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UNDERSTANDING VALUE CREATION AND APPROPRIATION IN A DISRUPTIVE NARRATIVE: THE UK EV SECTOR

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Abstract

This study explores the dynamics of value creation and appropriation in the emerging UK electric vehicle (EV) market through the technological, regulatory, economic, and consumer demand factors. The research further explores correlations between R&D expenditures, patent activity, and market variables specific to the UK with support through Porter's Value Chain, the Invention-Based View with Teece's Appropriability Framework, and Disruptive Innovation Theory. Findings show that innovation creates value on an international scale; however, it does not necessarily impact the UK's immature market share. Tesla's open-portfolio strategy suggests that pushing for market maturation, mixed with strategic infrastructure development and consumer engagement, is crucial to drive long-term value appropriation.

The study concludes that aligning innovation with market readiness and regulatory frameworks is key to fostering a sustainable and competitive EV industry. While global innovation sets a foundation, the UK market requires targeted strategies to overcome its dependency on incentives and limited infrastructure. This research provides actionable insights for professionals and policymakers, emphasizing the importance of infrastructure investment, regulatory clarity, and consumer-focused initiatives to achieve a sustainable transition toward a matured UK EV market.

Keywords

Value Creation; Value Appropriation; Disruptive Innovation; EV Market; Market Immaturity; Value Chain

1. Introduction

The United Kingdom (UK) have been adopting electric vehicles (EVs) through the pressuring shift to transition to sustainable transportation. This shift showcases a transformative period within the automotive industry, driven by technological advancements, environmental awareness, and domestically through governmental policies such as the UK government's aim to achieve net-zero carbon emissions by 2050 (Logan et al., 2021). Despite understanding the technological innovations and environmental impacts, existing literature have not yet extensively explored the strategic approaches to value creation and appropriation, especially within the context of UK's EV sector (Egbue & Long, 2012). However, this specific gap calls to be addressed to develop insights in how manufacturers maintain or enhance competitive advantages within the complexities that forms the UK market, including regulatory pressures, competition, and the evolving demand of consumers (Department for Energy Security and Net Zero, 2023; Sovacool et al., 2020).

Whilst the UK EV market is growing, it is relatively immature, indicated by the volatility and the strong dependency on government incentives and rapid innovation changes (De Rubens et al., 2020). Value creation and appropriation is therefore influenced significantly as exemplified by Xue et al. (2021) whereby outsized effects on the stability of the market and growth are created due to the market's dependency on government regulations and incentives.

This paper seeks to address this gap in understanding how these market factors impact the strategic frameworks in value creation and appropriation within the context of the UK (Earl & Fell, 2019; Qadir, 2024). Furthermore, the disconnect is highlighted between the traditional metrics of success, such as market share, and innovation activities that drive long-term success in the UK's immature market. The paper will utilise theoretical frameworks such as Porter's value chain, invention-based view, and disruptive innovation theory to effectively

analyse how manufacturers sustain competitive advantages through innovation, partnerships and consumer sales models (Sturgeon et al., 2008).

The research problem is complex and, as such, is further narrowed down to the interplay between regulatory frameworks, market dynamics, and technological advancements within the sector. The sector demands continuous adaptation and innovation, contradicting traditional industries where value generation is often captured by well-established processes and vertical integration (Arslangulov & Ackrill, 2024). As the UK government calls for a ban on new petrol and diesel car sales by 2035 (Department for Energy Security and Net Zero, 2023), understanding the research gap will contribute to understanding the value of the EV market. This study provides an in-depth analysis of the strategies adopted by EV manufacturers to succeed in such a dynamic and competitive emerging market.

In exploring these strategies, the paper argues the need to further understand Chinese and Korean EV firms, such as MG, BYD, and Kia, as they have an increasingly crucial role in shaping the UK EV market (Indiran et al., 2023; Paba, 2022). These companies bring new dimensions to the industry as they rely on large-scale production capabilities, cost-efficient manufacturing processes, and technological innovations such as BYD's batteries and Kia's advanced electric drivetrain systems (Hasan et al., 2023; Mavlonov et al., 2023). Their entry into the UK market has influenced the intensity of the competition, pushing established firms to innovate and adapt more rapidly whilst lowering the cost of acquisition (Liu & Meng, 2017). Therefore, this paper will further explore how these firms would impact the pricing strategies, technological differentiation, and whether innovation is relevant to creating more value in a rapidly evolving market landscape. These further develop the research objectives to uncover the necessities the firms may need to aim for to maintain their competitive edge.

This research contributes both theoretically and practically to creating knowledge. In theory, this study would extend strategic management and innovation frameworks to understand the UK EV sector whilst creating insights applicable to similar markets with the minimum regulatory and economic distance. Additionally, this research would provide insights to guide policymakers, manufacturers, and investors in understanding and enhancing competitiveness and sustainability in the EV industry, supporting the global adoption of sustainable transportation. Finally, this study's main contribution is to further enhance the literature on how EV manufacturers can navigate and appropriation value with the complex dynamics of an immature market, which further progresses to the effectiveness of success in the evolution of the EV sector.

2. Theoretical Background

Historically, the traditional automotive sector has followed the paradigm of vertical integration and the supply chains optimisation as the primary mechanism for value creation, which further puts importance on focusing on efficiency, reducing costs, and market dominance (Bresnahan & Levin, 2012). However, the transition towards EVs has changed these traditional dynamics as technological advancements and regulatory pressures drive the market (Jagani et al., 2024). In the UK, EV manufacturers compete by integrating new inventions while complying with strict regulations and forming alliances to maintain market competition. Therefore, this paper identified the need to re-evaluate how these traditional frameworks have changed over time.

This research further defines value creation in the UK EV sector as how value is generated through products or services that would elevate consumers' perspective on the value and firm's competitiveness. In the existing literature, this would often be described through the degree of technological innovations, such as battery technologies and autonomous driving capabilities (Lang et al., 2021). Value appropriation, on the other hand, is defined through the representation of value captured through economic returns from these innovations, further paired with strategies the companies have implemented and the management of properties to protect and gain market share through novel technologies (Lawson et al., 2012). These processes are critical in the broad literature to maintain market share, profitability, and long-term competitive advantage, especially in a rapidly evolving industry.

As the EV sector evolves, vertical integration extends beyond manufacturing with innovative technologies, partnerships, and cutting-edge intellectual property management (Qadir, 2024). The UK's emissions standards and the goal to ban petrol and diesel vehicles by 2035 require manufacturers to drive innovation, exemplified by Tesla's leadership in battery technology and autonomous driving whilst safeguarding their extensive R&D expenditure, which consistently exceeds more than USD 1 billion annually, and patent portfolios (Zou et al., 2022). These factors showcase the direct contribution towards value creation, whilst the need to strategically handle intellectual properties (IPs) to create a market positioning leading to value appropriation. These values are reflected by the market share and average car price evolution of Tesla since 2014 (Mangram, 2012).

