A Bibliometric Analysis of Consumer perception Models for Adoption of Electric Vehicles

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Abstract:

This bibliometric analysis systematically maps the intellectual landscape of scholarly research on consumer perception models for Electric Vehicle (EV) adoption. Using Scopus data from 2012 to 2025, the study identifies temporal growth patterns, influential publications, leading authors, institutions, and prominent journals. It also examines geographical contributions, international collaborations, and the evolution of key themes and methodologies. Findings indicate a significant surge in research from 2019, reflecting EV market growth. Early foundational works maintain influence, suggesting cumulative knowledge building. The field shows high collaboration, with a notable shift in research output and impact towards emerging economies like China and India. Thematic evolution progresses from general EV concepts to specific behavioral and policy mechanisms, increasingly incorporating advanced analytical techniques. This overview highlights the interdisciplinary and global nature of understanding consumer perceptions for electric mobility transition.

Keywords: Consumer PerceptionModels, Adoption of Electric Vehicles, Bibliometric Analysis.

Introduction:

Background on Electric Vehicles and Consumer Adoption: Electric Vehicles (EVs) are crucial for sustainable transportation, offering reductions in emissions and operational costs. Despite technological advancements and supportive policies, widespread EV adoption faces challenges beyond technical or economic factors.

Significance of Consumer Perception in EV Adoption: Consumer perception is a critical determinant of EV adoption. Concerns like range anxiety, charging infrastructure availability, high upfront costs, and perceived performance limitations significantly influence purchasing decisions. Understanding and modeling these perceptions are

[1] Citation. Pathak, N., Patel, P., & Kumar, R. (2025). *A bibliometric analysis of consumer perception models for adoption of electric vehicles*. *Ecosocial Studies: Banking, Finance and Cybersecurity Journal, 7*(2). 49-68. https://doi.org/10.56334/ecosbankfincyber/7.2.5
Issue 2, Vol 7, 2025, https://ecosocialissues-az.com/index.php

essential for effective policy formulation, targeted marketing, and future technological innovation.

Rationale for Bibliometric Analysis: A bibliometric analysis provides a systematic and quantitative approach to map this dynamic research domain. By analyzing publication patterns, citation networks, and keyword co-occurrence, it objectively identifies trends, influential works, key contributors, and thematic evolution, offering a robust understanding of the field's structure and future directions.

Objectives:

The primary objectives are:

1. To quantitatively assess annual scientific production and growth dynamics.
2. To identify and analyze the citation impact of influential scholarly works.
3. To map intellectual leadership by identifying prolific authors, leading affiliations, and prominent sources.
4. To examine geographical distribution patterns and trace thematic evolution and conceptual structure through co-word analysis and trend topic identification.

Methodology: The foundational dataset for this bibliometric analysis was meticulously compiled from the Scopus database, a widely recognized and comprehensive repository of peer-reviewed academic literature. The search strategy was designed to ensure both relevance and breadth, capturing publications directly addressing consumer perception models in the context of Electric Vehicle adoption. The raw data retrieved from Scopus was subsequently processed and analyzed using Biblioshiny, a user-friendly web interface for the 'bibliometrix' R-package. This specialized software is proficient at performing a wide array of bibliometric analyses, facilitating a robust examination of the intellectual structure and dynamics of a research field. Various analysis techniques were involved , such as Performance Analysis (to assess the productivity and influence of research over time, measured publication trends, growth rates, and citation impact), Intellectual Structure analysis (Identified key authors, institutions, and journals, to map the academic landscape), Thematic Mapping and Evolution (Analyzed keyword co-occurrence to uncover major research themes and their development across time periods), Historiographical Review (Reviewed key influential papers to trace the evolution of research focus, theoretical models, and methodologies).

Scope andSystematic Literature Collection:

In this study literature search was conducted on the Scopus database using the terms “Consumer perception models” AND “adoption of Electric Vehicles”. Subsequently 97 related articles appeared. We started screening them based on subject area. The titles, abstract and keywords of exiting literature were evaluated. The search was limited for the period of 2012-2025. The papers were narrowed to 84 papers which met the purpose of our study.

Data Analysis and Interpretation:

The bibliometric dataset spans from 2012 to 2025. and includes 84 documents sourced from 53 journals, books, and other scholarly outlets. The research output shows a

modest annual growth rate of 5.48%, with an average document age of 3.45 years and an impressive average of 43.7 citations per publication, supported by 5,411 references. Keyword analysis reveals 525 Keywords Plus and 303 author-defined keywords. The study involved 242 authors, though only 8 documents were single-authored, highlighting a collaborative research environment with an average of 3.12 co-authors per paper and 23.81% involving international collaboration. Articles dominated the document types (70), supplemented by a few book chapters, conference papers, reviews, and conference reviews.

Overview of Scientific Production:

- *Publication Trends and Growth Dynamics:* The scope ofanalyzed research on consumer perception models for EV adoption spans from 2012-2025. After minimal activity (0-2 articles) from 2013-2018, a significant acceleration began in 2019 (6 articles), reaching a peak of 20 articles in 2024 before a slight dip to 14 in 2025 (till June). This surge from 2019 onwards marks the field's rapid growth and recognition, paralleling the expansion of the EV market, signaling a rapid increase in scholarly interest and activity.. This accelerated academic inquiry closely parallels the real-world expansion of the EV market and the increasing urgency of global policy initiatives promoting electric mobility.

