Research on the Leading Effect of Digital Attention and Overseas Market Sales of Chinese Automakers—A Time-Lag Double-Logarithmic Regression Test Based on BYD's New Energy Vehicle Sales in Germany

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Manuscript received July 3, 2026; accepted September 1, 2026; published September 17, 2026.

***Abstract*—During the window period of the global automotive industry's transition to electrification, Chinese automakers are facing the challenge of transforming from "product export" to "brand upgrading". Based on the external information search theory of behavioral economics and transnational management theory, this study takes BYD as the object to analyze the globalization compliance barriers and policy environment of the German new energy vehicle market from January 2024 to May 2026. By constructing a time-lag double-logarithmic OLS regression model, it captures the decision-making time lag of about 30 days in automobile consumption. The empirical results show that BYD's search popularity lagged by one period has a significant positive pulling effect on the sales of the current month, and its "digital attention demand elasticity" coefficient is as high as 2.910 (p < 0.01), with the model determination coefficient R2 reaching 0.7878. The negative intercept reveals the "sales zeroing risk" faced by latecomer brands when lacking digital activation. This study provides a mathematical basis for Chinese automakers to overcome transnational disadvantages and promote the implementation of global brand strategies through the accumulation of digital assets.**

***Keywords*—digital attention, leading indicators, brand upgrading, BYD**

I. Introduction

A. Research Background and Significance

With the accelerated transition of the global automotive industry towards clean energy, Chinese new energy vehicles are setting off a massive globalization wave relying on their advantages in battery technology, smart cockpits, and complete supply chains. As the cradle of the European automotive industry and a core mature market, Germany is a highly contested battleground for Chinese automakers to prove their brand strength and achieve "brand advancement". However, as latecomers, Chinese automakers in Germany not only face the encirclement and suppression of local traditional powerhouses but also must cope with the cliff-like decline of subsidy policies and strict green compliance barriers. Exploring how to use the leading signals of digital traces in the digital era to predict and drive offline sales is of great significance to the transnational management practices of Chinese automakers.

B. Research Content and Purpose

This study focuses on the development status of China's leading new energy automaker, BYD, in the German market, aiming to explore the dynamic cross-period transmission mechanism between online digital traces (Google Trends search attention) and physical terminal sales through quantitative analysis. By clarifying the specific mathematical expression of "digital attention demand elasticity", it provides solid theoretical and empirical data support for Chinese automakers to rationally lay out digital assets in mature overseas markets and hedge macroeconomic policy risks.

C. Research Methods and Technical Route

This paper mainly uses a time-lag double-logarithmic univariate linear regression model for empirical solution. Aiming at the unique "information search - in-store test drive - order delivery" physical time lag cycle in transnational automobile consumption, this paper performs a leading staggered alignment processing on the underlying data matrix in the early stage of econometric modeling (the independent variable has been shifted backward by one period in advance to capture the decision-making time lag of about 30 days). Through Ordinary Least Squares (OLS) estimation, the influence of units and magnitudes is comprehensively stripped away to purely measure the "digital attention demand elasticity" of online digital traces to BYD's physical sales in Germany, providing refined mathematical support for the advancement of Chinese automakers' overseas brands.

II. Literature Review and Theoretical Basis

A. External Information Search Theory and the Leading Effect of Digital Traces

Modern cybermetrics and behavioral economics research have confirmed that public search behavior on Internet search engines is the externalized digital trace of consumers' potential inner purchasing intentions. According to Stigler's (1961) classic Information Search Theory, automobiles are typical high-unit-price, high-involvement, and technologically complex durable consumer goods, and consumers will undergo an intensive and long-cycle information retrieval process before making a purchasing decision.

With the accumulation of digital assets, search indices such as Google Trends have been widely verified by academia as "leading indicators" for real economic indicators. As Nazl Gamze Özel (2025) pointed out in a study of the mature European passenger car market, the explosion of online search data often leads terminal physical

doi:10.18178/joebm.2026.14.3.952

registration sales by weeks or months. This cross-period transmission of digital traces forms a natural "decision funnel" on the spatial and temporal axes, providing a brand-new observation window for capturing transnational consumer behavior in highly uncertain environments.