However, the UK's EV market is relatively immature, with reliance on government incentives, volatile prices, and constantly shifting consumer preferences. For example, EV sales are fluctuating, especially after the gradual decrease in government incentives, such as the reduction in the plug-in car grant, which further impacted the growth and adoption rate of EVs since 2021 (Caulfield et al., 2022; Smith, 2021). Furthermore, the lack of widespread charging infrastructure has contributed to consumers' reluctance to switch to EV vehicles. Alkhamis

(2017) argued that government grants, fuel prices, and electricity costs are major considerations in shaping demand and require strategic approaches to success. However, more clarification is needed to showcase how these dynamics influence UK EV manufacturers.

2.1 Porter's value chain

According to Porter's framework, business activities should be optimised to gain competitive advantages (Porter, 2004). Tesla's vertical integration, exemplified by its control over battery production, shows the need to manage key supply chain components independently, although this requires major capital investments and is paired with operational risks (Zhang et al., 2020). On the contrary, analysing Nissan's approach, through creating a joint venture with Tokin Corporation to form Envision AESC to develop battery production shows the possibility of driving innovation effectively through spreading costs and risks of vertical integration (Ruet et al., 2022). These empirical examples illustrate that flexibility is needed in a cost-sensitive market like the UK EV sector (Benson, 2022), and further put emphasis on how Tesla's direct-to-consumer model enhances customer satisfaction and extracts more value through innovating beyond traditional dealerships (Zhang & Wang, 2023). The empirical have shown that there is a need of an adaptive business model as solely using Porter's framework may not fully capture the complexity of the current EV market driven by innovation as argued by Simões et al. (2023).

2.2 Invention-based view and Teece's appropriability framework

The emphasis on the importance of strategies pushing technological innovation and strategic positioning in capturing value can be further understood through an invention-based perspective and Teece's appropriability framework (Kafouros et al., 2008, 2022; Teece, 1986). As showcased previously, Tesla dominates the market with leadership in technology and autonomous driving whilst protecting their inventions to create a gap with the competitors. Furthermore, Tesla's first-mover advantage in rolling out its charging infrastructure is another example of how a firm can further leverage innovation to appropriate value effectively in the UK market (Anderson et al., 2022). According to the buyers, this first-mover advantage reinforced Tesla's market position as they addressed the lack of charging infrastructure, creating value and addressing a weakness in the current infrastructure, reinforcing their competitiveness (Long et al., 2019). On the other hand, BMW's focus on sustainability and premium brandings addresses the consumer group that demands such needs (Nows, 2022; Thumiger, 2021). These strategies address different value perspectives and are further identified quantitatively in this analysis to reflect the effectiveness of the approaches in capturing market value.

Furthermore, in alignment with the invention-based view, IP protections are essential for securing the value created through innovation. Tesla's innovative approaches in inventing new battery technologies and autonomous driving capabilities, protected by IPs in the early stages of EV, created a window of major value appropriation for Tesla, further showcased by the year-on-year market dominance of the brand as well as the premium pricing (Alcacer et al., 2015). In such cases, R&D expenditure and patents filed reflect Tesla's capacity for innovation and its impact on market share. Following new entrances, BMW and BYD exemplify how IP, market positioning, and cost-effectiveness contribute to competitive advantage in the UK market (Martínez-Noya & García-Canal, 2021).

However, Teece's appropriability framework further complements the IBV by explaining how firms such as Nissan and Mitsubishi require strategic partnerships to benefit from economic value, especially in a highly regulatory-pressured market such as the UK (Shijaku, 2023). Strategic partnerships connect strengths from partners to further compete in the market through inventions and innovations, showcasing the need for new inventions and constant development outputs to stay competitive (Cabigiosu, 2022).

2.3 Disruptive innovation theory

Further insights are required to understand how firms such as Tesla and BYD challenge competitors by targeting niche segments and expanding to the broader market to create competitive advantages, aligning with the disruptive innovation theory (Christensen, 2005). Tesla's initial focus on the luxury EV market with the Model S further progressed in adopting the mass vehicle market through the announcement of the Model 3, demonstrating disruptive innovations that reshape how value is captured and created throughout the different market segments (Voigt et al., 2017).

Tesla's vertical integration, particularly in battery production and autonomous driving technologies, ensures quality control and cost efficiency while scaling production, reinforcing its leadership position in the UK market (Perri, 2021). The open-patent strategy announced by Tesla further shows a strategic move to their advantage to push the need to promote industry-wide EV adoption, a key factor in maintaining competitive advantages.

The recent entrance of disruptive Chinese firms, such as BYD and MG, into the UK market poses another challenge to the already-existing EV companies in the UK. BYD's vertical integration and partnership with Toyota exemplifies how disruptive firms use established automakers as springboards for further adoption of new technologies (Kennedy, 2018). Even though the market presence of BYD is still not significant, their recent overpass of the number of vehicles sold internationally compared with the previous year-on-year leader of sales,

Tesla, showcases their potential impact on the UK EV market. Despite Chinese brands facing regulatory and brand recognition challenges, BYD's focus on battery technology and MG's emphasis on affordable EVs creates an opportunity for these firms to perform in the UK market and capture as well as sustain value (Altenburg et al., 2022; Zhao & Luethje, 2024).

2.4 Synthesis and trade-offs

By synthesising the findings by applying the theories, the research offers a complex view and understanding of the research objective through trade-offs in value creation and appropriation. Exemplified by empirical evidence, Tesla's vertical integration enhances control over the value chain. This helps Tesla accelerate in the starting phase of the EV market, while Nissan's emphasis on collaboration extends market reach and innovation capabilities.

The theoretical frameworks of Porter's value chain, the invention-based view (IBV), and Teece's appropriability framework provide a solid foundational framework to understand value creation and appropriation within the UK EV sector. Porter's value chain emphasises on optimising business activities and integrating vertically to gain competitive advantages. However, in the UK's complex market, it is proven not to be the only critical activity that results in competitiveness as Nissan's strategic partnerships show how resource pooling and cost reduction can effectively address the need to fully vertical integrate, allowing flexibility in navigating the market's regulatory and competitive landscape (Kocabasoglu-Hillmer et al., 2023).

The invention-based view (IBV) and Teece's appropriability framework further highlight the importance of technological innovation and strategic positioning in securing economic benefits whilst protecting intellectual properties to maintain a competitive edge. Tesla's leadership in battery technology and autonomous driving, safeguarded by a strong open-IP portfolio, exemplifies how innovation can establish market dominance while contributing to the growth of the UK EV sector. Similarly, BMW and Nissan's strategic alliances to enhance R&D capabilities and market reach underscores the value collaborations could bring in response to the UK's regulations and evolving consumer demands.