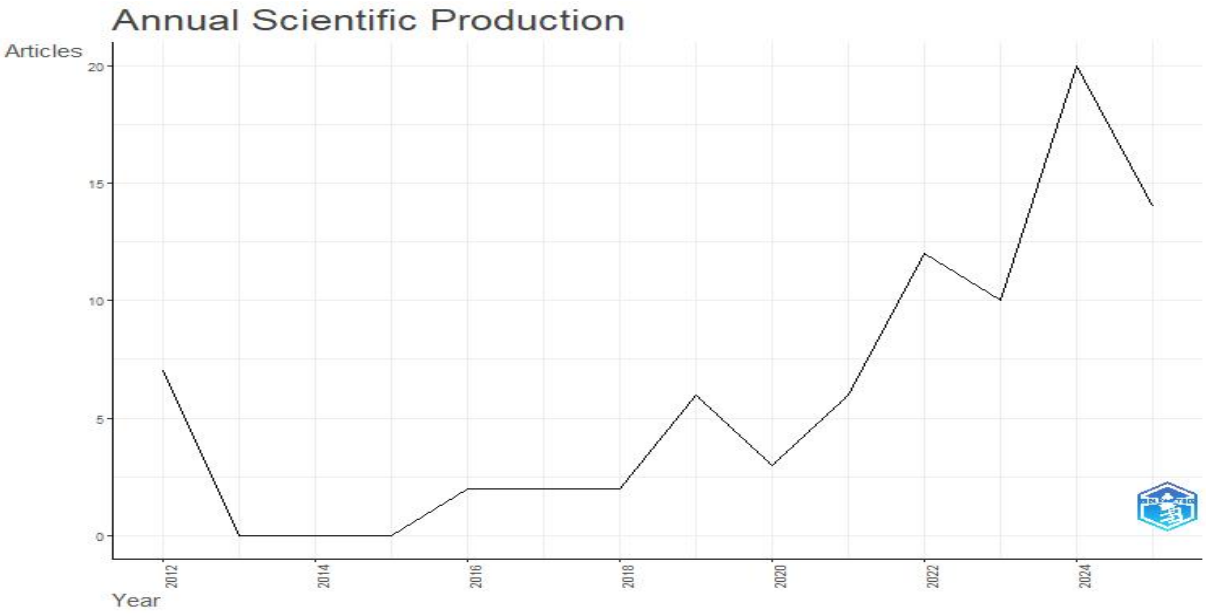

Fig 1: Annual scientific production

Impact and Citation Analysis:

- *Overall Citation Metrics and Highly Cited Works:* The average citations per year for articles exhibit variability, peaks in 2018 (36.75) and 2019 (14.64), with a 2012 paper maintaining 39.79 citations per year. The most cited work is by Graham-Rowe E et al. (2012) in Transportation Research Part A: Policy and

Practice, with 557 total citations, indicating its foundational role despite being an early publication. This suggests a cumulative knowledge-building process where early insights remain relevant.

