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Political Economy Implications of Electric Vehicle Policies: A Bibliometric Analysis

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ABSTRACT

This article examines the current landscape of research on electric vehicle (EV) policy, emphasizing the critical yet underexplored role of political economy. While existing studies predominantly focus on infrastructure development, sustainability, and subsidy policies, there is a notable lack of attention to the political dynamics and economic influences that shape EV initiatives. This study investigates the implications of EV policies through a bibliometric analysis, utilizing tools such as VOSviewer to map and analyze academic literature on the topic. It provides a comprehensive overview of key themes, including highly cited research, author contributions, country-level outputs, institutional engagement, and network analyses such as co-citation, bibliographic coupling, and keyword co-occurrence. The study also highlights the countries that have significantly contributed to the field. Findings reveal that integrating political economy perspectives is essential for developing comprehensive and equitable EV policies that address the diverse needs of stakeholders. Ultimately, this article calls for a more holistic approach to EV research, advocating a deeper exploration of the interplay between political and economic forces to enhance the effectiveness and inclusivity of electric mobility initiatives. This study contributes to the growing body of knowledge on EV policy frameworks by offering insights into the complex dynamics of political economy, thereby informing policymakers and researchers seeking to navigate the challenges of sustainable mobility transitions.

Keywords: *Bibliometric Analysis; Electric Vehicles; Political Economy; Public Policy; Sustainable Mobility*

1. Introduction

Achieving net-zero greenhouse gas (GHG) emissions by 2050 requires rapid and large-scale decarbonization across all economic sectors, including transportation. Globally, road transport is a major and growing contributor to GHG emissions, accounting for three-quarters of all transport-related emissions, which represented 24% of total global emissions in 2018 (Ragon & Rodríguez, 2021). Therefore, reducing emissions from road transport is essential to advancing the net-zero agenda and forms a central element of global climate change mitigation strategies (Baumgarte et al., 2021). To support these goals, governments have implemented various incentive policies, including subsidies, tax exemptions, and regulatory measures that promote the adoption of electric vehicles (Lieven, 2015).

Motivated by long-term objectives to mitigate climate change and reduce petroleum consumption, the development and utilization of electric vehicles, shaped by the integration of sustainability and innovation, has become increasingly important (Lopez-Carreiro & Monzon, 2018). Governments around the world are promoting electric vehicles as a means to establish sustainable transportation systems (Nie et al., 2016) and have developed strategic policies to accelerate the transition to electric mobility (Mock & Yang, 2014).

The discourse on electric vehicles (EVs) has expanded significantly, resulting in a large and growing body of literature. This research explores a variety of dimensions, including charging infrastructure (Chen et al., 2017; Dorcec et al., 2019), policy incentives (Bjerkan et al., 2016; Melton et al., 2017; Sierzchula et al., 2014), business models (Nian et al., 2019; Wu, 2019; Yoon et al., 2019), and other relevant aspects.

While substantial research has addressed the technical, economic, and policy dimensions of energy transitions (Smil, 2010), relatively little attention has been paid to the political dynamics underlying these changes (Stokes & Warshaw, 2017). Energy policies, particularly those designed to support transformative transitions, often challenge incumbent industries and involve significant economic costs, which require strong political support to ensure successful implementation and long-term effectiveness (Breetz et al., 2018). Although there is widespread recognition that political factors are primary barriers to energy transitions, more so than technological or economic constraints (Delucchi & Jacobson, 2011), existing literature does not adequately examine how political and economic forces influence the direction and outcomes of EV policies (Stokes & Breetz, 2018).

This study aims to provide a comprehensive evaluation of the political economy context of electric vehicle (EV) policies, with the goal of generating scientific insights and mapping research trends that can guide future studies. Employing a bibliometric approach, this study systematically analyzes academic literature to identify dominant themes, influential scholars, institutional contributions, and research gaps. Drawing from a recognized bibliographic database, the analysis presents an up-to-date overview of the evolving discourse surrounding EV policies.

This approach enhances understanding of how political and economic structures influence EV policy development. It also serves as a practical resource for policymakers, researchers, and industry stakeholders navigating the complex landscape of sustainable mobility transitions.

Although attention to EV policy has increased in the past decade in parallel with the global shift toward renewable energy, a significant gap remains in understanding the political economy that underpins these developments. While many studies examine EV adoption across countries, few have mapped the structure of recent research in a systematic way. To address this gap, this study poses the following research question: How has research on EV policies evolved from a political economy perspective, and what gaps remain in the literature?

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To answer this question, the study employs bibliometric analysis to assess the political economy context of EV policy research. Utilizing tools such as VOSviewer and established databases, this study seeks to provide structured research mapping and a comprehensive overview of the field. By identifying key trends, thematic clusters, and underexplored areas, the analysis offers useful insights for scholars and decision-makers aiming to design more inclusive, politically grounded, and effective EV policy frameworks. Ultimately, this study contributes to a better understanding of the interactions between political and economic forces in shaping global electric mobility transitions.

2. Research Methodology

Bibliometric analysis is a widely adopted method for systematically examining extensive scientific literature. It enables the identification of patterns, trends, and influential contributions within a specific research domain (Donthu et al., 2021; Tomaszewski, 2023). This method incorporates both quantitative and qualitative approaches to assess research productivity, thematic evolution, and intellectual structure (Breuer et al., 2022). In this study, bibliometric analysis is employed to explore the intersection between political economy and electric vehicle (EV) policies, focusing on publications from 2010 to 2024. The analysis highlights key elements such as the most frequently cited articles, prominent authors and institutions, geographical distributions, and thematic subject areas. All bibliometric procedures are based on data retrieved from a recognized scientific database, selected within a clearly defined timeframe.

To ensure the validity and relevance of the analyzed literature, a set of eligibility criteria was applied. As illustrated in **Figure 1**, the selection process began with an initial retrieval of 792 records from the Scopus database. During the first screening phase, non-research article documents, including book chapters, books, and conference proceedings, were excluded. This step resulted in 311 research articles eligible for further evaluation. A second exclusion criterion was applied based on the publication year, limiting the dataset to studies published between 2010 and 2024. Eighteen articles that did not fall within this period were excluded, yielding a final sample of 293 articles to be included in the bibliometric analysis.

The primary information source for this study is the Scopus database (www.scopus.com), known for its comprehensive coverage of peer-reviewed academic publications. The search strategy employed a keyword algorithm using the phrase "Political Economy Policy," which was combined with the term "Electric Vehicles" through Boolean operators (AND/OR) to expand the scope of relevant results. The application of these combined search terms allowed the inclusion of literature discussing EV policy in both political and economic contexts. The resulting articles were exported into a raw database, which was subsequently processed using the VOSviewer software to generate visualizations and analyze network relationships among keywords, authors, and institutions.

To further refine the dataset and ensure the inclusion of high-quality publications, specific inclusion parameters were applied. These included limiting the publication years to between 2010 and 2024 (PUBYEAR > 2009 AND PUBYEAR < 2025), restricting the document type to journal articles only (LIMIT-TO (SRCTYPE, "j")), and selecting only those articles that had reached their final publication stage (LIMIT-TO (PUBSTAGE, "final")). Additionally, the study was limited to subject areas relevant to EV policy, namely Social Sciences (SOCI), Environmental Science (ENVI), Decision Sciences (DECI), and Economics (ECON). Only English-language publications (LIMIT-TO (LANGUAGE, "English")) were included to ensure broader accessibility and comparability. The final dataset was analyzed through bibliometric mapping techniques such as co-citation analysis, bibliographic coupling, and keyword co-

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occurrence to identify the structural and thematic development of the field. This methodological approach not only provides a comprehensive overview of how political and economic factors influence EV policy but also highlights key research gaps to inform future scholarly and policy-oriented endeavors.