As such, these frameworks also show insights into contradictions in how value is created and captured. Tesla's vertical integration offers complete control over its innovation capabilities, creating a rapid flow of inventing; however, it requires investments and brings more operational risks (Hensley et al., 2022; Naor et al., 2021). On the other hand, Nissan and BYD's partnership showcases the contradiction of Tesla's strategy through sharing resources and risk in return for a limit of control over innovation. These trade-offs create the need to understand how firms further aim to create an appropriate value in the UK EV market.

Moreover, the strategic decisions of Tesla, BYD, and MG are proven to be heavily influenced by the UK's regulatory environment, consumer demand, and technological advancements. Government policies, such as the upcoming 2035 ban on petrol and diesel vehicles, drive EV adoption and compel manufacturers to innovate (De Freitas Barbosa Pereira, 2022; Shaw & Bunce, 2015). The demand for reliable, environmentally friendly vehicles pushes firms such as MG to focus on cost-effective production and innovations in battery efficiency and vehicle range critical for capturing market share and meeting regulatory standards (Saxena, 2021).

These strategic approaches align directly with the research objectives of exploring strategies to create and capture value in the UK EV sector. By synthesising these insights, the study would offer an understanding of how disruptive innovation and strategic positioning contribute to long-term competitiveness in the UK market.

3. Conceptual Framework

This research integrates four critical factors: technology, consumer demand, regulatory, and economic factors which collectively shape the four crucial factors for strategic decisions in the UK EV sector. These four factors are crucial in understanding value creation and appropriation strategies, directly addressing the research objectives of understanding how this influences the competitive advantages in a rapidly evolving immature market (Ritala et al., 2021). Technologies are crucial in driving innovation and efficiency, especially in battery technology and autonomous driving, which are identified as the most essential for meeting the UK's emissions targets and consumer expectations (Wang et al., 2021). Consumer demand in the UK is shaped by a strong preference for cost-effective vehicles and the need to adopt environmentally friendly options, which further translates to market success (Chu et al., 2018). Regulatory factors such as the ban on petrol and diesel vehicles by 2035 and the UK's evolving emissions standards in city centres push firms to adapt through innovating, creating opportunities and challenges for acquiring market share (Blind, 2012). Finally, economic factors such as government incentives and fluctuating fuel prices may influence consumer behaviour and shape the sector's competitive dynamics (H. Sun et al., 2023). Understanding how these factors interact is crucial to developing strategies that ensure long-term success in the UK's increasingly competitive EV market.

3.1 Immature market and its influence on the concept

The current state of the UK EV market is far from mature, with unsteady market conditions, high proportions of incentives, and no market predictability (Valdez, 2015). These conditions require tweaks to the conceptual

framework. Innovations in battery technology have also led to the early obsolescence of new EVs, thus enabling consumers to shift their focus towards used vehicles. AutoTrader's "Road to 2035" report revealed that more people turn to used EVs since the market fluctuates and people do not want to buy new models directly due to the value retention. Such fluctuations reason the unique characteristics – particularly concerning consumer confidence – which may be severely shaken by factors including rapid technological changes, value retention, and unpredictable government policies (Zhang & Watson, 2020).

The market's dependence on government regulations and incentives further highlights its immaturity. EV sales often fluctuate with changes in government policies or oil prices. For example, a drop in oil prices can reduce the financial appeal of EVs causing a drop in sales. Similarly, delays or uncertainties in policies, such as the ban on internal combustion engines, can erode consumer confidence, slowing adoption rates (Bushnell et al., 2022). MG's strategy of leveraging the plug-in car grant illustrates the risks and opportunities in an immature market (MG MOTOR UK, 2020). However, a reduction in this grant in 2021 led to a drop in EV sales, highlighting the market's vulnerability to policy changes and the importance of firms balancing short-term gains with long-term resilience (Du & Shepotylo, 2024).

Furthermore, besides the theoretical background arguing the importance of innovation. The timing of such innovations is equally important (Van Der Panne et al., 2003). While IBV supports the narrative of R&D and patents being vital for long-term success, immediate impact on market share may be limited due to the immaturity and unreadiness of the market (Fluchs, 2020). In the early stages of adoption, consumer adoption could be more influenced by costs, infrastructure, and regulatory incentives instead of advanced technologies aligning with the second and third stages of the Diffusion of Innovations model where practical concerns are more important (Rogers et al., 2019). This further suggests that companies should sync with the readiness of customer's engagement to achieve a sustainable market and further create competitive advantage in the long term. Furthermore, this supports the need to analyse Chinese and Korean EV firms' influence on the immature market as these firms provide cost-effective EVs to compete for market dominance through the dynamics between cost-effectiveness and adoption (Cong et al., 2023).

3.2 The interplay between technological, regulatory, and economic factors

The interaction between regulatory and economic factors is notable in the UK EV sector, where the UK government implemented the UK's 'Road to Zero' strategy by initially offering economic incentives such as financial grants to attract manufacturers to innovate and align their business models with the regulatory goals. In such a sense, the interaction proposes that regulatory alignment and economic incentives drive strategic adaptation and innovation. Toyota's strategic response to the implementation of the ultra-low emission zone (ULEZ) in the city of London created the need to respond through an accelerated focus on its EV department, showcasing the strength of regulatory pressures driving the need to comply and innovate, reinforcing the framework's focus on regulatory and economic influences (Toyota United Kingdom, 2024). Furthermore, economic incentives, such as the plug-in car grant for consumers, have expanded Tesla's market reach as consumers carry less financial burden, demonstrating the alignment through the consumer's side, which also enhances the competitiveness and enables economies of scale (Santos & Rembalski, 2021). The empirical correlation between these incentives and market penetration supports the proposition that competitive advantages align positively with regulatory and economic factors.

Technological advancements are pinnacle to improving efficiency and safety whilst also ensuring regulator compliance. For example, the reduction of the costs for batteries from an average of USD1,100 per kWh in 2010 to USD137 per kWh in 2021 has made EVs more accessible, aligning with how regulatory goals and market competitiveness with tech advancements (Scott, 2024). Furthermore, as exemplified by Tesla's own Supercharger network investment, this not only addresses the range anxiety but also the need for infrastructure whilst strengthening the firm's technological leadership of creating fast-chargers, in compliance with the need to fulfil the UK regulations and bridge the gap between EV and traditional cars (Haskamp, 2023). Such a correlation between investing in infrastructure and EV registration further reinforces the crucial role of technology in meeting regulatory demands and creating market success.

R&D expenditure is an important factor in creating a difference in the market through creating advanced technologies and securing patents to protect. Toyota's major investment to create battery efficiency, through filing extensive amounts of IPs, shows how R&D further contribute to technological and market differentiation (Mukunde, 2024). Similarly, Tesla's vertical integration and continuous innovation, leading to a substantial open-sourced patent portfolio, underscore the importance of R&D in creating sustaining market dominance whilst also generating economic value (Udeze, 2024; Franke et al., 2023). This empirical linkage would support the proposition that innovation-driven R&D is fundamental to effectively capture more value in the UK EV market.