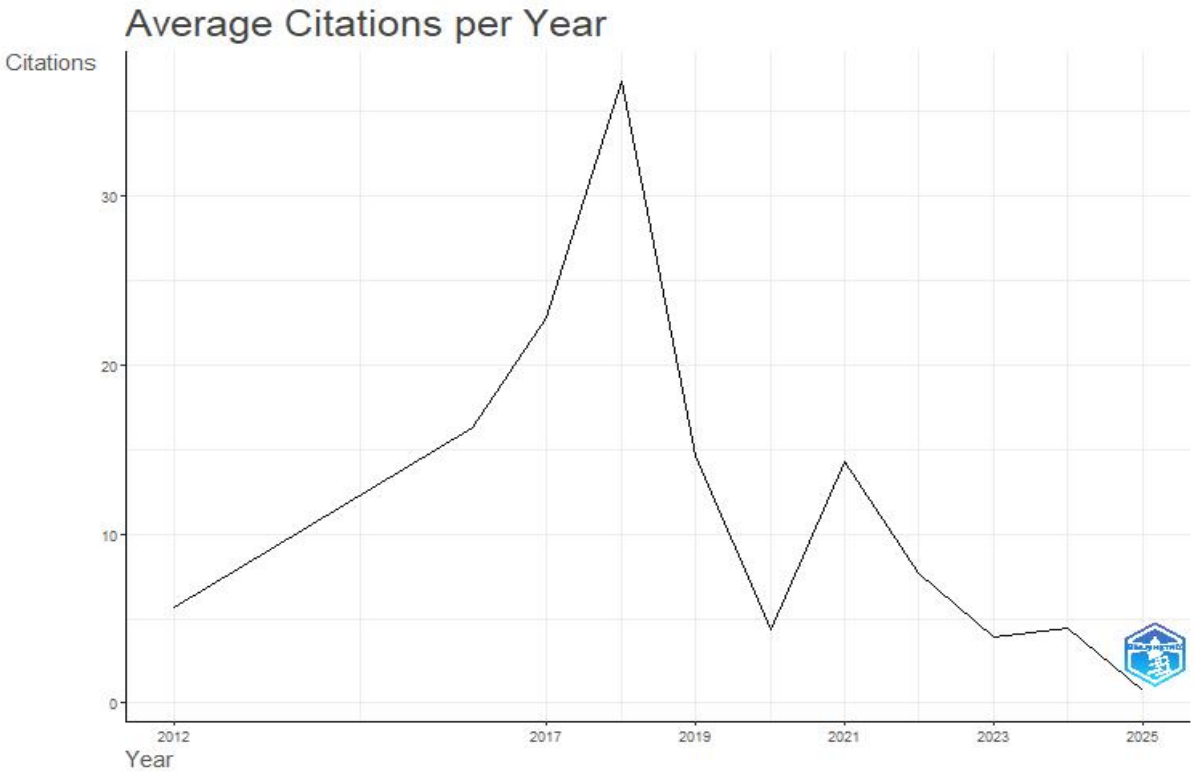

Fig. 2: Average citation per year

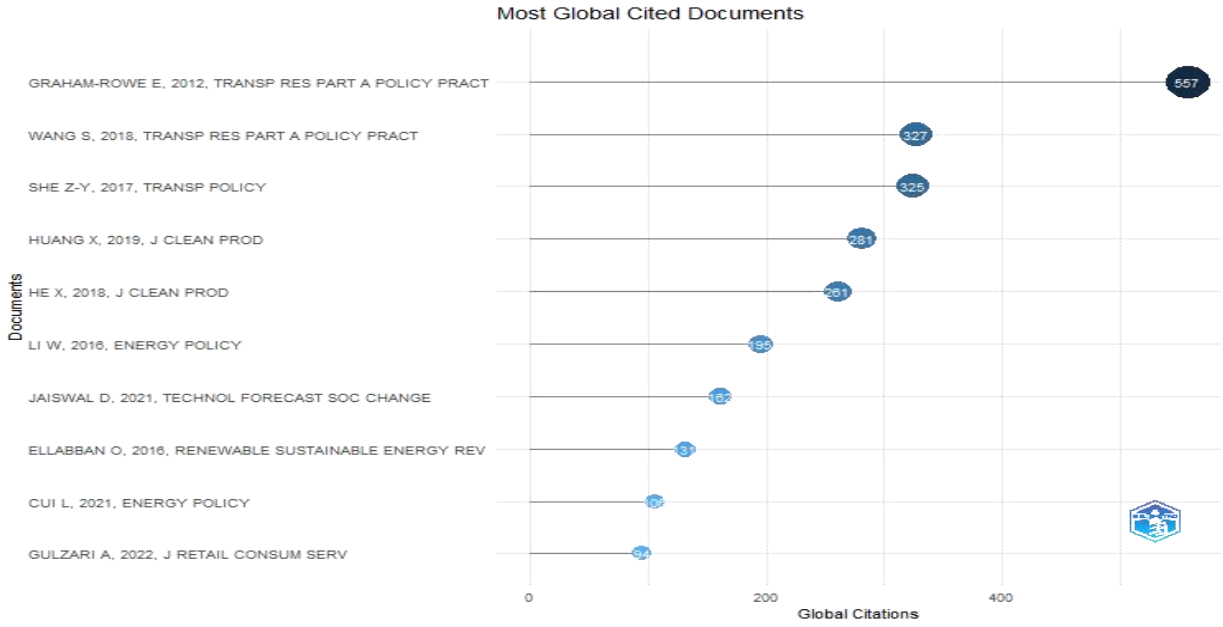

Fig. 3 Mostglobally cited documents.

Key Contributors and Institutional Landscape

- *Most Prolific Authors and their Contributions:* Authors like CHINEN K, JAISWAL D, KANT R, MATSUMOTO M, and WANG Y are most prolific authors, each with three articles, indicating sustained research commitment and specialized expertise.

Fig. 4: Most relevant author

- *Leading Research Institutions and their Influence:* California State University (9 articles), Universiti Sains Malaysia (8 articles), and Wuhan University (7 articles) lead institutional contributions, suggesting dedicated research groups and strategic investment in this domain.

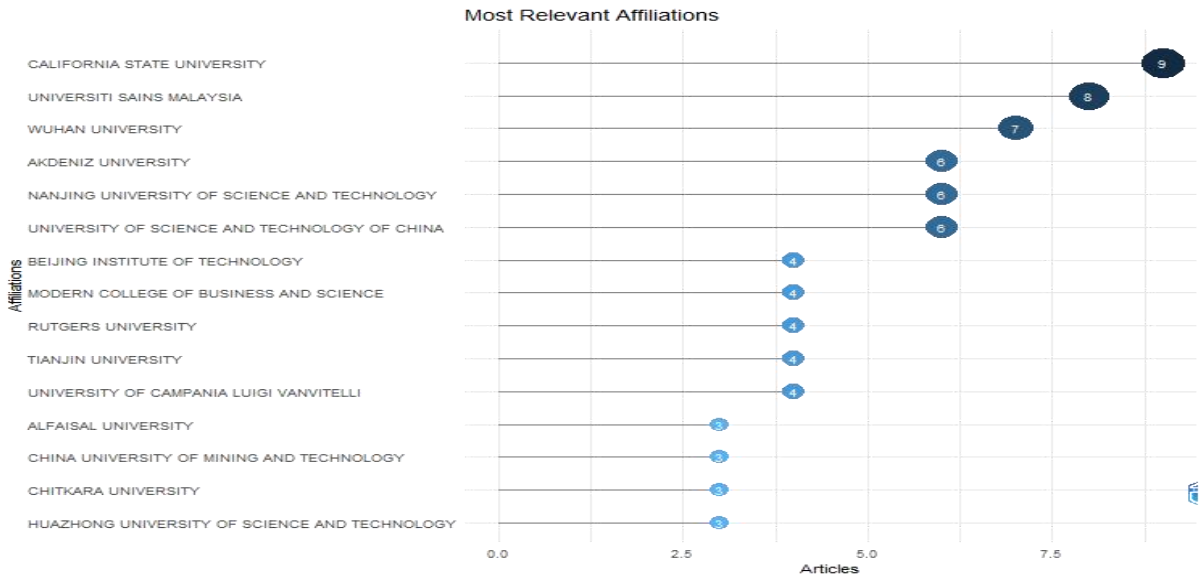

Fig. 5: Most relevant affiliation

- *Most Relevant Sources (Journals/Conferences):* "SUSTAINABILITY (SWITZERLAND)" (7 articles), "18TH AMERICAS CONFERENCE ON INFORMATION SYSTEMS 2012, AMCIS 2012" (6 articles), and "TRANSPORTATION RESEARCH PART A: POLICY AND PRACTICE" (5 articles) are key publication outlets . Their diversity highlights the interdisciplinary nature of EV adoption research, drawing from environmental science, transportation, and information systems.