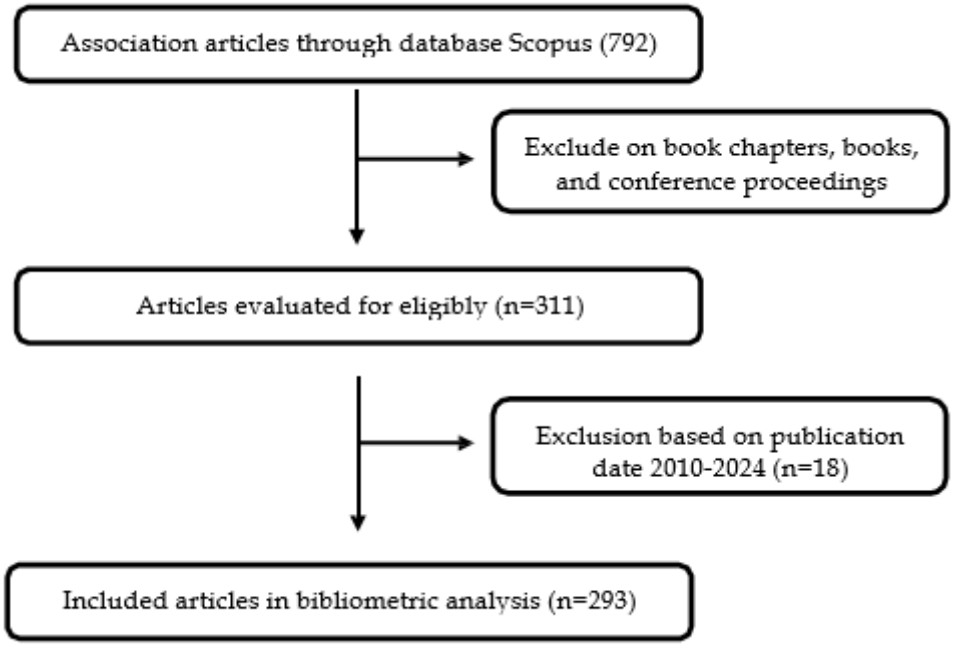

Figure 1. Flow Diagram Illustrating the Selection and Inclusion Process for Bibliometric Analysis

From 792 initial records retrieved from the Scopus database, non-article publications were excluded, resulting in 311 research articles. An additional 18 articles were excluded based on publication year filters (outside the 2010–2024 range), leaving 293 articles for final analysis.

3. Results

3.1. Annual Publication Rates

The earliest academic articles addressing public policy in the context of electric vehicles (EVs) were published in 2010 (Ou et al., 2010). One such study examined the greenhouse gas (GHG) emissions associated with EVs powered by coal-derived electricity in China. The authors concluded that comprehensive policies are needed to accelerate the development of battery technology, improve charging infrastructure, enhance energy efficiency management, and promote the deployment of low-carbon technologies such as carbon capture and storage (CCS). The study suggested that EVs remain a viable strategy for reducing emissions, even in coal-dependent energy systems. In the same year, another study based in the United States presented a future scenario for 2050 in which fossil fuels and corn ethanol are replaced by sustainable and inexhaustible energy sources to achieve long-term energy sustainability (Tonn et al., 2010).

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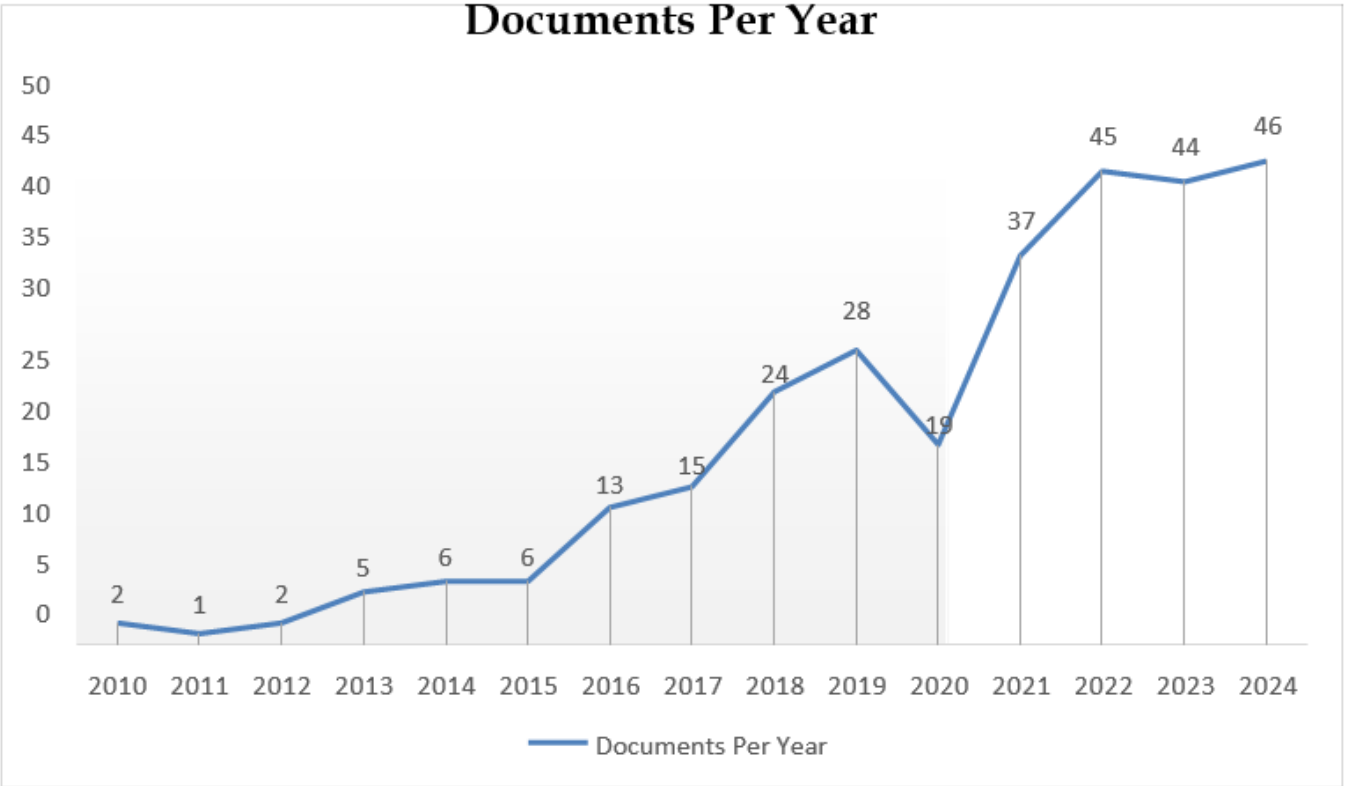

Figure 2. Annual Distribution of EV Policy Publications (2010–2024)
Source: Compiled by the authors

Between 2010 and 2015, scholarly interest in EV policies remained limited. As illustrated in **Figure 2**, only 20 articles were published on this topic during that six-year period. Several of these early studies explored public awareness and consumer attitudes toward EV adoption, particularly in the Chinese context. For instance, Zhang et al. identified factors influencing consumer preferences for Evs (Y. Zhang et al., 2011). Bakker and Trip outlined six categories of feasible policy measures: supporting citizens and businesses, facilitating charging infrastructure development, implementing regulatory mechanisms, raising awareness, positioning the government as a lead user, and fostering multilevel governance coordination (Bakker & Jacob Trip, 2013). In a related study, Larson et al. emphasized the importance of public education to enhance knowledge and improve purchase decisions regarding EVs (Larson et al., 2014).