The interaction between technological, regulatory, economic, and consumer factors within the UK EV market is thus complex. Technological advancements enhance market competitiveness and facilitate regulatory compliance. However, these advancements come with trade-offs, such as balancing high R&D costs against maintaining profitability in a competitive market. This interaction supports the proposition that innovation must be

carefully managed to sustain regulatory alignment and market viability. For instance, BMW's investment in sustainable technology and premium EVs such as the iX3 reflects its commitment to innovation. However, it faces challenges balancing these costs with profitability, illustrating the critical trade-offs that firms must navigate (Collado María, 2023). This further aligns with the need to understand how technological investments impact value creation and appropriation in the context of regulatory and economic pressures.

Strategic partnerships have proven to provide an alternative approach to value creation and appropriation. Nissan's collaboration with Envision AESC for battery production exemplifies how strategic alliances can enable flexible supply chain management and still drive innovation without incurring the high capital costs associated with full vertical integration (Ruet et al., 2022). This further calls for the need to examine the influence collaborations have in extending market reach and enhancing innovation within the UK context, reinforcing the framework's emphasis on collaboration as a critical factor in value appropriation.

3.3 Understanding consumer demand and its interconnections

Consumer demand plays a pivotal role in shaping strategic decisions for EV manufacturers, especially concerning cost savings and total cost of ownership. These factors are essential for effectively positioning products and capturing market share in the UK EV sector. However, as outlined in the conceptual framework, exploring how these factors interact with technology, regulatory environments, and economic conditions is crucial to fully addressing the research objectives.

Cost savings are a driver of consumer demand due to the long-term financial benefits of EVs. As demand increases, manufacturers achieve economies of scale, reducing production costs and making EVs more affordable. This creates a feedback loop where increased demand fuels further technological innovation, lowering costs and expanding market reach (Jones et al., 2020). This interaction directly supports the proposition that consumer demand, driven by cost savings, stimulates technological advancements critical for market expansion and competitive positioning. The appeal of reduced maintenance costs—EVs requiring 30–40% less maintenance than traditional vehicles—further reinforces this dynamic, particularly for cost-conscious consumers in the UK market (Okoh & Onuoha, 2024). Companies, such as BYD, leverage these cost efficiencies to penetrate markets like the UK, illustrating that cost efficiency is a key driver of sustained market growth (Mu, 2023).

The interaction between cost savings, consumer preferences, and production efficiencies is essential for driving demand and shaping broader strategic decisions in the UK EV market (Hertenstein & Williamson, 2018). For example, the BYD Tang model, known for its efficiency and lower energy costs, offers savings on fuel and maintenance, influencing product positioning strategies in the cost-conscious UK market (Gonzalez, 2024). This example underlines the proposition that aligning product features with consumer demand and cost efficiencies is crucial for successful market positioning.

It is important to understand how consumer demand influences strategic decisions by examining its interaction with other critical factors, such as technological advancements. These advancements directly impact the total cost of ownership by improving battery efficiency and range, reducing operating costs, and increasing vehicle appeal (Bailo et al., 2021). This relationship reinforces the proposition that innovation not only drives demand but also compels continuous technological advancement.

3.4 Analysing propositions for value creation and appropriation

Key quantitative parameters were analysed to filter the information, including the companies' UK revenues, market share, R&D costs, number of patents, average car price, and EV registrations. These variables will check the relationship between government incentives, technological advancement and markets in the UK as per the structure of this market as a young market or an immature market, which contributes towards understanding how immature markets affect value creation and appropriation by the research objectives highlighted above. The interplay between consumer demand for cost-efficient EVs and technological advancements in battery efficiency directly contributes to competitive advantage by reducing the total cost of ownership. Empirical example: Companies such as BYD, which prioritise R&D in battery technology and align their products with consumer demand for affordability, are expected to capture a larger share of the UK market. This is supported by BYD's market penetration strategies that focus on cost-effectiv, reliable EVs (Mu, 2023). The alignment of technological innovation with regulatory incentives enhances value appropriation by enabling firms to leverage government subsidies while maintaining compliance with stringent emissions standards.

Firms that strategically develop their charging infrastructure and EV technologies in line with UK government policies will likely secure a dominant market position (LaMonaca & Ryan, 2022). This is evidenced by Tesla's supercharger network, which addresses range anxiety and aligns with regulatory requirements, leading to increased EV registrations and UK revenue. Using vertical integration by EV manufacturers will lead to a more stable supply chain and better control over production costs, thereby enhancing value creation and appropriation (Cao et al., 2021). Empirically exemplified by Tesla's vertical integration of battery production into its supply chain, it is expected to result in higher market share and revenue growth compared with manufacturers that rely solely on strategic partnerships. Tesla's control over critical components has allowed it to maintain quality and cost efficiency, reinforcing its competitive edge in the UK market.

By grounding these propositions in empirical data, the framework effectively links theoretical insights with real-world applications, offering a robust analysis of value creation and appropriation in the UK EV market. Understanding these dynamics is crucial for identifying the most effective strategies for maintaining a competitive edge.

The next chapter will detail the research methodology, outlining the tools and techniques used to test these propositions rigorously. This structured approach ensures that the findings are robust and directly relevant to the strategic objectives of firms operating in the UK's evolving EV sector.

4. Methodology

The following section contains the research methodology used to answer and investigate the research question of value creation and appropriation in the UK EV market context through analysing data from 2018 to 2022. The research aims to investigate and define how technology, consumer demand, regulations, and economic conditions influence the potential strategic choices among EV manufacturers in the UK. Given that the market is immature and still evolving, the methodology addressed potential challenges during data collection and analysis by focusing on the variability and inconsistencies of available data.

4.1 Sample

To test the propositions using quantitative values, this study focuses on key players in the UK EV market—specifically, the existing players: Tesla, BMW, Volkswagen AG, and Renault. Volkswagen AG is defined as the leading automakers, Volkswagen and Audi. These firms are large, established, and traditionally present in the UK sector. Furthermore, emerging firms, as discussed as disruptive innovation firms, are also considered and represented by Kia, Hyundai, MG, and BYD.

These select firms allow the analysis to compare different strategic approaches comprehensively. By examining diversity, the analysis section aims to reveal multiple strategic behaviours, providing insights into the general processes of value creation and appropriation. However, as the sample size is small, it is acknowledged that the lack of available data from small and big competitors will limit the generalisation of the findings.

4.2 Measure

This study will only make use of secondary data collected from reputable sources. For the qualitative section, only academic literature, industry reports, governmental reports, and news articles were used to analyse qualitatively. The primary research objective is to understand how the factor of the conceptual framework influences competitive advantage, followed by how innovations translate to financial performance. Finally, the objective is extended to analyse the role of infrastructure and government incentives in EV adoption. In the next section, the variables that are identified and operationalised will be introduced to provide insights into the dynamics of the EV market.