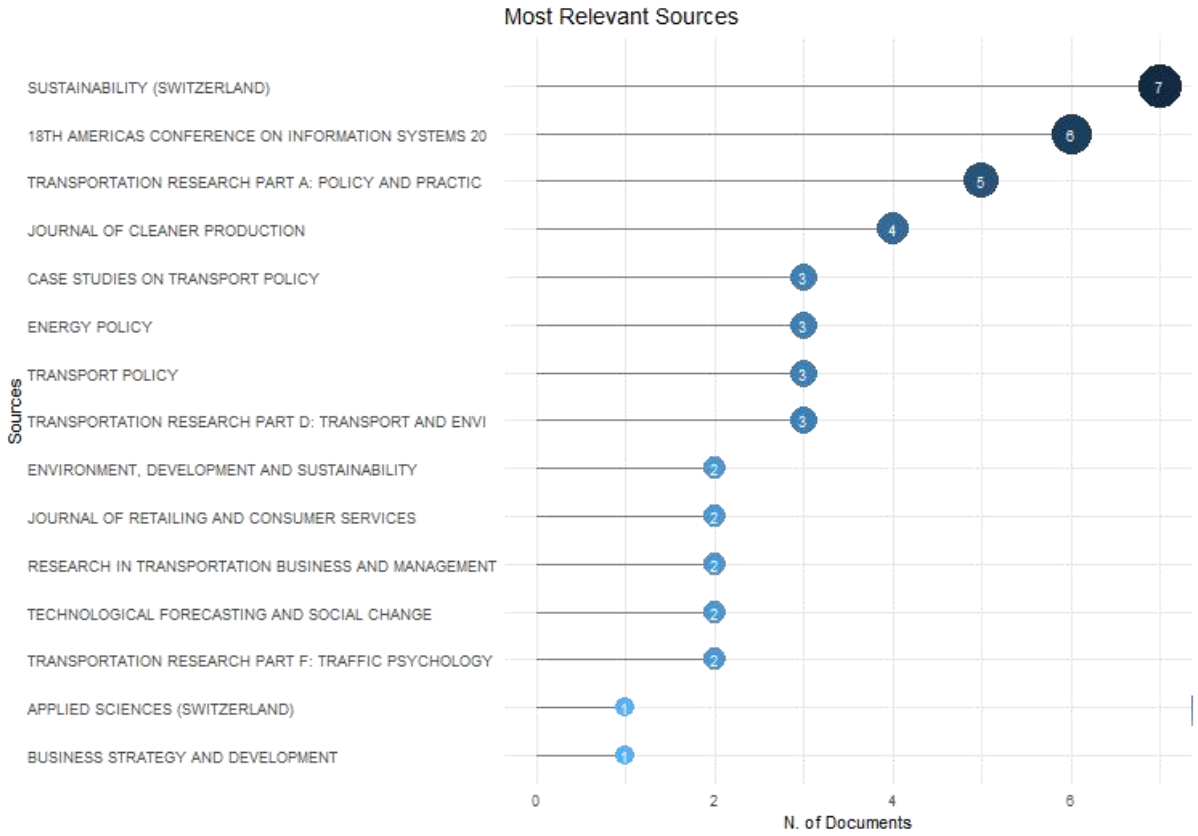

Fig. 6: Most relevant Sources

Country-Level Research Output and Dynamics:

Research dominance has shifted dramatically towards emerging markets. The United Kingdom demonstrated early engagement in this field, with seven articles published in 2012, and maintained a relatively consistent output in the single digits through 2024, before increasing to 13 articles in 2025. In contrast, China's research output, which began at zero articles in 2012, experienced an explosive growth trail, reaching an impressive 62 articles by 2025. Similarly, India, also starting from no publications in 2012, rapidly scaled its research contributions to 45 articles by 2025. The United States also showed substantial growth, with its article count rising to 32 by 2025.