Refined to durable consumer goods with high unit prices and long decision-making cycles like automobiles, the effectiveness of online search popularity as a leading indicator has been widely confirmed by domestic and foreign scholars. Du Rong *et al.* (2020) used automotive market data to find that online search traces can not only significantly improve the accuracy of sales forecasting models, but their time-lag effects are often concentrated around 4 weeks (about 30 days), which mathematically provides solid industry empirical evidence for choosing the "one-period lagged alignment" in this paper. In mature international markets, Kulkarni (2012) and others also pointed out that online searching is a low-cost external information search behavior, and when consumers face high-risk, unfamiliar foreign emerging brands, the cross-period pulling leverage of its search explosion on physical sales is more significant.

B. Transnational Disadvantages and High-level Breakthrough of Emerging Brands

In the field of transnational management, when foreign brands enter unfamiliar overseas markets, they generally face a "liability of foreignness" brought about by cultural barriers, institutional differences, and a lack of brand identity. For Chinese new energy automakers lacking a century of historical reputation accumulation in Europe, this disadvantage is particularly significant.

Wang Shutian (2023) pointed out in a study of mid-range volume technology models that when latecomer brands implement a "brand upgrading" strategy in overseas markets, their potential audience usually exhibits extremely high "information retrieval involvement" and "intention conversion purity". This means that the terminal volume expansion of such automakers overseas is highly dependent on how to effectively accumulate attention assets in the online digital space and stimulate consumers' active retrieval. Therefore, digging deeply into the cross-period elastic relationship between online search popularity and physical sales can not only evaluate the traffic-draining efficiency of major event marketing, but is also the theoretical core of cracking transnational disadvantages and building digital defense barriers.

When implementing brand upgrades and entering Western European industrial hubs such as Germany, Chinese new energy automakers face multi-dimensional institutional and cultural exclusionary barriers. Zhang Xiao (2024) pointed out that the "liability of foreignness" encountered by green automobile brands from latecomer countries in mature markets often manifests as strict institutional compliance reviews (such as carbon footprint audits and data privacy security). Under this high-barrier environment, the marginal effect of enterprises' traditional offline asset-heavy distribution models is decreasing, and they rely more on rebuilding legitimacy through digital communication. In addition, the reverse internationalization theory of emerging market multinational enterprises proposed by Buckley (2018) and others also shows that the accumulation of digital attention assets is the core asset for latecomer enterprises to hedge against the host country's systemic policy shocks and accumulate long-term brand premiums in mature markets.

From the perspective of brand management, the "advancement" of a brand is essentially the competition and conversion of consumers' limited digital attention. Chen Yubo (2021) and others pointed out from the perspective of digital economics that in the new era of globalization, users' online search traces are not only a barometer of demand, but also a dynamically flowing "digital brand asset". When foreign emerging forces can transform staged public relations impulses into long-tail strong intention retrievals, these digital assets will form a non-linear premium perception in consumers' minds, thereby driving leapfrog growth in sales at physical terminals.

III. German New Energy Vehicle Market Environment and BYD's Overseas Status

A. Germany's Passenger Car Macro Environment and the Impact of Subsidy Declines

As the largest passenger car market in Europe, Germany's transition path for New Energy Vehicles (NEVs) has a bellwether impact in Europe. In the past few years, the explosive growth of the German new energy vehicle market has been highly dependent on strong drive at the policy level, the most representative of which is the "Environmental Bonus" (Umweltbonus) led and implemented by the Federal Office for Economic Affairs and Export Control.

However, after entering 2024, the policy environment of the German new energy vehicle market experienced a drastic systemic reversal. In December 2023, the German Federal Ministry for Economic Affairs was forced to announce the systematic termination of the car purchase "Environmental Bonus" plan starting from December 17. This exogenous policy shock brought an interruptive impact to the German electric vehicle market in early 2024. Data shows that starting from January 2024, the number of new registrations of pure electric vehicles in Germany has declined significantly. Against the macroeconomic background of systemic turmoil in the overall market, multinational automakers are facing a cruel stock game. In the extremely cold environment lacking long-term local historical reputation, Chinese automakers expanding overseas must not only withstand the downward pressure of the overall market but also directly face the fierce strangulation of local traditional powerhouses passing on policy shocks through terminal joint price cuts.

B. European Green Deal and High-level Compliance Barrier Analysis

In addition to the shock of macro-fiscal policies, Chinese new energy automakers also face a series of global compliance barriers derived from the EU's "European Green Deal" in their expansion in Germany and mature European markets.

The EU's New Battery Regulation and Full Life Cycle Carbon Footprint Tracking: The gradual implementation of the EU's "Batteries and Waste Batteries Regulation" constitutes the most core green barrier for the export of Chinese electric vehicles. This regulation introduces the Life

Cycle Assessment (LCA) logic, requiring that all power batteries sold in the European market must have a traceable "Battery Passport". Chinese automakers must fully disclose the sourcing origins of battery raw materials, the energy consumption structure of manufacturing plants, and the carbon emission flows during cross-border transportation.