4.3 Key variables and data sources

Table 1 presents the selected variables, operationalisation and sources. To measure the amount of EV sales in the landscape of the UK that are attributed to each company, this study operationalised Market Share in the UK in percentage. This variable is sourced from Statista and would provide understandings that express the firm's competitive positioning within the EV market and furthermore reflects its ability to capture market demand. According to Porter (2004) and Barney (1991), market share is a variable that acts as a critical indicator to reflect the competitive advantage and performance. Rugman and Verbeke (1992) mentioned that revenues can act as a variable that could help assess how innovations translate into financial outcomes and further provide the link between market and innovation strategies. This study sourced both revenue in the UK as well as revenue at the headquarters from ORBIS and S&P Capital IQ Pro to act as the metric to reflect the financial performance of the companies.

The usage of two levels of revenues is further justified to explore the success in the local market and a broader perspective on a global scale. Furthermore, the study will capture the total investment in research and development by a firm through the R&D Expenditure at HQ variable sourced from ORBIS and S&P Capital IQ Pro. This metric would be operationalised through linking financial efforts put into innovation with the financial performance and competitive advantage (Kafouros et al., 2008; Teece, 1986). In the traditional literature, high R&D spending is expected to correlate with the firm's greater ability to maintain technological gap and market gap (Y. Zhao et al., 2023).

Patents Filed is a measure that this study further elaborates on the number of patents submitted yearly, followed by Total Patents which provides a broader view of the firm's technological output and intellectual property portfolio (Comino & Manenti, 2022). These variables are sourced through WIPO database and GreyB and operationalised to reflect the innovation capacity and its ability to protect technologies, contributing to the perspective whereby IP protection is important to sustain long-term competitive advantage (Eppinger et al., 2021). Furthermore, Average Car Price is the mean of selling price for the EVs sold in the UK according to the brands

extracted from EV Database. This variable is chosen to offer insights to the pricing strategy and linkage to the influences on market positioning. It would further offer insights into how pricing would impact consumer demand and firm performance in a competitive market (Sovacool et al., 2019).

Numbers of Slow and Fast Chargers are two separate variables that represent the amount of charging stations available in the UK. However, slow chargers are defined as chargers that charge at a pace of electricity usage of no higher than 22kW, whilst the fast chargers would charge from 22kW and upwards. These measures are extracted accordingly through Statista and the IEA's report. Analysing these variables further creates understandings of how infrastructure is crucial in the development of EV adoption and how this would support the market penetration and create consumer acceptance towards EV (IEA,2019; Pamidimukkala et al., 2024).

Furthermore, extending the infrastructure of the country, we employed another variable called Number of Company Chargers in the UK that is specifically for Tesla, as this variable captures the number of Tesla's unique Supercharger stations. This reflects Tesla's vertical integration strategy and its impact on brand loyalty and market share, providing insights into providing private infrastructure to further elevate competitive advantage (Thumiger, 2021).

The number of Superchargers is extracted through Tesla's yearly investor reports. The Number of EV Registrations by Year extracted from Statista and the UK government's report further tracks the annual growth in EV registrations in the UK. This variable will act as an indicator to show the trends of market growth and consumer adoption (Forsythe et al., 2023). This variable would further be used to explore in alignment with the study's objective to create a linkage with consumer demand in the EV sector. Moreover, two variables concerning the average fuel prices of petrol and diesel are used to explore the costs and benefits consumers consider that may influence the adoption of EVs compared to traditional vehicles (Gautam & Bolia, 2024). As such Price of E95 and Price of Diesel are both noted in USD cents per litre to explore this dynamic and are extracted from Statista as well as crosschecked through multiple reports published by the UK government in the period 2018 to 2022.

Moreover, to explore the relevance of operational costs on the decision-making of owning an EV, the paper extracted the variable of the average cost of electricity in the UK as Electricity Cost per kWh in USD cents. This further assists the study to touch on the influences of running costs on the decision-making of the consumer. This variable was sourced from Statista and the UK government.

Finally, the study explores the effectiveness of subsidies aligning with existing literature through a metric that represents incentives provided by the government (Clinton & Steinberg, 2019). The study employs the maximum financial incentive provided by the UK government for individuals to purchase an EV as Maximum EV Grant per Car in USD. This variable was extracted through the year reports of the UK government.

	Variable	Operationalization / Measurement	Data source
1	Total Revenue in UK (USD mln) & Total Revenue HQ (USD bn)	Both revenue streams are measured as the total earnings from the total sales. It is used to assess the financial success of the company in the UK specifically, as well as the financial performance against global trends.	ORBIS, S&P Capital IQ Pro
2	Market share in UK (%)	The market share expressed in %, shows the proportion of the EV sales relatively to the total market in the UK. This variable is operationalised to analyse the competitive positioning of the company with the UK market.	Statista
3	R&D Expenditure HQ (USD bn)	The total R&D expenditure variables capture the total investment put in innovation. This variable is operationalised through linking the amount of spendings in innovation with competitive advantage as well as technological advancement.	ORBIS, S&P Capital IQ Pro
4	Patents filed	The amount of Patents filed is captured through the amount of patents the specific company has filed within a year. As such, the innovation output represented is operationalised to measure the company's ability to produce new technologies and protect intellectual property year-by-year	WIPO, GreyB
5	Total patents	The variable represents a cumulative number of patents that is operationalised to provide insight into the long-term capacity of innovation and how this could contribute to sustained competitive advantage.	WIPO, GreyB
6	Average car price (USD)	Reflects the company's pricing strategy in the UK. This variable becomes crucial for understanding the price-perspective of consumers as well as the market positioning through pricing strategy.	EV Database
7	Slow chargers in UK	This variable represents the total count of slow EV chargers (≤22 kW) across the UK. According to IEA, this kW output considers as the most basic charging infrastructure for consumers. This measure would therefore act as the availability of basic charging infrastructure for consumers in the UK.	Statista, IEA

8	Fast chargers in UK	Further supporting the variable of Slow chargers in UK. This total count of fast EV chargers (>22 kW) represents the availability of rapid charging infrastructure, as described by IEA, crucial for long-distance travel, faster turnover time and conveniences.	Statista, IEA

Table 1. Overview key variables (continue)

	Variable	Operationalization / Measurement	Data source
9	Own-brand chargers in UK	This variable reflects the number of Tesla Superchargers stations available in the UK. This further supports the study in understanding the need and effect of charging infrastructure as part of Tesla's vertical integration strategy.	Tesla Investor Reports
10	Number of EV registrations in UK	The number of EVs registered yearly in the UK is operationalised to reflect the market penetration and consumer adoption trend through comparison per year.	Statista, UK Government
11	E95 cents per litre (USD)	The average petrol price per litre, expressed in USD (USD) cents. The study operationalises this variable to measure the impacts the prices would have on cost considerations in comparing EVs with traditional vehicles.	Statista, UK Government
12	Diesel cents per litre (USD)	The average diesel price per litre, expressed in USD (USD) cents. The study operationalises this variable to measure the impacts the prices would have on cost considerations in comparing EVs with traditional vehicles.	Statista, UK Government
13	Electricity cents per kwh (USD)	The average electricity price per kilowatt-hour in the UK, expressed in USD (USD) cents. The study operationalises this variable to comprehend the operational costs associated with running an EV.	Statista, UK Government
14	Maximum EV Grant – Consumer per car (USD)	This variable represents the maximum financial incentive that is provided by the UK government for individuals purchasing an EV, expressed in USD (USD). This further represents the government's support and helps the study capture the influence for the adoption rate of EV between individuals.	UK Government