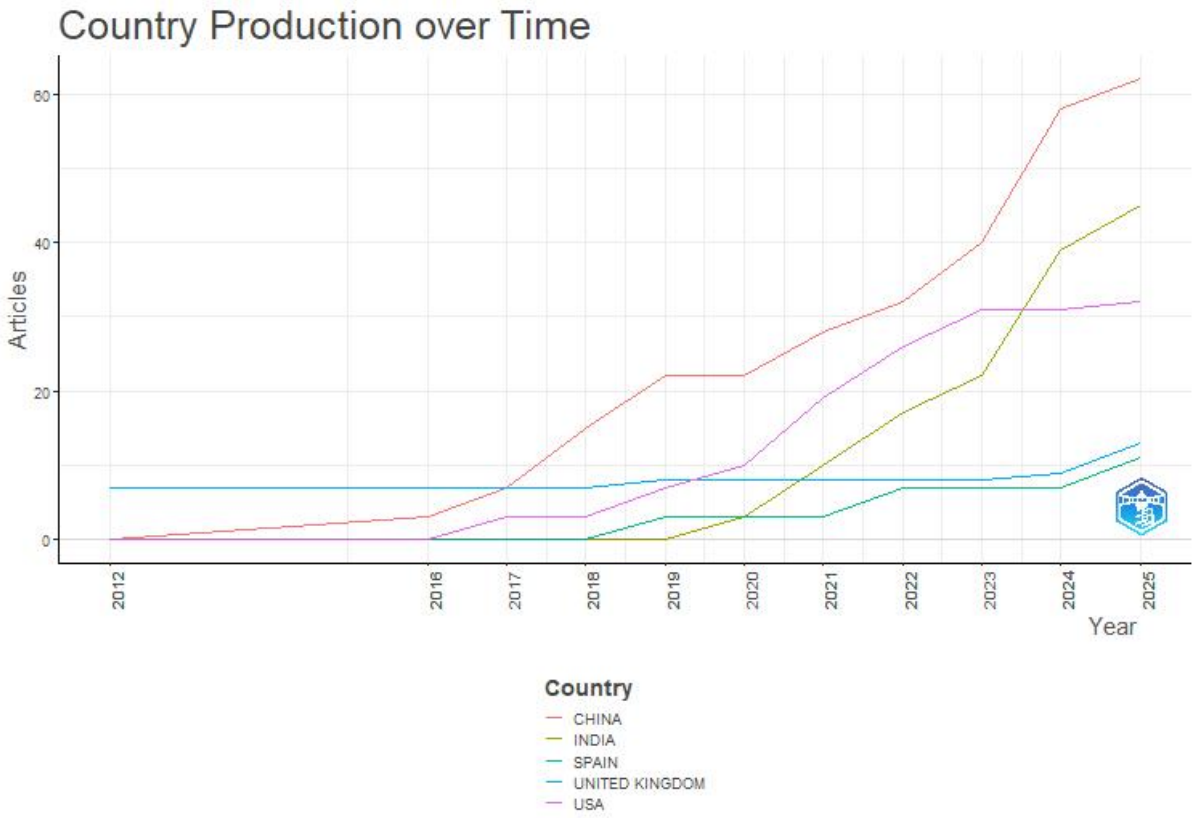

Fig. 7: Country's production over time

- *Most Cited Countries:* China leads in total citations (1746) and average article citations (102.7), confirming its intellectual influence and the high quality of its research.

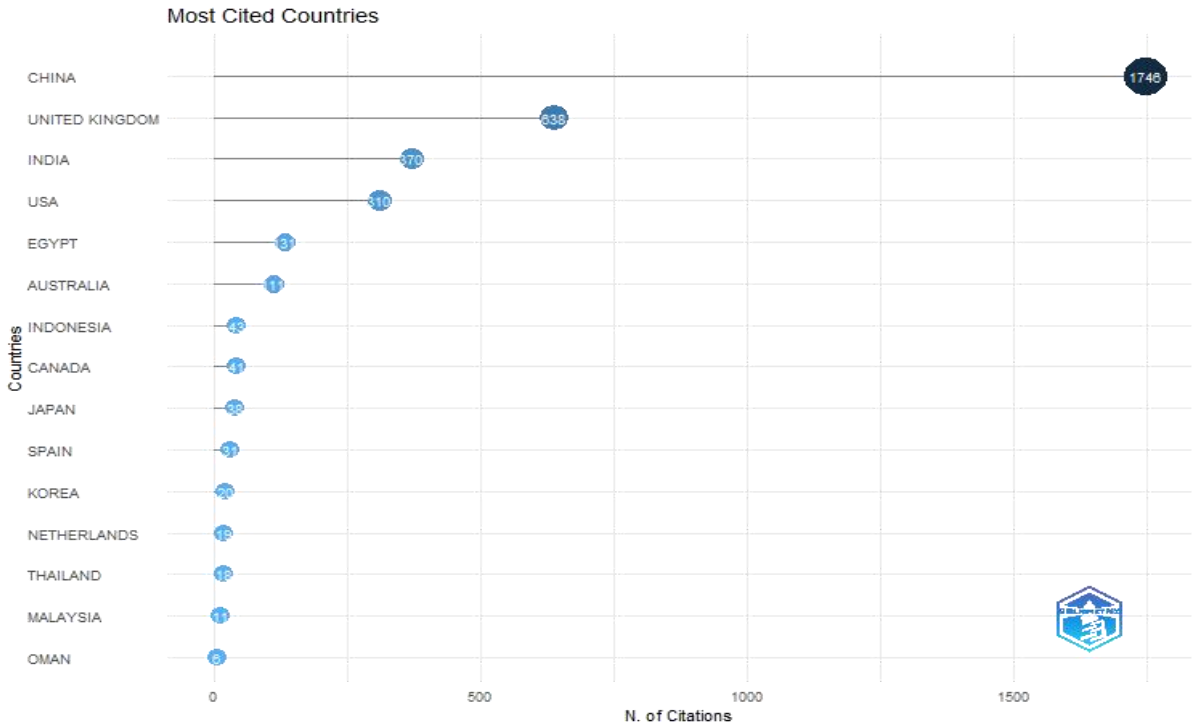

Fig. 8: Most cited countries

Thematic Evolution and Conceptual Structure:

- *Dominant Keywords and Research Concepts:*An analysis of the most frequently occurring words provides a clear picture of the core conceptual landscape of the field. The terms "electric vehicle" (48 occurrences) and "electric vehicles" (38 occurrences) are overwhelmingly dominant, affirming the central subject matter of the research. Following closely are terms related to the human element of adoption: "perception" (22 occurrences), "consumer behavior" (16 occurrences), "consumption behavior" (15 occurrences), and "purchase intention" (14 occurrences). "Technology adoption" (15 occurrences) also features prominently, linking the specific context of EVs to broader theories of innovation diffusion. The term "sales" (14 occurrences) highlights the practical, market-oriented outcome that researchers often seek to predict or influence. The consistent appearance of "structural equation models" and "theory of planned behavior" further indicates the established methodological and theoretical approaches used to investigate these behaviors.