The period from 2016 to 2020 marked significant growth in EV policy-related research, with 99 publications recorded. During this phase, Klumpp analyzed the shortcomings of green logistics initiatives by examining political, economic, business, and social motivations. The study concluded that governments often prioritize short-term political agendas over long-term investments in transportation and logistics systems (Klumpp, 2016). Talebian et al. argued for the necessity of new policies to support diversified renewable electricity generation and low-carbon development pathways (Talebian et al., 2018). Ćetković and Skjærseth further emphasized that in small, oil- and gas-dependent states, consensus-oriented political economies must be complemented by forward-looking foreign policies rooted in norm-setting and multilateral cooperation (Ćetković & Skjærseth, 2019).

From 2021 to 2024, research on EV policy continued to evolve with the adoption of more diverse analytical approaches. For example, Jiang and Xu investigated the impact of policy incentives and technological innovation on EV development in China (Jiang & Xu, 2023). Haustein et al. found that clear policy signals significantly influence the adoption of EV-related

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regulations (Haustein et al., 2021). Lin and Shi highlighted the ongoing importance of EVs in environmental governance and proposed corresponding policy measures to further promote the growth of new energy vehicles (Lin & Shi, 2022). Nevertheless, the findings indicate that relatively few studies have offered in-depth analysis on the politicization of EV policy. The political economy dimension remains underexplored compared to the technical and environmental aspects of EV development.

3.2. Research Domains

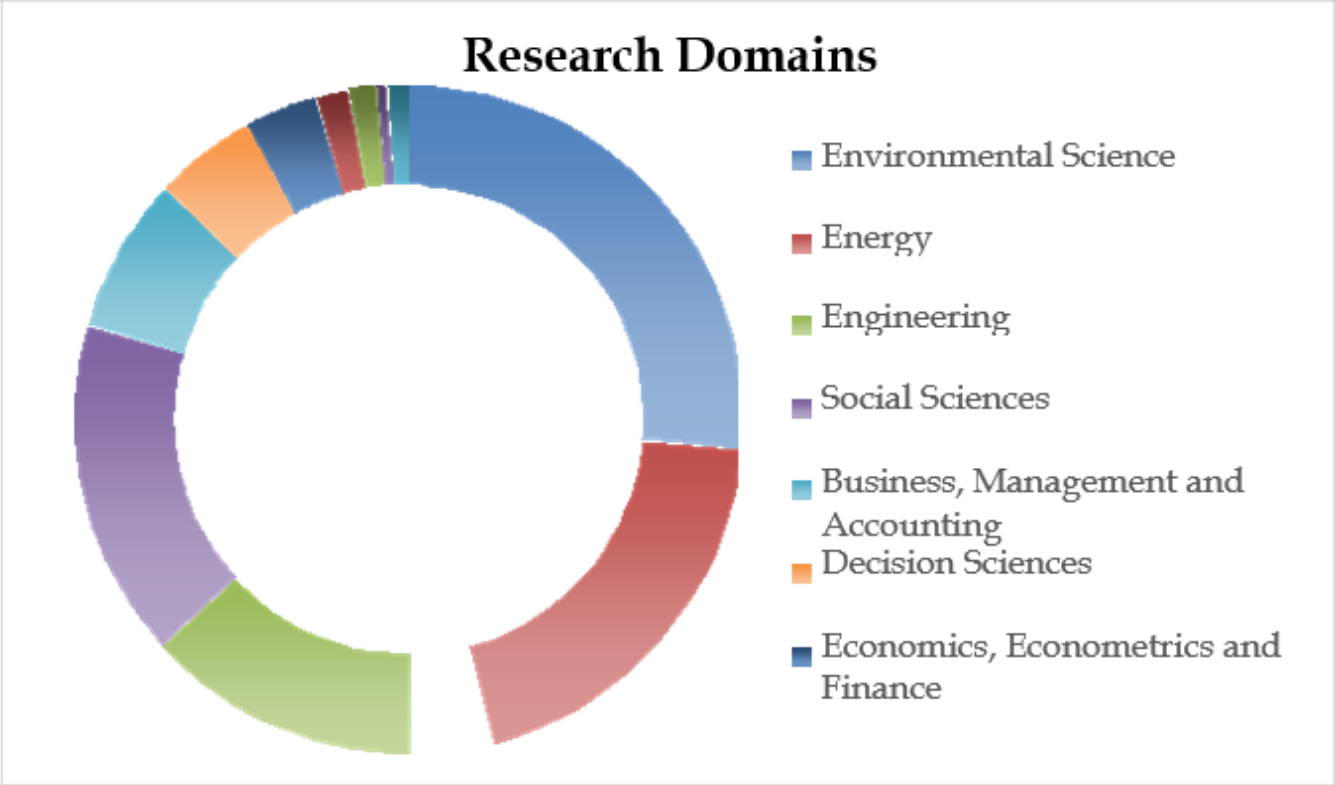

Figure 3. Disciplinary Distribution of Electric Vehicle Policy Research in Scopus
Source: Compiled by the authors

Figure 3 presents the distribution of EV policy research across major academic fields, as indexed by Scopus. The bibliometric analysis shows that studies on EVs are predominantly situated within Environmental Science and Energy disciplines, reflecting a strong focus on sustainability, climate change mitigation, and carbon emission reduction. Engineering and Decision Sciences also contribute significantly to the literature, indicating a continuing emphasis on technical solutions such as vehicle design and charging infrastructure optimization.

However, a notably smaller proportion of studies is found in Social Sciences, Economics, Econometrics and Finance, and Business, Management and Accounting. This imbalance suggests that the political economy and public policy aspects of EV adoption remain underrepresented in academic discourse, even though political frameworks, regulatory mechanisms, and economic incentives are crucial to the success of EV transitions in different national contexts.

In addition, disciplines such as Computer Science, Mathematics, and Earth and Planetary Sciences appear underutilized in EV-related research. This gap highlights untapped potential

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for employing data-driven models, advanced simulation techniques, and environmental impact assessments to examine the broader implications of EV systems. Emerging research areas such as artificial intelligence for charging infrastructure optimization and the environmental consequences of battery material extraction represent promising directions for future studies.

Taken together, these findings underline the need for a more balanced and interdisciplinary approach to EV policy research. Future studies should address technological challenges and investigate how institutional arrangements, public policy frameworks, market regulations, and socioeconomic factors influence the adoption and effectiveness of electric vehicles. A comprehensive, cross-disciplinary perspective is essential for developing robust policy strategies to guide the transition toward sustainable and equitable electric mobility.