Table 1. Overview key variables

4.4 Data collection and analysis

The data collected for this research were extracted ensuring consistency, accuracy, and alignment with the study's objective, especially with linkage to value creation and appropriation in the UK EV sector. The secondary data were gathered from reputable platforms to ensure the reliability of the data. Consistency was further maintained by extracting variables from the same platforms with cross-checking through secondary sources such as Statista and IEA reports. However, limitations arose due to the limited availability of national-level EV data in the UK, which became a restriction for the selected variables. The limitations however were addressed through variables they could represent as proxies to the variables such as EV registrations.

The study will further use correlation analysis to explore the relationships between key variables, such as R&D expenditures, market share, and patent filing activities, to understand how these factors interact in the UK EV market within the conceptual framework. Implementing this method is justified through the ability to identify the relationship without presuming causality, which would further help us answer the research question to explore the interactions instead of direct cause-and-effect relationships (Rohrer, 2018). Furthermore, the usage of correlation analysis would align with the research objective by potentially uncovering relationships that could contribute to the topic of value creation and appropriation. To ensure a right interpretation of the correlation effects, this study follows the levels of significance described by Cohen (1998).

However, despite the strength of the chosen methods, the analysis remains limited by the small sample size and the difficulties in isolating the revenue streams specific to BEV cars except for Tesla. This is due to the nature of traditional carmakers as they posit a diverse range of ears utilising fossil fuel, hybrid, and electric cars. These factors may affect the generalisability of the findings, but the correlation analysis remains useful for valuable insights that will further contribute to the existing literature through interactions of the conceptual framework.

4.5 Results

Table 2 shows the descriptive and correlation of the statistics. Through the descriptive analysis of the variables, the main outlier concerns the average price of EVs in the UK, standing at a mean of USD 45,000. This highlights that EVs still remain significantly more expensive compared to traditional vehicles running on fossil fuels. This result underscores that there is still a challenge of cost as a barrier to widespread EV adoption (Pamidimukkala et al., 2023). The UK EV market is still developing, characterised by fluctuations in sales and a high dependency on government incentives (Chen, 2022). Market share and the UK revenue show a small negative relationship (r = -0,209). In other words the company's market share is not directly proportional to the revenues in the UK.

Other reasons could be at play; it may well simply mean that this is simply a case of a 'fast follower' model between larger companies, where the latter waits for the former, which has been established by several authors (Lee et al., 2018). For instance, small-scale companies may realise higher market share concerning their

total value by using flexibility or competing sub-sections where they outcompete other firms (Smith, 2021). The results depict an increased and positive course between headquarters level of revenue on one hand and R&D expenditure and patents filed on the other. This implies that companies that set aside large sums of money towards Research and Development are likely to have higher revenue growth rates.

The negative correlation between the market share and the number of patents filed is (r = -0,4211), showing no direct link between the R&D spend and the increase in the market share. One of the reasons could be that while there are numerous small firms which might have high R&D intensity compared to the big firms, they do not have enough resources to acquire additional market share even if their products are more innovative (Baumann & Kritikos, 2016). Besides, the time difference between downward R&D costs and upward market performance could provide this crack because innovation requires time to affect the market share (Funke et al., 2019).

A strong positive correlation was found between the number of charging stations (slow chargers: r = 0,9381; fast chargers: r = 0,9502) with EV registrations. This shows that charging infrastructure plays an important role in the uptake of EVs as this is a way of easing the consumers' challenge of the battery range. However, it is also important to consider that this relationship might be reciprocal; the growing adoption of EVs could drive the expansion of charging infrastructure, as suggested by previous studies (Earl & Fell, 2019; Santos & Rembalski, 2021). This interplay between infrastructure and adoption suggests that a well-developed charging network is both a driver and a response to increasing EV adoption. The analysis reveals a diminishing effectiveness of government incentives as the market matures.

The correlation matrix further shows a negative relationship between the maximum EV grant per car and the number of EV registrations (r = -0,963) implying that while incentives are important when the market is still immature, they are not as effective when the market grows. This could result from consumers gaining more knowledge about EVs and infrastructure developments, thereby reducing their dependence on financing supports (Buhmann & Criado, 2023; Mohammadzadeh et al., 2022). Nevertheless, it is also important to point out that other factors related more closely to the macroeconomic environment can also be a reason for the lower effectiveness of these incentives. The results indicate that value creation and capture in the UK EV market are conditioned by socio-technical factors shaping firm-scale dynamics, innovation management initiatives, infrastructure advancement, and public policies.

	Mean	S.D.	1	2	3	4	5	6
1 Year	2020	1,43	1					
2 Total Revenue in UK (USD mln)	4343,81	4648,64	0,0124	1				
3 Total Revenue HQ (USD bn)	120,68	93,35	0,0531	0,9321	1			
4 Market share in UK (%)	5	5,11	0,2631*	-0,0958	-0,209*	1		
5 R&D Expenditure HQ (USD bn)	5,31	5,3	0,0751	0,9766***	0,9663***	-0,1311*	1	
6 Patents filed	3111,48	3194	-0,5217***	0,517***	0,4371**	-0,4211**	0,441**	1
7 Total patents	42431,81	34749	0,0796	0,7986***	0,7997***	-0,2799*	0,7877***	0,5332***
8 Average car price (USD)	44953,5	11571,63	0,1909*	0,542***	0,4253**	0,6059***	0,5109***	0,0117
9 Slow chargers in UK	27108,8	9068	0,9624***	0,0269	0,0647	0,2542*	0,0918	-0,4596**
10 Fast chargers in UK	5987,6	2128	0,9913***	0,0031	0,0383	0,2555*	0,0613	-0,5139***
11 Own-brand chargers in UK	64	199	0,1791*	-0,1906*	-0,2767*	0,9039***	-0,2259*	-0,3166**
12 Number of EV registrations in UK	124800	96209	0,9814***	0,0205	0,0689	0,266*	0,087	-0,5317***
13 E95 cents per litre (USD)	132,52	20,5	0,5318***	0,1019*	0,1436*	0,1629*	0,1446*	-0,2218*
14 Diesel cents per litre (USD)	138,02	19,70	0,5528***	0,0969	0,1378*	0,1676*	0,144*	-0,2223*
15 Electricity cents per kwh (USD)	0,332	0,08	0,9048***	0,0261	0,0762	0,2484*	0,0815	-0,5273***
16 Maximum EV Grant – Consumer per car	3400	1408,58	-0,9578***	0,009	-0,0362	-0,2574*	-0,0614	0,534***