Fig. 9: word cloud (most repeated words)

- *Emerging Research Trends:* Trend topics show a progression from broad EV concepts (e.g., "energy utilization," "vehicles" in 2016-2019) to specific policy and vehicle types (e.g., "incentive," "battery electric vehicles" in 2018-2021). More recent trends (2021-2023) focus on detailed behavioral and policy mechanisms, including "environmental concerns," "willingness to pay," and "structural equation models," indicating a deeper dive into psychological and economic drivers.

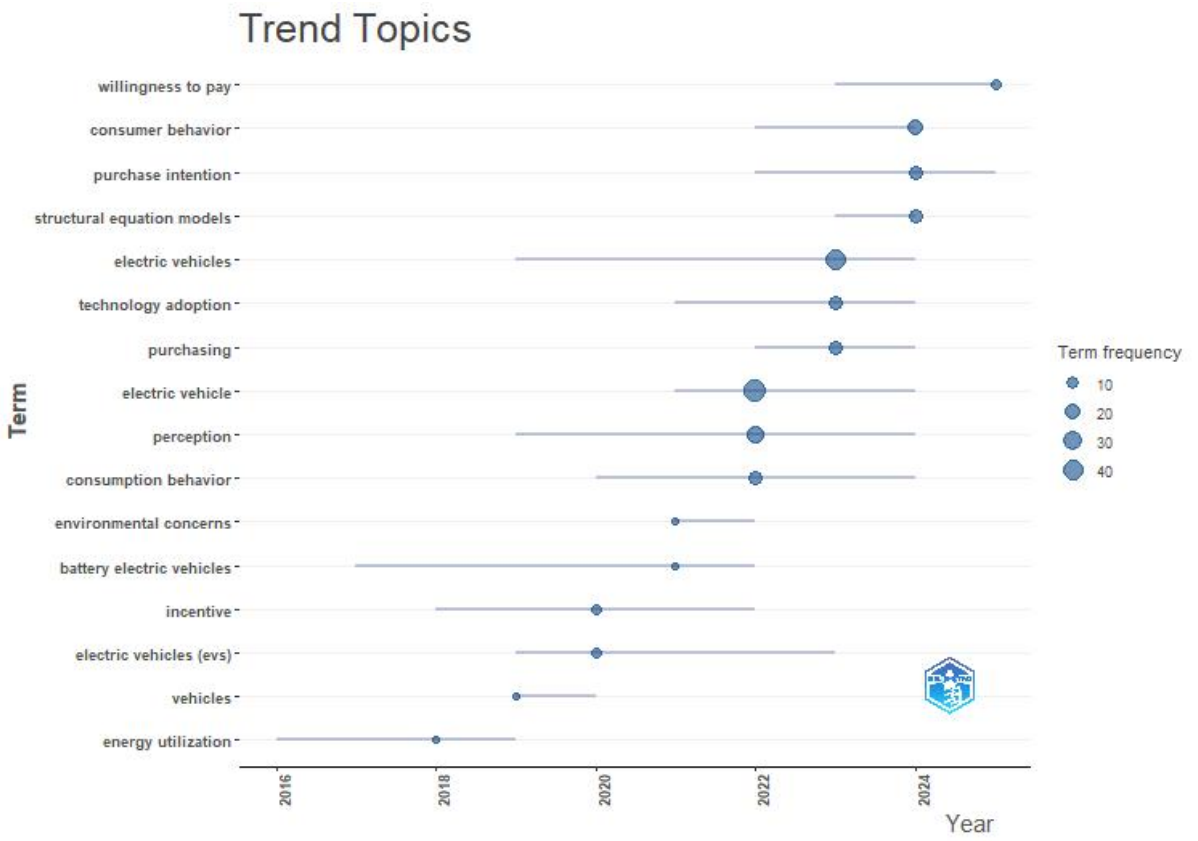

Fig. 10: Trend topics

- *Co-Word Network Analysis and Thematic Clusters:* The co-word network reveals distinct thematic clusters :
    a. Cluster 1 (Perception & Initial Adoption Factors): Centered on "perception" and "consumption behavior," including "china," "attitude," and "incentive," reflecting early psychological and policy focus.
    b. Cluster 2 (Core EV Concepts & Technology Adoption): Dominated by "electric vehicle" and "electric vehicles," linked to "technology adoption" and "adoption intention," indicating the core subject and diffusion theories.
    c. Cluster 3 (Behavioral Models & Outcomes): Led by "consumer behavior," "purchase intention," and "sales," featuring "structural equation models" and "theory of planned behavior," highlighting analytical approaches to behavioral outcomes.