3.3. Top Cited Articles

Based on the analysis of 293 scientific articles on electric vehicle (EV) policy, **Table 1** presents the ten most-cited publications in this field. The most frequently cited article is titled "The Influence of Financial Incentives and Other Socio-Economic Factors on Electric Vehicle Adoption" by Sierzchula et al., which has been cited 940 times (Sierzchula et al., 2014). This article emphasizes that charging infrastructure is the most significant factor associated with EV adoption. Ranked second is the article "The Role of Instrumental, Hedonic, and Symbolic Attributes in the Intention to Adopt Electric Vehicles" by Schuitema et al., which has received 530 citations (Schuitema et al., 2013). The third most cited article is "Intent to Purchase a Plug-In Electric Vehicle: A Survey of Early Impressions in Large U.S. Cities" by Carley et al., with 508 citations (Carley et al., 2013).

Table 1. Top Cited Articles on Electric Vehicle Policy

Authors	Title	Source	Citations	Year
Sierzchula, W., Bakker, S., Maat, K., Van Wee, B.	The Influence of Financial Incentives and Other Socio-Economic Factors on Electric Vehicle Adoption (Sierzchula et al., 2014)	Energy Policy, 68, pp. 183–194	940	2014
Schuitema, G., Anable, J., Skippon, S., Kinnear, N.	The Role of Instrumental, Hedonic and Symbolic Attributes in the Intention to Adopt Electric Vehicles (Schuitema et al., 2013)	Transportation Research Part A: Policy and Practice	530	2013
Carley, S., Krause, R.M., Lane, B.W., Graham, J.D.	Intent to Purchase a Plug-In Electric Vehicle: A Survey of Early Impressions in Large U.S. Cities (Carley et al., 2013)	Transportation Research Part D: Transport and Environment, 18(1), pp. 39–45	508	2013
Hardman, S., Jenn, A., Tal, G., Turrentine, T., Witkamp, B.	A Review of Consumer Preferences and Interactions with Electric Vehicle Charging Infrastructure (Hardman et al., 2018)	Transportation Research Part D: Transport and Environment, 62, pp. 508–523	474	2018
Bjerkan, K.Y., Nørbech, T.E., Nordtømme, M.E.	Incentives for Promoting Battery Electric Vehicle (BEV) Adoption in Norway (Bjerkan et al., 2016)	Transportation Research Part D: Transport and Environment, 43, pp.	444	2016

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Authors	Title	Source	Citations	Year
		169–180		
Mersky, A.C., Sprei, F., Samaras, C., Qian, Z.S.	Effectiveness of Incentives on Electric Vehicle Adoption in Norway (Mersky et al., 2016)	Transportation Research Part D: Transport and Environment, 46, pp. 56–64	357	2016
Biresselioglu, M.E., Demirbag Kaplan, M., Yilmaz, B.K.	Electric Mobility in Europe: A Comprehensive Review of Motivators and Barriers in Decision-Making Processes (Biresselioglu et al., 2018)	Transportation Research Part A: Policy and Practice, 109, pp. 1–13	301	2018
Wang, S., Wang, J., Li, J., Wang, J., Liang, L.	Policy Implications for Promoting the Adoption of Electric Vehicles: Do Consumers' Knowledge, Perceived Risk, and Financial Incentives Matter? (S. Wang et al., 2018)	Transportation Research Part A: Policy and Practice, 117, pp. 58–69	274	2018
Lévay, P.Z., Drossinos, Y., Thiel, C.	The Effect of Fiscal Incentives on Market Penetration of Electric Vehicles: A Pairwise Comparison of Total Cost of Ownership (Lévay et al., 2017)	Energy Policy, 105, pp. 524–533	269	2017
Saint Akadiri, S., Alola, A.A., Olasehinde-Williams, G., Etokakpan, M.U.	The Role of Electricity Consumption, Globalization, and Economic Growth in CO_2 Emissions and Its Implications for Environmental Sustainability Targets (Saint Akadiri et al., 2020)	Science of the Total Environment, 708, Article 134653	239	2020

Source: Processed by the authors

3.4. Most Leading Institutions and Top-Contributing Countries

Research on the political economy of electric vehicle (EV) policy has garnered considerable attention from academic institutions and research centers worldwide. As illustrated in **Figure 4**, Tongji University is the most active institution in this field, contributing seven publications. This is followed by the National University of Singapore, Xi'an Jiaotong-Liverpool University, and Université Paris-Saclay, each producing five publications. Other notable institutions include the Delft University of Technology, the University of Hong Kong, the Norwegian University of Science and Technology (NTNU), the University of California, Davis, and the Beijing Institute of Technology, all of which have contributed four publications each.

Overall, the top ten institutions are primarily located in Europe, North America, and Asia, with no representation from the African continent. This geographic distribution suggests a concentration of EV policy research in regions with advanced research infrastructure, substantial investment in clean transportation technologies, and active government involvement in sustainable mobility initiatives.

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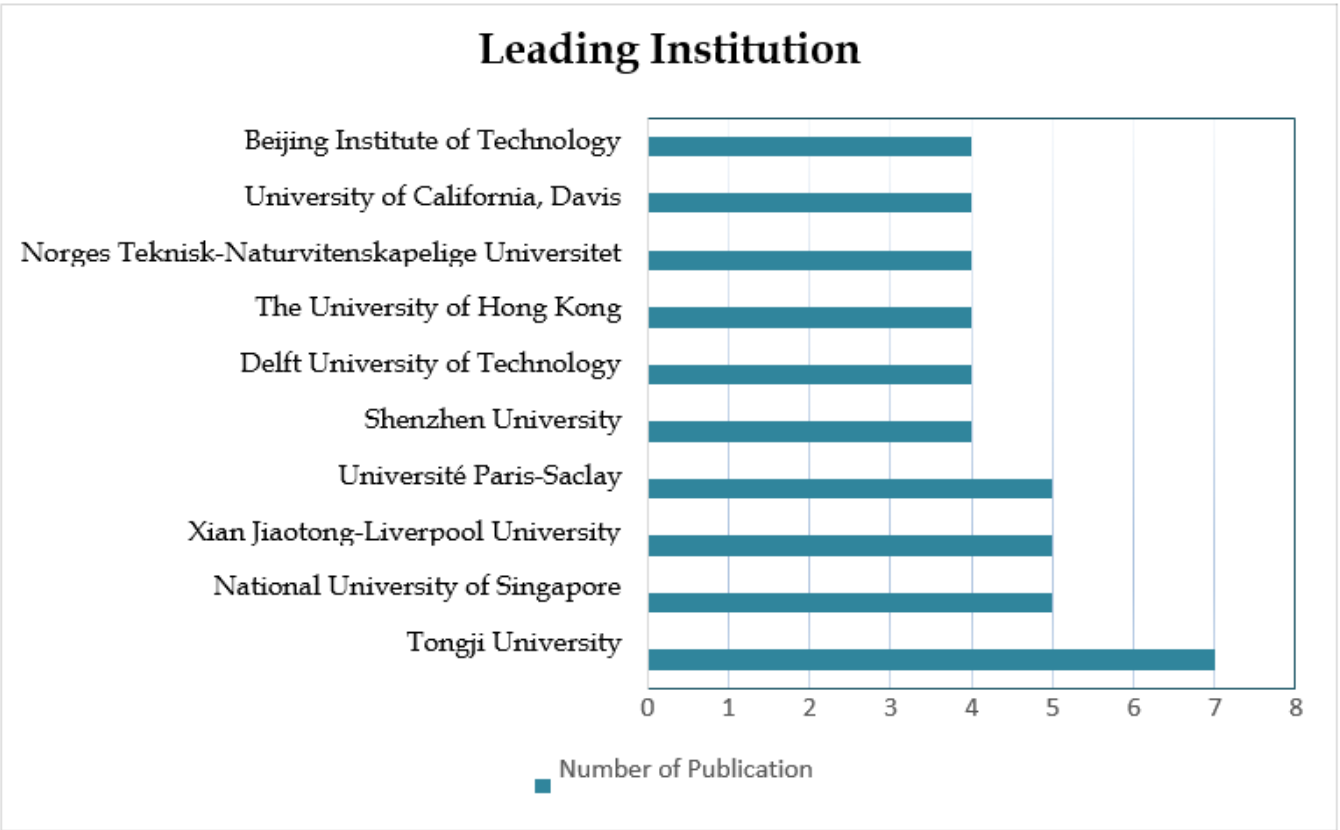