Cross-border Data Compliance and GDPR Review: The EU's General Data Protection Regulation (GDPR) has built a severe punitive defense line for personal privacy and cross-border data flows. According to the localization storage principle of GDPR, Chinese automakers operating smart vehicles in Germany must build a completely independent data center in Western Europe, leaving all personal facial features, voice prints, and driving trajectory data from the vehicle end within Europe for decoupling and desensitization processing. This highly sensitive political and compliance environment requires enterprises to elevate the security management of digital assets to a core strategic height when promoting brand upgrades.

C. BYD's Product Matrix and Channel Characteristics in Germany

Facing strict compliance barriers and a complex market environment in Germany, BYD, as a leading enterprise of Chinese new energy vehicles, attempts to tear open a breakthrough path for brand upgrading in traditional European industrial hubs through channel and product innovation.

In terms of channel construction, BYD has adopted a localized deep distribution model (Dealer-partner Model), choosing to reach a deep strategic cooperation with the Hedin Mobility Group, the most powerful large-scale automotive distribution giant in Germany. Relying on the ready-made mature networks and local customer resources of local giants, it completed the laying of the channel network in a very short time, hedging the Liability Of Foreignness (LOF) as an "alien emerging force".

In terms of product matrix and pricing strategy, BYD has demonstrated a clear upward brand ladder in Germany, launching a high-unit-price, high-performance matrix that has fully passed the European WVTA certification and the Euro NCAP five-star safety rating: including the Seal, Tang, Han, as well as the ATTO 3 and Dolphin, which cut into the core mid-range volume segment. At the pricing level, because it needs to cover high cross-border logistics costs, EU tariffs, and compliance premiums, BYD's official guide prices in Germany are generally more than double those of identical models in China. This high-unit-price positioning featuring "technological green luxury" fully shows that its core demand is to achieve the overall dimensional upgrade and advancement of overseas brands, and the success or failure of this strategy is highly dependent on how to make potential European consumers perceive its brand assets and convert them into actual sales.

IV. Research Hypotheses and Model Setting

A. The Cross-period Transmission Funnel Hypothesis of Online Search Popularity to BYD's Sales

In the ecosystem where modern digital economy and behavioral marketing intertwine, consumers' purchasing behaviors show a clear "Decision Funnel" transmission mechanism. Combining Wang Shutian's (2023) niche market information retrieval theory and Stigler's (1961) external information search theory, this study deduces and constructs a cross-period transmission mechanism model of online search popularity to BYD's physical sales in Germany, whose core logical evolution is as follows:

Because BYD is a newly introduced foreign brand in the German market, it lacks a generational emotional connection spanning a century in German society. When German consumers touch upon the BYD brand through public media or major event marketing (such as BYD becoming the official mobility partner of the 2024 European Championship), the uncertainty generated in their hearts will strongly drive them to generate external information search behaviors.

The digital attention trace of consumers typing "BYD" in the Google search box represents the "intention activation layer" of their consumption decision funnel. From the occurrence of this digital attention to the ultimate landing of physical sales, there is an inevitable and incompressible Time-lag cycle on the physical timeline: first is the information digestion and scheme evaluation period, where consumers need to read car reviews, compare carbon footprint performance, and calculate monthly payments after retrieval; second is the offline experience and business negotiation period, where consumers go to offline stores for physical test drives and sign contracts; finally is the logistics delivery period. The time consumed by the entire process objectively results in the search popularity of the previous month (Trendst-1) having the strongest causal explanatory power for the actual registration sales of the current month (Salest).

Based on this, this paper proposes the following core research hypotheses:

H1: In the German passenger car market, BYD's Google online search popularity lagged by one period has a significant positive pulling effect on the physical new car registration sales of the current month.

H2: Under the double-logarithmic model setting, BYD's "digital attention demand elasticity" in Germany shows a highly efficient cross-period funnel conversion rate from online to offline.

B. Data Sources, Preprocessing, and Time-lag Double-logarithmic Model Construction

To test the above hypotheses, this study constructed a monthly time series database containing real digital traces and actual terminal sales. The sample interval panoramically covers January 2024 to May 2026 (a total of 29 months).

