data-driven closed-loop operations. Tesla's leadership exemplifies its capability for systematic intelligent ecosystem development. Consequently, it is advised that governments formulate forward-looking technological standards and incentive mechanisms to support the enterprises in strengthening comprehensive in-house R&D and platform construction, thus promoting a triadic ecosystem development model integrating intelligent driving, large AI models, and user interactions. Enterprises should be encouraged to further strengthen autonomy in core areas such as chipsets, algorithms, and data platforms, thereby enhancing EV enterprises' embedding and collaborative capabilities in global intelligent ecosystems.

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