Figure 4. Most Productive Institutions in EV Policy Research
Source: Prepared by the authors

The distribution of leading institutions in EV policy scholarship reflects regional research priorities and the broader geopolitical landscape of electric mobility. The prominence of Chinese institutions, such as Tongji University and the Beijing Institute of Technology, highlights China's strategic leadership in EV innovation, supported by aggressive industrial policies, state-backed incentives, and national electrification goals. This aligns with China's policy-driven model of EV adoption, which emphasizes infrastructure development, fiscal subsidies, and market regulation.

European universities, such as Delft University of Technology and Université Paris-Saclay, demonstrate strong engagement with EV policy by focusing on environmental governance, regulatory mechanisms, and climate action frameworks. Similarly, North American institutions like the University of California, Davis, show a particular interest in consumer behavior, policy effectiveness, and integration of EVs into broader transportation networks. The participation of institutions from Singapore and Norway reflects their commitment to smart urban mobility and progressive decarbonization targets. Collectively, these trends underscore the growing importance of international and interdisciplinary collaboration in shaping equitable and effective EV policy frameworks across different regions.

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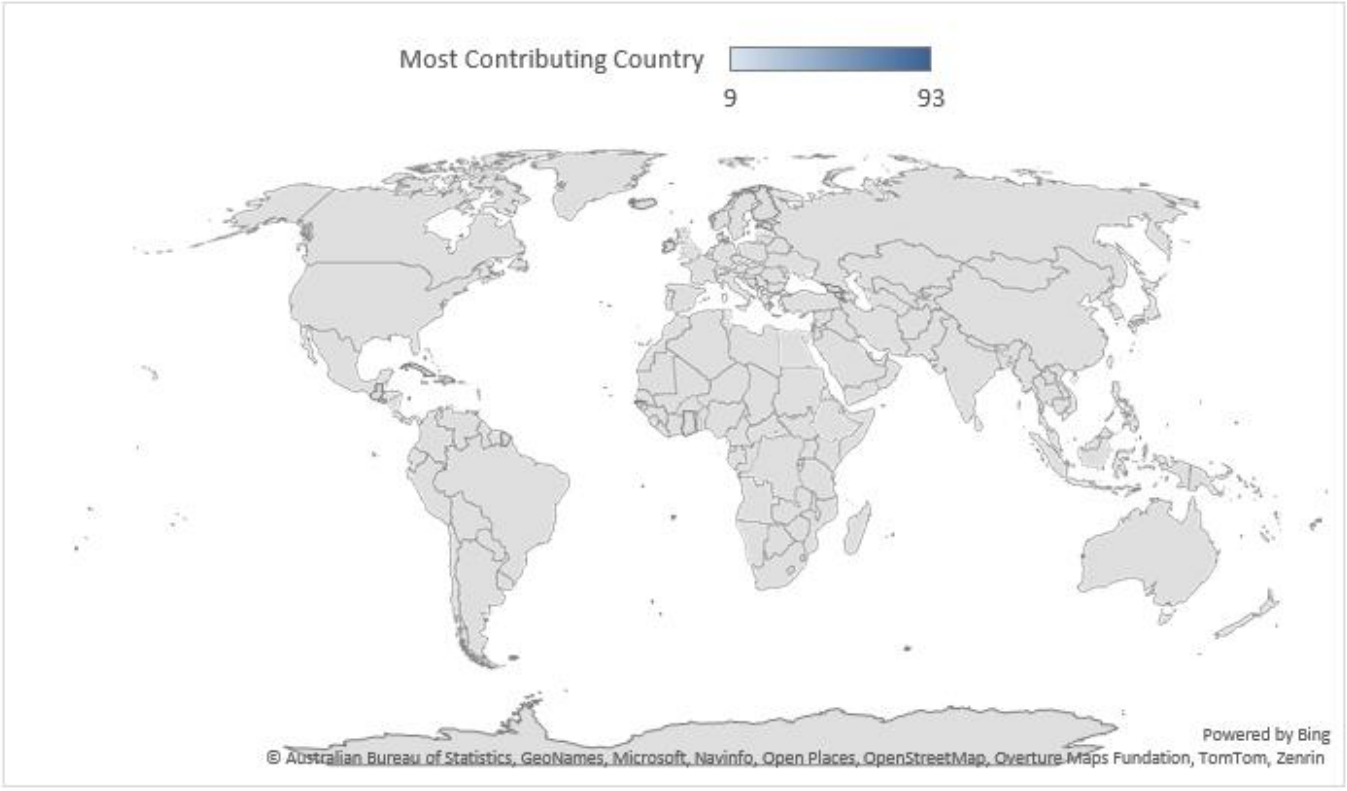

Figure 5. Most Productive Countries in EV Policy Research
Source: Prepared by the authors

Figure 5 displays the top ten countries that have contributed most to EV policy research. China leads with 93 publications, followed by the United States (59) and the United Kingdom (30). Other contributing countries include Germany (18), France (17), Brazil (16), the Netherlands (15), India (11), and Australia (10). This distribution highlights the global relevance of EV policy as a research agenda that transcends regional boundaries.

China's dominant position demonstrates the breadth of academic interest and reflects the country's policy experimentation and large-scale implementation of EV-related programs. Understanding and influencing consumer decision-making has been identified as a critical factor in advancing EV acceptance (Huang et al., 2021). The concept of cultural political economy has also emerged as a crucial analytical tool, particularly concerning multilevel governance processes and the exercise of productive power in policy implementation (Tyfield, 2014). As EV policies continue to evolve, the need for comprehensive policy evaluation frameworks becomes more pressing (C. Li et al., 2019). Moreover, despite efforts to scale back purchase subsidies, the provision of financial support for charging infrastructure remains a vital complementary strategy to promote widespread EV adoption (Song et al., 2020).

In the United States, EV policy has focused on three primary strategies: the implementation of pilot programs, the use of vendor limits or market caps, and the incorporation of equity-focused policies to ensure inclusive access to EV technologies (Riggs et al., 2021). Additionally, the successful deployment of EV charging infrastructure depends heavily on pricing models, infrastructure investment costs, and the level of user acceptance and engagement (Faria et al., 2014). Public policy instruments, such as tax exemptions and purchase subsidies, have proven effective in accelerating EV market penetration and enabling earlier break-even points for consumers (Tanco et al., 2019).