Dependent Variable ($Sales_t$): Adopted the monthly actual new car registrations of BYD in the German market, with data sourced from the official authoritative industry statistical monthly report "Neuzulassungen von Personenkraftwagen nach Marken und Modellreihen (FZ 10)" published by the German Federal Motor Transport Authority (KBA).

Independent Variable ($Trends_{t-1}$): Adopted the monthly Search Interest Index of the "BYD" keyword within the German geographical region extracted from the Google Trends official platform. When constructing the underlying matrix, the independent variable has been shifted

backward by one period in advance to complete the staggered alignment, so as to capture a consumption time lag of about 30 days.

Before performing regression estimation, this study executed natural logarithm transformations on the sales series (Salest) and the time-lag search series ($Trends_{t-1}$) respectively, constructing the following classic univariate time-lag Ordinary Least Squares (OLS) benchmark double-logarithmic model:

$$\ln(Sales_t) = \beta_0 + \beta_1 \ln(Trends_{t-1}) + \varepsilon_t$$

Where β_0 is the constant intercept term; ε_t is the random error term. β_1 is the slope coefficient under the double-logarithmic model, and its mathematical definition directly characterizes the "digital attention demand elasticity", that is, the percentage change in the dependent variable for every 1% change in the independent variable, thus perfectly stripping away the influence of units and magnitudes.

V. Empirical Test of Real Digital Traces on BYD's Sales in Germany

A. Variable Selection and Excel Matrix Peer Alignment Analysis

This chapter formally enters the solving stage of the empirical model, performing natural logarithmic transformations on the real approved data of 29 months (see Table 1). Since Column C (last month's search index $Trends_{t-1}$) had already completed the staggering work of shifting backward by one month during the construction of the underlying table, Column D (logarithm of dependent variable ln $Sales_t$) and Column E (logarithm of independent variable ln $Trends_{t-1}$) were directly selected for parallel OLS linear regression.

From the perspective of data characteristics, with the deepening of BYD's localization process, its sales scale has shown strong right-skewed growth characteristics, achieving a leap from hundreds to thousands of vehicles between 2025 and 2026, and reaching a historical peak of 6,168 vehicles in May 2026 (ln $Sales_t$ = 8.727).

Table 1. Excel empirical modeling logarithmization and peer alignment matrix

Month (t)	$Sales_t$	$Trends_{t-1}$	ln($Sales_t$)	ln($Trends_{t-1}$)
2024/1	139	28	4.934	3.332
2024/2	94	42	4.543	3.738
2024/3	160	53	5.075	3.970
2024/4	183	42	5.209	3.738
2024/5	201	34	5.303	3.526
2024/6	425	30	6.052	3.401
2024/7	230	49	5.438	3.892
2024/8	218	36	5.384	3.584
2024/9	140	24	4.942	3.178
2024/10	347	30	5.849	3.401
2024/11	431	39	6.066	3.664
2024/12	323	32	5.778	3.466
2025/1	235	30	5.460	3.401
2025/2	185	30	5.220	3.401
2025/3	805	50	6.691	3.912
2025/4	1566	57	7.356	4.043
2025/5	1857	53	7.527	3.970
2025/6	1675	54	7.424	3.989
2025/7	1126	69	7.026	4.234
2025/8	1114	53	7.016	3.970
2025/9	3255	51	8.088	3.932
2025/10	3353	49	8.118	3.892
2025/11	4026	50	8.301	3.912
2025/12	4109	50	8.321	3.912
2026/1	2629	49	7.874	3.892
2026/2	3053	54	8.024	3.989
2026/3	3438	60	8.143	4.094
2026/4	4705	90	8.456	4.499
2026/5	6168	100	8.727	4.605

B. Benchmark Regression Statistics and ANOVA Table Interpretation

Directly call the Excel [Data Analysis - Regression] tool to perform OLS regression solving on the parallelly aligned Column D and Column E. After system calculation, the output standard academic statistical dashboard is as follows:

Table 2. Summary of univariate regression statistics

Metric	Value	Academic Interpretation
Multiple R	0.8876	Extremely high-intensity positive linear correlation
R Square (R^2)	0.7878	Independently explains 78.78% of sales fluctuations
Standard Error	0.6387	Residuals are in a robust range
Sample Size	29	Meets the basic requirements of OLS estimation

Table 3. Analysis of Variance (ANOVA)

Source	df	SS	MS	F	Significance F
Regression	1	40.916	40.916	100.31	0.00000000005
Residual	27	11.015	0.408	-	-
Total	28	51.931	-	-	-

ANOVA Academic Criterion Interpretation: The model's F statistic is as high as 100.31, and the corresponding joint Significance F has reached a staggering 10-11 level, far smaller than the statistical academic critical value of 0.01. This indicates that the model is extremely significant as a

whole at the 1% level, strongly rejecting the "spurious regression" null hypothesis that there is no linear relationship between the dependent variable and the independent variable, confirming that the mathematical foundation for predicting BYD's sales with online digital traces is extremely solid.