    The high betweenness centrality of "electric vehicle" (430.96) and "perception" (64.51) signifies their crucial role as bridges, connecting different conceptual areas and underscoring their integrative importance across the entire field. This structural organization confirms that consumer perception of EVs is a multifaceted field where psychological factors, technological characteristics, policy incentives, and broader sustainability goals are intricately linked.

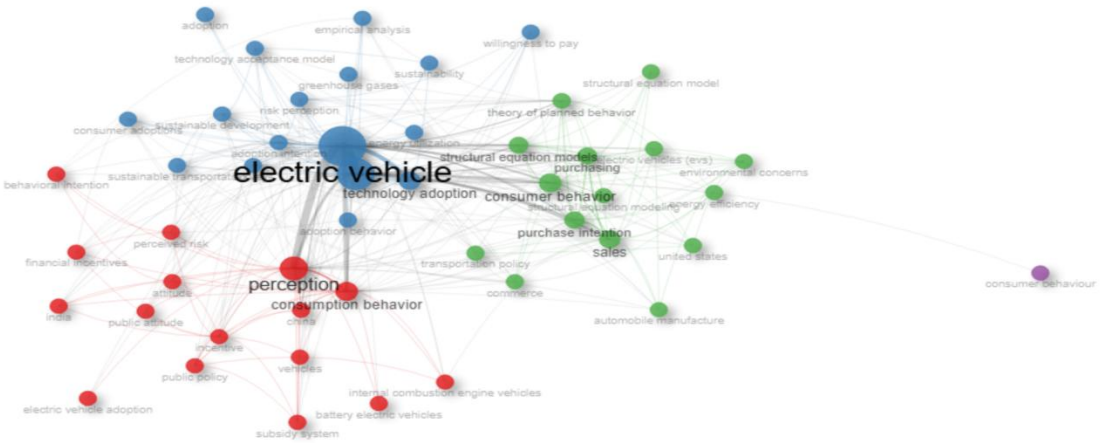

Fig. 11: Co-occurrence word network

Thematic Evolution Across Defined Periods:

The thematic evolution across three distinct periods provides a compelling narrative of the field's maturation and its progressive refinement and diversification of research focus.

- *Period 1 (2012-2017):* Focused on foundational concepts like "electric vehicles" and "battery electric vehicles," with early recognition of "perception" and geographical context like "China".
- *Period 2 (2018-2021):* Deepened behavioral insights, with "perception," "consumption behavior," and "technology adoption" gaining prominence. "Autonomous vehicles" emerged, and "consumer behavior" and "surveys" formed distinct clusters.
- *Period 3 (2022-2025):* Showcases refinement and diversification, with continued focus on "electric vehicle" and "electric vehicles," but increased emphasis on "purchase intention" and "structural equation models." New clusters like "environmental concern," "consumer behaviour," and "willingness to pay" emerged, alongside "artificial intelligence" for advanced analytics.

This progression indicates a move from broad descriptive studies to analytical, predictive, and interdisciplinary investigations.

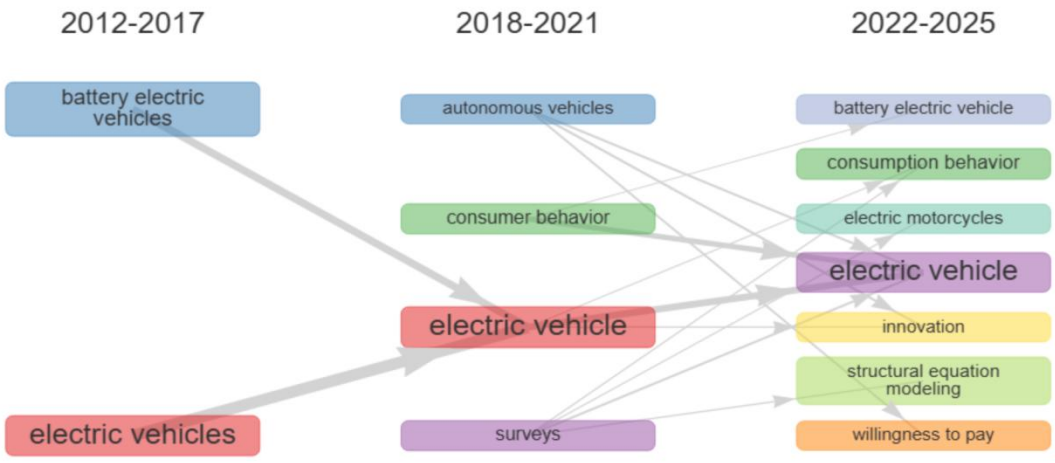

Fig. 12: Thematic Evolution

4.6. In-depth Analysis of Influential Papers

Highly cited papers demonstrate theoretical convergence and methodological sophistication.Here's a table summarizing the literature review, including the author, model, variables, and findings for each paper:

Author	Model	Variables	Findings
Graham-rowe E, (2012)	Qualitative analysis (semi-structured interviews)	attitudes, identity, mainstream adoption, marketing, technology, responses, evaluations, psychological aspects, social aspects.	Explored mainstream consumers' responses and evaluations of plug-in battery-electric and plug-in hybrid electric cars, focusing on psychological and social aspects like identity for mainstream adoption. Laid substantial groundwork for subsequent research.
Egbue O, (2017)	Logistic regression	demographic, behavioral, attitudinal measures, willingness to pay, distance driven, environmental perceptions.	Evaluated factors influencing mass deployment of sustainable transportation and EV adoption. Identified willingness to pay, distance driven, and environmental perceptions as key factors, bridging individual attitudes

			to broader sustainable transportation objectives.
She Z-Y, (2017)	Structural equation models, chi-square tests	consumer interest, performance concerns (safety, reliability, range), high battery cost, inadequate charging infrastructure.	Identified primary impediments to widespread adoption of battery electric vehicles in Tianjin, China, highlighting the importance of both technological and infrastructural factors in consumer perception.
Wang S, (2018)	Extended Technology Acceptance Model (TAM)	consumer knowledge about EVs, perceived risk, perceived usefulness, financial incentive policies, adoption intention.	Found consumer knowledge, perceived risk, and perceived usefulness to be significant factors influencing adoption intention. Surprisingly, financial incentives were not directly significant, challenging conventional wisdom.
He X,(2018)	Personality-perception-intention framework	personal innovativeness, environmental concern, positive utilities, negative utilities, purchase intention.	Explored consumers' EV adoption behavior in China, finding that personal innovativeness and environmental concern directly influence purchase intention, with positive and negative utilities acting as mediators. Expanded psychological models by incorporating personality.
Huang X, (2019)	Theory of Planned Behavior (TPB) and Structural Equation Modeling (SEM)	consumer cognitive status, product perception, incentive policy measures (non-monetary, monetary), attitude, perceived behavior control, purchase intention.	Extended the TPB framework to analyze consumer purchase intention in Beijing, China. Found that attitude, perceived behavior control, cognitive status, product perception, and monetary incentive policies had significant positive effects.
Shakeel U, (2022)	Extended Theory of Planned Behavior (TPB)	consumer attitude (AT), subjective norms (SN), cognitive states (CS), product perception (PA), perceived behavioral control (PBC), non-	Predicted consumer purchase intention in Pakistan. Findings indicated that most factors had a significant beneficial outcome on consumers'

		monetary incentive policy (NMIP), monetary policy (MIP), purchase intention.	intentions to buy EVs, providing context-specific insights for a developing nation.
Xia Z, (2022)	Diffusion of Innovation Theory	perceived compatibility, complexity, relative advantage, monetary subsidies, risk of price reduction, intelligent function, sustainability risk, status symbol, reputation risk, EV adoption.	Examined economic, functional, and social factors influencing EV adoption. Found that perceived compatibility, complexity, and relative advantage were key predictors, influenced by various economic, functional, and social aspects.
Cabeza-ramírez LJ, (2025)	Theory of Planned Behavior (TPB) and Norm Activation Model (NAM)	willingness to pay, performance risks, financial risks, environmental awareness, social pressure, personal norms, intention, moderating variables (age, income, vehicle use, prior experience).	Explored rational and normative determinants in EV adoption in Spain. Highlighted environmental awareness, social pressure, and personal norms as influences on intention and willingness to pay, with moderating effects from demographic and experience variables.

The consistent application and extension of established behavioral models like the Theory of Planned Behavior (TPB) and the Technology Acceptance Model (TAM), alongside the widespread adoption of Structural Equation Modeling (SEM) and Partial Least Squares Structural Equation Modeling (PLS-SEM) as predominant analytical techniques, indicate a significant theoretical convergence and methodological sophistication within the field. Researchers have largely coalesced around a set of robust theoretical frameworks and quantitative methods for investigating consumer perception in EV adoption. Furthermore, studies are increasingly integrating these established models with novel factors, such as personality, social commerce, Maslow's Hierarchy of Needs, and the Diffusion of Innovation Theory. This is complemented by their application to diverse and specific contexts, including Pakistan, Beijing, Tianjin, Spain, and studies focusing on young consumers or two-wheelers.

Conclusion:

Summary of Principal Findings:

This bibliometric analysis reveals a rapidly evolving and sophisticated research domain concerning consumer perception models for EV adoption. Scholarly output has grown exponentially since 2019, reflecting increased global interest in EVs. Leading authors and institutions contribute consistently, with a significant shift in research dominance

and impact towards emerging markets, particularly China and India. The field is highly interdisciplinary, drawing from various sciences. Thematic evolution shows a progression from broad barriers to nuanced psychological factors, policy impacts, and new mobility concepts.

- *Theoretical and Practical Implications:* Theoretically, research has refined and extended behavioral models like TPB and TAM, applying them to sustainable consumption and automotive technology. This has deepened understanding of how economic, psychological, social, and policy factors interact in EV adoption. The increasing use of multi-faceted models and advanced analytical techniques points to more comprehensive and predictive theoretical frameworks.
  Practically, findings offer actionable insights for policymakers and industry. Policymakers should design incentives addressing financial and psychological barriers (e.g., range anxiety), emphasizing charging infrastructure and public awareness. Industry stakeholders should focus on product design that mitigates concerns and tailor marketing strategies to diverse consumer segments, leveraging emerging trends like battery swapping.
- *Limitations of the Bibliometric Approach:* This analysis provides a macroscopic view, not delving into qualitative depth or specific methodological nuances beyond keyword analysis. Reliance on the Scopus database may exclude some relevant publications. Keyword selection, though meticulous, might miss papers using alternative terminology. Future-dated papers may have incomplete citation data, potentially affecting impact metrics.

Future Research Avenues:

Future research should delve into specific demographic segments and conduct cross-cultural comparisons to uncover context-driven factors influencing EV adoption. Longitudinal studies are needed to understand how consumer perceptions evolve with policy changes and market maturity. Integrating AI and machine learning with behavioral models can reveal deeper insights into consumer decision-making. Additionally, emerging EV technologies and business models, along with the effectiveness of policy and communication strategies, warrant focused investigation to support sustained adoption.

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