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3.5. Most Productive Authors

Figure 6 presents a chart ranking the most productive authors based on the number of publications they have contributed to the field of electric vehicle (EV) policy. Lin, B. appears as the most prolific author, followed closely by Perez, Y., and Qian, L., each of whom has authored four documents. This distribution indicates a concentration of research output among a small group of key contributors. The presence of several authors with similar levels of productivity may also suggest potential for collaboration and co-authorship, which could strengthen the depth and diversity of future research efforts.

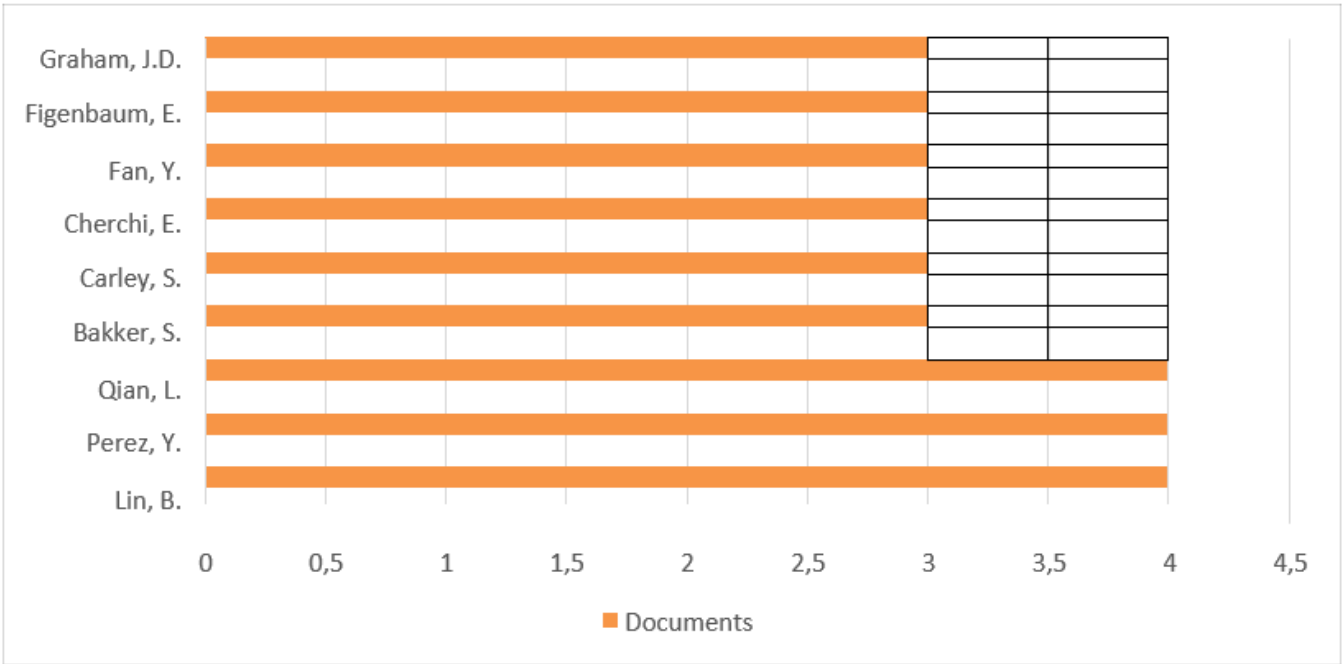

Figure 6. Most Productive Authors in EV Policy Research
Source: Prepared by the authors

The figure highlights the significance of individual author contributions to the development of EV policy literature. Authors such as Carley, S., Bakker, S., Graham, J.D., Cherchi, E., and Figenbaum, E. each contributed three publications, reflecting an active and balanced engagement with the topic. This distribution demonstrates a collaborative and multidisciplinary approach to EV policy research, involving perspectives from political economy, environmental studies, and transportation science.

This trend reflects the growing complexity of EV policy discussions, which require a combination of expertise to address regulatory barriers, technological innovation, and market transformation. Additionally, the relatively even spread of contributions across different authors indicates that the EV policy research community is broadly distributed and not dominated by a single institutional or geographic hub. This diversity emphasizes the importance of cross-regional academic cooperation in developing effective and inclusive sustainable mobility policies.

3.6. Bibliometric Network Analysis

This section utilizes the co-occurrence feature in VOSviewer to examine the relationships among keywords in the electric vehicle (EV) policy literature. **Figure 7** displays the results of the co-occurrence analysis conducted using VOSviewer (van Eck & Waltman, 2010), with a

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minimum threshold of two keyword occurrences. The size of each node in the network map indicates the frequency of keyword usage, reflecting the prominence of specific concepts within the research field. Larger nodes represent keywords that appear more frequently and are therefore more central to EV policy discussions, while smaller nodes reflect terms that have received less attention. The visualization also identifies multiple clusters, offering insights into thematic groupings and keyword associations. In total, the software identified 1,438 unique keywords, categorized into four clusters, with 1,684 links and a total link strength of 5,108. A summary of these clusters is provided in **Table 2**.

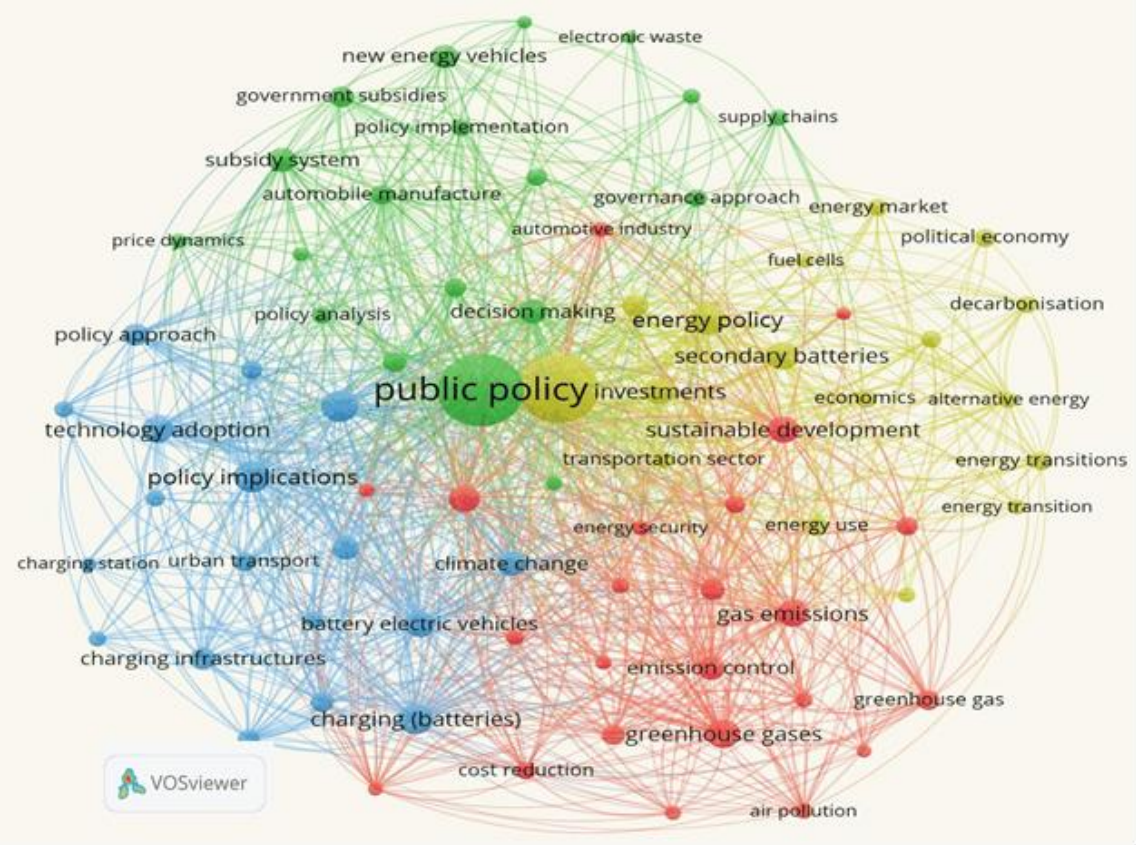

Figure 7. Bibliometric Coupling Generated by VOSviewer
Source: Prepared by the authors