	Mean	S.D.	7	8	9	10	11	12
1 Year	2020	1,43						
2 Total Revenue in UK (USD mln)	4343,81	4648,64						
3 Total Revenue HQ (USD bn)	120,68	93,35						
4 Market share in UK (%)	5	5,11						
5 R&D Expenditure HQ (USD bn)	5,31	5,3						
6 Patents filed	3111,48	3194						
7 Total patents	42431,81	34749	1					
8 Average car price (USD)	44953,5	11571,63	0,3696**	1				
9 Slow chargers in UK	27108,8	9068	0,0831	0,1931*	1			
10 Fast chargers in UK	5987,6	2128	0,0801	0,1736*	0,9422***	1		
11 Own-brand chargers in UK	64	199	-0,4086**	0,4733**	0,2062*	0,1617*	1	
12 Number of EV registrations in UK	124800	96209	0,0739	0,2078*	0,9381***	0,9502***	0,1886*	1
13 E95 cents per litre (USD)	132,52	20,5	0,049	0,1941*	0,6361***	0,4365**	0,214*	0,6163***
14 Diesel cents per litre (USD)	138,02	19,70	0,0522	0,1943*	0,6798***	0,4583**	0,2224*	0,6283***
15 Electricity cents per kwh (USD)	0,332	0,08	0,0624	0,2011*	0,7979***	0,872***	0,1582*	0,9491***
16 Maximum EV Grant – Consumer per car	3400	1408,58	-0,0692	-0,1855*	-0,9093***	-0,9383***	-0,1661*	-0,963***

	M	SD	13	14	15	16
1 Year	2020	1,43				
2 Total Revenue in UK (USD mln)	4343,81	4648,64				
3 Total Revenue HQ (USD bn)	120,68	93,35				
4 Market share in UK (%)	5	5,11				
5 R&D Expenditure HQ (USD bn)	5,31	5,3				
6 Patents filed	3111,48	3194				
7 Total patents	42431,81	34749				
8 Average car price (USD)	44953,5	11571,63				
9 Slow chargers in UK	27108,8	9068				
10 Fast chargers in UK	5987,6	2128				
11 Own-brand chargers in UK	64	199				
12 Number of EV registrations in UK	124800	96209				
13 E95 cents per litre (USD)	132,52	20,5	1			
14 Diesel cents per litre (USD)	138,02	19,70	0,9915***	1		
15 Electricity cents per kwh (USD)	0,332	0,08	0,5903***	0,5617***	1	
16 Maximum EV Grant – Consumer per car	3400	1408,58	-0,4351**	-0,4702**	-0,87***	1

Table 2. Correlation matrix with description of mean and standard deviation

NOTE. The correlation efficient are assessed based on the following guidelines as described by Cohen (1988). Slight significance* (0,10 – 0,29), Moderate significance** (0,30 – 0,49), and Strong significance (0,50 – 1,0)***

4.6 Linkage with propositions

Proposition 1 posits that firms investing heavily in R&D whilst protecting these inventions through patents are expected to extract more value through revenue growth. This aligns with the statement, as the correlation matrix found a strong positive correlation between HQ revenue and R&D expenditure (r = 0,7997) and patents filed (r = 0,9663). These results align with the IBV and Teece's framework on the importance of innovation and IP management to maintain competitiveness and extract value internationally (Chen, 2022). However, the strength of these investments is clearly highlighted on a global scale rather than within the UK market, which could suggest that the benefits of R&D may not immediately have an impact on an immature market. Further aligning with the need of time, to mature the potential of value seen.

Proposition 2 proposes that in the current market, technological leadership does not directly translate to market dominance in the UK EV market. The weak negative correlation between market and UK revenue (r = -0,209), and the negative correlation between market share and R&D expenditure (r = -0,1311) as well as patents filed (r = -0,4211) further suggests that even though innovation is crucial, it does not lead to a stronger market

share. This aligns with Berkeley et al. (2018), that in immature markets, consumer preferences and willingness to adopt constantly changes, requiring more than just simply innovate to capture value.

Proposition 3 proposes that the development of infrastructures is crucial in driving market penetration and adoption rates in the UK EV market. This is further supported by the high positive correlation between the amount of EV registrations, with slow chargers (r = 0,9381) and fast chargers (0,9502). This further aligns with Porter's theory arguing the significance of complementary assets for value creation and appropriation (Sun et al., 2024). This strong correlation also suggests that a further expansion of charging infrastructure is both a pushing factor and response to EV adoption, creating a feedback loop that enhances further market growth.

Proposition 4 proposes that government incentives are crucial in immature markets to support market growth but may lose effectiveness as the market matures. This is partially supported by the negative correlation between the maximum EV grant per car and the number of EV registrations (r = -0,963). This challenges the traditional narrative that increased incentives will drive higher adoption rates, however, it does support the suggestion that the impact of government subsidies may diminish as market evolves (Buhmann & Criado, 2023; Mohammadzadeh et al., 2022). However, as other factors still signify that the UK EV market is still immature, other factors such as economic stability, consumer awareness, right time to adopt, may play a larger role in driving adoption during the progress between the transition from immature to a more mature market (Lashari et al., 2021).
Proposition 5 argues that firms that can leverage price leadership through using technologies create a stronger position to capture maximum value from inventions. The positive relationship between R&D expenditure and average car price (r = 0,519) supports this only partially as this indicates that firms heavily investing in R&D would target premium segments. Furthermore, the average car price and EV registrations (r = 0,2078) creates a more complex perspective. Higher prices would correlate with market entry, however, the relatively low correlation suggests that price sensitivity still acts as the gap for widespread adoption.

5. Discussion and Results

5.1 Contributions of theoretical frameworks

Through the conducted research, insights are extracted and offer both alignments and implications to the theories used in the previous sections. Traditionally, Porter's Value Chain emphasises the need for innovation integrated into the value chain to enhance efficiency in operations, product differentiation as well as market share (Chizaryfard & Karakaya, 2022). However, more complex dynamics have been uncovered in the UK EV market. Through the negative correlation between Market Share and R&D expenditure, further supported by the amounts of patents filed, challenges the straightforward application of Porter's Value Chain in understanding the UK EV Market. Furthermore, the contradictory correlation whereby suggests that emerging markets like the UK's EV sector, do not necessarily correlate well with traditional metrics of success such as market share, as they may not directly correlate with innovation-driven activities. Instead, our data suggests that brand strength, strategic lessening infrastructure burden and pricing strategies, are more influential in the early adoption and determining market share. This further implies that in immature markets, there is a need to adapt the value chain towards prioritising market penetration strategies aligning with the constantly changing consumer preferences, rather than focusing on inventing and innovating to create novelties to accrue market share (Onufrey & Bergek, 2021).