C. Core Coefficients Discussion and Behavioral Economics Mechanism Deconstruction

Table 4. Regression coefficient estimation and statistical test results

Variable	Coefficient (β)	Std. Error	t Stat	*P*-value	Significance
Intercept (β_0)	−4.316	1.104	−3.910	0.0006	***
$\ln(\text{Trends}_{t-1})$ (β_1)	2.910	0.291	10.015	0.00000000005	***

From this, the academic econometric equation conforming to the real matrix is extracted:

$$\ln(\text{Sales}_t) = -4.316 + 2.910 \ln(\text{Trends}_{t-1})$$

Mathematical Interpretation of "Hyper-elastic" Digital Attention

The regression coefficient of the core explanatory variable ln(Trendst-1) is as high as 2.910, and its corresponding t statistic reaches a stunning 10.015, which is extremely significant at the 1% statistical level.

Because this model simultaneously performed natural logarithmic transformations on the dependent and independent variables in its setting, the economic meaning of this coefficient is directly equivalent to the "digital attention demand elasticity". It clearly reveals that: in the German passenger car market, every 1% increase in consumers' Google search popularity for BYD's brand core words in the previous month will explosively drive the average physical new car registration volume of the current month to increase by 2.910% after a time lag of about 30 days for information digestion, test drive circulation, and registration. This significant "Hyper-elasticity" feature powerfully verifies core hypotheses H1 and H2.

The Negative Intercept and the Behavioral Meaning of Latecomers Breaking Through

The constant intercept obtained by regression is -4.316 (and is significantly negative at the 1% level). In econometrics, this negative intercept has profound reality implications for transnational marketing: it indicates that as a latecomer and "alien emerging force" in the Western European passenger car market, BYD will face an extremely severe sales zeroing suffocation risk under the extremely isolated state lacking online digital attention support (that is, when the Google Trends search index approaches 0, $\ln(\text{Salest}) \to 0$), due to the extremely high brand exclusivity and fuel car cultural barriers of local German consumers.

However, once the search index is activated through international major event marketing (such as the 2024 European Championship sponsorship) and the effective accumulation of online digital assets, the high elasticity coefficient of 2.910 will act as a nonlinear sales amplification leverage to drive terminal new car registrations to achieve a breakthrough. At the micro-brand level, this result perfectly verifies Wang Shutian's (2023) niche market differentiation theory that the potential audience of mid-range volume technology models possesses "high-involvement information retrieval" and "high purchase intention conversion purity," and it also highly echoes Nazl Gamze Özel's (2025) judgment on Google Trends as the "most Timely Leading Indicator" for the German electric vehicle market. For Chinese automakers currently at the center of the storm of global compliance investigations, the robust accumulation of online digital assets is a solid guarantee for cracking transnational disadvantages and driving cross-period breakthroughs in overseas brand upgrades.

VI. Strategic Suggestions for Chinese Automakers' Overseas Brand Upgrading and Global Compliance

A. Rely on Digital Asset Accumulation to Drive Highly Efficient Online Conversion Marketing

The empirical results of this study show that online search popularity is the core driving force for Chinese automakers' cross-period sales in Germany, with an elasticity coefficient as high as 2.910. This indicates that when Chinese new energy automakers promote brand upgrading in mature markets such as Western Europe, they must build a marketing funnel closed loop based on digital leading signals.

Long-tailing of Digital Attention in Major Event Marketing: BYD's high-profile sponsorship of the European Championship in 2024 triggered staged search impulses in the European market. However, automakers must realize that there is a physical time lag of about 30 days in the conversion from search popularity to sales. Enterprises should place high-frequency in-depth content targeting local German consumption pain points (such as full-vehicle five-star safety and full compliance with GDPR privacy protection) within the golden window period of the search index explosion, precipitating traffic into "strong intention digital attention" with high conversion purity.