Cluster 1 explores the relationship between electric vehicles and environmental and policy issues. Central themes include carbon emission reduction and the enhancement of energy security, both of which are critical in addressing climate change and ensuring long-term energy resilience. Case studies within this cluster frequently discuss environmental policies and sustainable energy strategies (Silvia & Krause, 2016). Policy interventions are highlighted for their role in promoting renewable energy and achieving sustainable development goals (Liu et al., 2021). The findings emphasize that these policies aim not only to advance clean energy transitions but also to integrate environmental and economic objectives for long-term national development.

Cluster 2 focuses on the economic and policy management of electric vehicles. This cluster analyzes financial mechanisms and regulatory frameworks that influence EV adoption, including cost-benefit analyses and strategies for reducing costs (Noel et al., 2017). Government subsidies, public policy implementation, and local governance initiatives are shown to be crucial in accelerating EV market penetration (Jiang & Xu, 2023). Moreover, the literature

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discusses supply chain dynamics and technological diffusion, underscoring the importance of aligning financial incentives, innovation, and policy-making to facilitate widespread EV adoption and system sustainability (Fu et al., 2018).

Cluster 3 centers on transportation infrastructure and consumer behavior. This theme addresses the importance of building reliable charging networks and understanding user preferences and technology adoption patterns. Key components include the development of charging stations, integration into urban planning, and societal perceptions of plug-in and hybrid vehicles (Jia & Chen, 2023). The analysis shows that public acceptance and infrastructure readiness must work in tandem to foster sustainable transportation systems (Rajagopal, 2023). This cluster highlights the interaction between technological development and public support as a foundation for successful EV transitions.

Table 2. Summary of Thematic Clusters Identified in the Bibliometric Network

Cluster	Concept Items	Color	Research Trend
1	Air pollution, automotive industry, behavioral research, carbon emission, carbon footprint, electricity supply, environmental economics, energy security, greenhouse gas, renewable energy, policy intervention, sustainable development	Red	Environmental Policies and Sustainable Energy
2	Governance, government subsidies, local government, policy implementation, price dynamics, public policy, subsidy systems, supply chains, technology diffusion, total cost of ownership	Green	Economic and Policy Management of Electric Vehicles
3	Battery electric vehicles, charging infrastructure, consumer behavior, hybrid vehicles, plug-in vehicles, transportation planning, urban transport, technology adoption	Blue	Transportation Infrastructure and Consumer Behavior
4	Electric mobility, energy policy, decarbonization, taxation, fuel cells, political economy, investment, energy markets	Yellow	Energy Market Policies and Electrification

Source: Processed by the authors

Cluster 4 addresses energy market policies and the transition to electrification. This cluster investigates the intersection between market structures, policy incentives, and the adoption of low-carbon technologies. It highlights policies focused on decarbonization, including taxation systems, renewable energy integration, and infrastructure investment (Andersson & Börjesson, 2021). Key themes include fuel cell development, battery technologies, and the political economy of energy systems (Klumpp, 2016). The findings suggest that cohesive strategies are needed to overcome both economic and technological barriers and to align national policies with global sustainability goals.

In addition, further research is needed to evaluate the effectiveness of financial incentives across various economic contexts, particularly to determine optimal models for subsidies and taxation. Promising research directions include the analysis of consumer behavior in emerging markets and the assessment of infrastructure readiness. The interaction between policy frameworks and technology also presents an opportunity for interdisciplinary exploration, such

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as how governance innovations like carbon credit systems and dynamic pricing mechanisms could enhance EV market development. Addressing these research gaps could contribute to a more integrated and sustainable transition toward electric mobility.

The transition to EVs is deeply embedded within broader political economy dynamics. This shift is not merely technological but also involves questions of power, institutional arrangements, and economic interests. For example, the success of financial incentives depends on political commitment, the influence of incumbent fossil fuel industries, and the fiscal capacity of developing nations. The integration of renewable energy into EV infrastructure raises important questions about state involvement, market regulation, and the strategic control of critical minerals such as lithium and cobalt. Consumer preferences are similarly influenced by taxation policy, regulatory clarity, and national narratives that shape public perceptions of clean transportation.

The intersection of technology and governance also illustrates global competition among major economies. Countries such as China, the United States, and members of the European Union are vying for leadership in the EV sector through industrial strategies, trade regulations, and strategic investments. Analyzing EV transitions through the lens of political economy allows for a more nuanced understanding of how governance structures, economic power, and geopolitical interests shape the future of sustainable transportation.

The continued growth of EV-related research reflects the urgency of global carbon reduction efforts. **Figure 8** presents the overlay visualization of the bibliometric network, showing the temporal distribution of research themes. The color gradient in the visualization illustrates the evolution of research, with darker blue indicating older topics and yellow representing more recent developments. Foundational themes such as public policy, energy policy, and climate change appear in dark blue, indicating their well-established presence in the field. Newer themes include charging infrastructure, government subsidies, and new energy vehicles, pointing to emerging areas of interest.

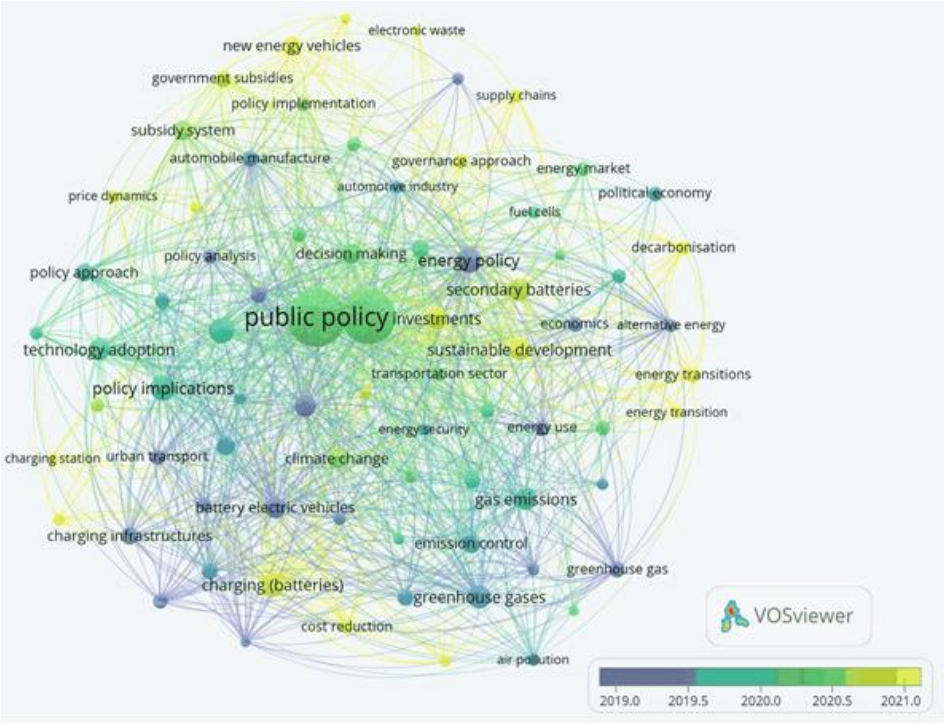

Figure 8. Overlay Visualization of Research Trends in EV Policy
Source: Prepared by the authors