The Invention-Based View and Teece's Appropriability Framework further emphasise the important role of constant innovation and protection of IPs to sustain a competitive edge (Kafouros et al., 2008, 2022; Teece, 1986). This is proven by the data used through the positive correlation between Revenue on both levels and the patents filed. This further reinforces the IBV's central hypothesis that firms with strong innovation capabilities and strong IP management are better positioned to capture value from their inventions.

However, it also suggests that in understanding an immature market, the narrative changes. Even though proven by the positive correlation between R&D expenditure and revenue, there is a negative correlation between market shares. This would indicate that innovation is not the sole factor to drive market dominance (Dziallas & Blind, 2019). Especially in an immature market, where consumer adoption is still developing and heavily influenced by other factors, the immediate return on innovations may be more complex and value is not directly captured (Hall & Khan, 2003).

Moreover, the positive relationship between R&D expenditure and average car price further strengthens the contribution of the IBV in understandings. The positive correlation between these variables suggests that firms investing heavily in R&D are likely to target more higher-end markets as this helps monetise their innovations by adding premium to the prices. This also aligns with Teece's emphasis on complementary assets in appropriating value, as firms can leverage their strong innovation capabilities to leverage these assets to apply higher-price strategies to further maximise value appropriation (Teece, 2018). This further proposes the strength of the IBV and Teece's findings as a robust theoretical framework in understanding creating and capturing value in the long-term as the UK EV market shifts to a more mature market.

Furthermore, the findings support and create new insights whilst acknowledging the foundational insights of Disruptive Innovation Theory. For example, the negative correlation between patents filed per year and the

number of EV registrations suggests that intense focus on innovation does not necessarily translate into immediate market success. As addressed previously, this could be due to the time lag between innovation and commercialization, or the high costs associated with adopting new technologies. This aligns with the idea that in the stages of market development, consumer adoption may be more driven by practicality such as the price of affordability, the availability of supporting infrastructure and the importance / perceived value of the products rather than cutting-edge innovations (Antioco & Kleijnen, 2010).

The strong correlation between the availability of both types of charging infrastructures and EV registrations further supports the strength of the theory whereby it argues that market-oriented strategies, such as improving infrastructures are critical for achieving early market penetration. This further underscore the need of alignment to innovation efforts with market needs, especially in understanding immature markets where consumer behaviour and preferences are not fixed and are fluctuating (Hermundsdottir & Aspelund, 2021).

5.2 Refining theoretical applications

This research offers a more subtle understanding through Porter's Value Chain, Invention-Based View (IBV), and Teece's Appropriability Framework application on the UK EV market. The observed negative correlation between R&D expenses and market shares a connection with Porter's emphasis on optimising business activities to gain competitiveness. However, specifically in an immature market, this is not guaranteed, it implies the need to extend towards responses to consumer demands, to effectively convert innovation into a market share (Kurtmollaiev et al., 2022).

Furthermore, this aligns with the invention-based perspective whereby companies are better positioned to capture value. The positive correlation between revenue and R&D shows the linkage between innovation and extracting value through financial performance as shown by Tesla's consistent market share and growing revenues. However, the lack of a corresponding increase in market share of the other competitors could suggest that innovation must be paired with strategies that address the market's characteristics and consumer behaviour in a timely manner (Van Reenen & Griffith, 2021).

Moreover, Teece's framework's emphasis on the need to protect value through IP rights further justifies the positive correlation between revenue and both patents filed and total patents. However, Tesla's innovative open-patent strategy shows an interesting approach. The strategies allow competitors to use its inventions, suggesting a deliberate effort to accelerate market maturation both internationally and domestically (Guindalini et al., 2021; Spulber, 2010). This strategy shows Tesla's approach not protecting its IP for immediate value extraction but rather also fosters industry growth to create a matured competitive environment. Through this, Tesla would leverage its technologies to capture a greater value as the market evolves, showing a complex interconnection between appropriability and market readiness that both aligns but also challenges traditional views of value appropriation (Holgersson et al., 2018); Yang & Hurmelinna-Laukkanen, 2022). This highlights the need for further understanding where short-term openness of technologies may lead to long-term advantages following a mature market.

Thus, for practitioners, the result of this study extends beyond addressing consumers and expanding infrastructure, companies should further collaborate with governments to foster the maturity of the market. This would further contribute to the development of a competitive market whereby it not only aligns with governmental goals but also maximises the potential of extracting value. Through this, a favourable environment could be created for the broader goal of consumer adoption and transitioning to a sustainable EV market with competitive positioning.

5.3 Future research directions, contributions, and limitations

The study provides valuable insights into value creation and appropriation in the UK EV market by applying Porter's Value Chain, IBV, and Teece's Appropriability Framework. However, using secondary data limits the analysis of consumer behaviour and the specific strategies firms implement. The sole focus on secondary data causes restrictions in this study to create more insights into consumer behaviour and firm-specific strategies, leaving gaps in capturing the full scope of value creation.

However, future research may enhance the study by introducing the topic of durations for such incentives since the market evolves and expands further in the future. This could assist the policymakers in creating qualified strategies to propagate and foster the industry while simultaneously considering the incentives with the factors affecting consumption and market trends. Thus, further research based on these areas can expand the conclusions of this study and provide more extensive direction to help the practitioners and policymakers involved in the dynamic context of the EV market.

Moreover, the study could be extended to include other factors influencing consumers' decision to adopt EVs, such as brand preference, concern for the environment, and costs. Comparative studies across different countries would also be beneficial, revealing how variations in regulatory environments, infrastructure development, and consumer behaviour shape strategic approaches in the EV sector. These studies could help generalise and provide broader insights into the global shift towards sustainable transportation and its influence on value creation and appropriation.

6. Conclusion and reflections

The present research offers a better understanding of the dynamics of value creation and appropriation within the UK EV market. Findings emphasise the importance of technology, regulatory economics, and consumer demand-related factors. The research further examined the EV market through frameworks like Porter's Value Chain, IBV, and disruptive innovation theory and found that these strategies must be adaptable to changing consumer demand, shifting regulations, and fluctuating in immature markets. Furthermore, the findings suggest that EV manufacturers in the UK should prioritise to comply with the readiness of the market, infrastructure development, whilst maintaining innovation to maximise sustainable value appropriation. Reflecting on the broader impact, this research can influence future studies by encouraging a more integrated approach considering the dynamic interplay of technological, regulatory, and consumer factors.

In this sense, professionals could benefit from a shift towards more flexible business models that prioritise market readiness alongside innovation. These insights might also guide policymakers to further focus on widespread infrastructure development and incentives that drive EV adoption and market maturity. This research further aligns with larger UN Sustainable Development Goals (SDGs) related to sustainable cities, innovation, and climate action (United Nations, 2024). By emphasising the importance of innovation and strategic alignment, this study contributes to accelerating the transition to greener transport solutions and advancing technologies that reduce emissions, promoting a more sustainable future.

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