Dynamic Customs Clearance and Logistics Coordination Based on Digital Popularity: Given that search data has strong leading indicator characteristics, enterprises should use the regional and time granularity data of Google Trends to dynamically adjust logistics and inventory to Germany. During the golden window of the step-by-step climb in Google search popularity, complete customs clearance and localized vehicle activation 2-3 weeks in advance to ensure that online digital intentions can be quickly satisfied when flowing to offline physical delivery, amplifying the digital leading dividends.

B. Perfecting the Transnational Compliance Defense Mechanism to Hedge Against Exogenous Policy Shocks

Although digital attention can effectively drive sales, the systemic downward trend of the German Umweltbonus subsidy market in early 2024 and various geopolitical barriers have verified the uncertainty of the institutional environment. Chinese automakers must regard "compliance management" as the first lifeline of brand advancement.

Building Full-Life-Cycle "Low-Carbon Compliance Barriers": In response to the strict audits of carbon footprints by the EU's new battery regulations, automakers expanding overseas need to accelerate the green reconstruction of their supply chains. By establishing "zero-carbon battery factories" domestically and actively introducing third-party international certification agencies to trace the raw material supply chain, perfect compliance data can be used to dispel protectionist prejudices under the European Green Deal.

Intelligent Connected "Data Localization Compliance" Security Defense Line: Given German society's high sensitivity to personal privacy (GDPR), Chinese smart vehicles must win the security trust of overseas consumers. Models sold in Germany should default to carrying localized decoupling solutions, ensuring that vehicle data is stored locally in Western European data centers, and proactively using "data security" as a core selling point for brand advancement in digital narratives.

VII. Conclusion and Outlook

A. Research Conclusions

Taking China's leading automaker BYD's entry into the mature German passenger car market as the core entry point, this paper systematically explored the causal transmission path between the leading effect of digital attention and brand advancement expansion. By collecting and approving authoritative time-series data from January 2024 to May 2026, and constructing a time-lag double-logarithmic Ordinary Least Squares (OLS) regression model for empirical solving, the following core academic conclusions are drawn:

Confirmed Google Search as the Core Leading Indicator and Hyper-Elastic Amplification Mechanism for Micro-Brand Sales: Empirical regression shows that BYD's Google Trends index, strictly peer-aligned and lagged by one period, has extremely strong causal explanatory power for the physical new car registration sales in Germany that month (the univariate model determination coefficient R2 is as high as 0.7878). Its "digital attention demand elasticity" coefficient is as high as 2.910 ($t = 10.015$, $p < 0.01$). For every 1% increase in consumers' online search attention to BYD's brand core words in the previous month, it will drive physical registration sales to increase by 2.910% after a consumption decision and delivery lag period of about 30 days. This finding powerfully broadens the niche market information retrieval theory and confirms that online digital traces can serve as a "golden barometer" for tracking consumers' strong intentional behavior in transnational management.

Revealed the Digital Asset Dependency Characteristics of Latecomer Brands: The constant intercept derived from model regression is significantly negative (−4.316), deeply outlining the survival norm of Chinese brands as latecomers in the mature Western European market—that is, in the normal state lacking online digital attention activation, they face an extremely high risk of sales zeroing. The online digital assets accumulated by Chinese automakers in mature overseas markets are the key leading source for hedging against exogenous institutional shocks and driving continuous cross-period sales climbing through traffic explosions.

B. Research Limitations and Future Outlook

Although this study solved empirical results with strong explanatory power in the Excel regression engine through rigorous staggered alignment, constrained by the objective data environment, the following limitations still exist:

Lack of Multi-Dimensional Control Variables: This paper mainly focuses on the core pulling effect of digital traces. Limited by the access barriers to public data in mature overseas markets, it failed to simultaneously incorporate micro multi-dimensional variables such as the number of offline 4S showroom networks actually invested by various brands in Germany and dynamic financial leasing interest rates into the same econometric model for multivariate control. Future research can try to establish data sharing with local dealer groups and introduce multiple regression to exclude more confounding interference.

Limitation of Time Series Length: Because the cycle of Chinese new energy vehicles entering Germany on a large scale and generating continuous registrations is currently still short (effective sample size N = 29), the application of long-cycle advanced econometric methods such as Vector Autoregression (VAR) or Vector Error Correction Models (VECM) is limited. In the future, as the overseas expansion cycle lengthens, time-series data with a longer span can be accumulated to explore their long-term co-movement patterns.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

Yingyi Li: Conceptualization, Methodology, Writing–Original Draft, Writing – Review & Editing. Huatong Huang: Data Curation, Formal Analysis, Software, Validation. All authors have read and agreed to the published version of the manuscript.

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