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Although established themes remain central, the predominance of dark blue nodes suggests that recent topics may not yet be fully integrated into the broader discourse. This highlights an opportunity for further research on how new developments build upon or diverge from historical trends. For example, it would be valuable to investigate how past energy policies inform current EV strategies and how previous regulatory frameworks are shaping technological innovations. In summary, the overlay visualization emphasizes the importance of integrating historical context with emerging priorities in EV research. It also points to the need for deeper exploration of how current innovations and policies are linked to long-standing issues in sustainable mobility.

4. Discussion

The limited exploration of political economy in the context of electric vehicle (EV) policy can be attributed to the predominant focus of existing research on several technical and environmental aspects. Much of the current literature prioritizes the development of charging infrastructure, which is essential for enabling widespread EV adoption (Lin & Yang, 2024; Y. Wang et al., 2023; W. Zhang & Dou, 2022). However, this focus often overshadows the underlying political and economic dynamics that influence infrastructure investment, deployment strategies, and long-term planning (Klumpp, 2016). Additionally, many studies emphasize sustainability and the environmental benefits of EVs. Although these aspects are critical, they divert attention from the political and economic structures shaping policy frameworks and funding mechanisms (Shafiei et al., 2018).

A deeper engagement with political economy perspectives reveals that EV policy development is not solely a technological or environmental concern. It is also intricately linked to global and regional power relations. For example, China has implemented aggressive industrial policies, including subsidies and protectionist measures, to position itself as a global leader in EV manufacturing (Liu et al., 2021). In contrast, the European Union has relied heavily on regulatory instruments such as carbon pricing and emissions standards to encourage electrification. Meanwhile, the United States has followed a more fragmented path due to shifting political priorities. Policies such as the Inflation Reduction Act (IRA) of 2022 provide domestic incentives for battery production while simultaneously addressing trade tensions with other key players in the EV supply chain, including China and the European Union. These regional differences highlight the importance of incorporating political economy frameworks into EV research to better understand how state intervention, geopolitical interests, and market forces shape global EV adoption trajectories.

The analysis of EV subsidy policies further underscores the relevance of political economy perspectives. While many studies focus on the quantitative effectiveness of financial incentives in promoting EV adoption (X. Li et al., 2017), fewer critically examine the political and institutional forces that influence how these subsidies are designed and implemented. For instance, lobbying by the fossil fuel and automotive industries can shape subsidy allocation in ways that do not always align with long-term sustainability goals (Meckling & Nahm, 2019). Moreover, competing interests among automakers, battery producers, and energy utilities often result in policy outcomes that benefit dominant market players at the expense of smaller firms and new entrants. By situating subsidy schemes within broader political and economic contexts, future research can generate more nuanced insights into how power relations and vested interests affect the success and fairness of EV-related financial incentives.

Beyond subsidies, the integration of EVs into renewable energy systems raises additional political economy questions. Although the technical and environmental dimensions of this

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transition have been widely studied, the institutional and market-based factors that shape its progress are frequently overlooked. For instance, the liberalization of energy markets in Europe has introduced competition among renewable energy providers, which may either accelerate or impede the development of EV charging infrastructure depending on the surrounding regulatory environment (Sovacool et al., 2020). In contrast, China's state-led energy model allows for centralized planning and rapid deployment of infrastructure but raises concerns about government control and market distortion (C. Wang et al., 2021). These contrasting governance models demonstrate how political structures and market configurations influence the scalability and feasibility of EV initiatives, reinforcing the importance of comparative political economy approaches in EV policy research.

The insufficient integration of political economy into EV research also risks generating policy blind spots, particularly in relation to equity and social justice. Without an understanding of how power asymmetries affect policy design and implementation, EV initiatives may inadvertently deepen socio-economic inequalities. For example, subsidies and tax incentives often disproportionately benefit higher-income individuals who can afford EVs, while low-income populations may face barriers due to high upfront costs and limited charging infrastructure in underserved areas (Sahoo et al., 2022). Additionally, global competition over strategic resources such as lithium and cobalt raises ethical concerns regarding labor practices, environmental degradation, and resource extraction in the Global South (Sovacool et al., 2021). Addressing these issues requires a more holistic policy approach that explicitly integrates political economy considerations to ensure that the transition to electric mobility is both inclusive and socially just.

In conclusion, while bibliometric trends indicate a strong emphasis on charging infrastructure, sustainability, and subsidies, these topics should be analyzed through a political economy lens to fully capture the structural forces shaping EV policy development. A comparative examination of regional approaches illustrates the varying roles of political institutions, economic interests, and geopolitical considerations in influencing EV adoption. Moving forward, researchers and policymakers must engage more critically with how political power, market dynamics, and institutional governance affect the transition to electric mobility. Doing so will enable the design of EV policies that not only support technological progress and environmental benefits but also address socio-economic disparities and global power asymmetries that define this rapidly evolving sector.

5. Conclusion

This study highlights the critical importance of integrating political economy perspectives into electric vehicle (EV) policy analysis, serving as a complement to the existing body of research on infrastructure development, environmental sustainability, and financial subsidies. While technological and environmental aspects of EV adoption have received considerable scholarly attention, the political and economic forces that shape policy decisions remain relatively underexamined. Incorporating insights from political economy enables policymakers to formulate more effective and equitable EV policies that are responsive to power relations, regulatory structures, and competing economic interests.

The bibliometric analysis conducted in this study reveals a concentration of research within a limited number of authors and institutions, indicating a need for broader interdisciplinary collaboration. This gap presents opportunities for future research to explore how diverse governance models, policy regimes, and global supply chain dependencies impact EV adoption and broader sustainability transitions. Understanding these dynamics is crucial for designing

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policy instruments that are not only technically sound but also politically feasible and socially just.

To bridge the gap between academic research and policy implementation, several key recommendations emerge. First, policymakers should incorporate political economy considerations into the design of subsidies and incentives to avoid disproportionate benefits to specific industries or socio-economic groups. Second, adopting a multi-stakeholder approach that involves local communities, civil society organizations, and marginalized populations is essential to ensuring that EV policies are inclusive and contextually relevant. Third, enhancing international cooperation in securing raw materials and addressing geopolitical risks in the EV supply chain is vital for long-term resilience and sustainability.

Future research should prioritize comparative analyses of EV policy implementation across different political and economic systems. This will require closer collaboration between political scientists, economists, environmental scholars, and policy practitioners. Advancing such interdisciplinary approaches will contribute to developing EV policies that are not only environmentally and technologically sound but also socially equitable and politically sustainable. Ultimately, a more holistic and politically informed approach to EV policymaking can help ensure that the global transition to electric mobility delivers meaningful benefits across all sectors of society.

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