INFORMATION
Volume 29, Number 1, pp.17-24
ISSN 1343-4500 eISSN 1344-8994
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Analyzing EV Transition Strategies in the Motorcycle Industry through the Lens of Firm Theory

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Abstract

This study investigates how strategic decision-making influences the success of electric vehicle (EV) transition among motorcycle manufactures. By applying economic firm theory, this study examined the relationship between firm profitability using profit margins and four core strategies, Brand value strategy, Electrification investment strategy, Policy responsiveness strategy, and Supplier cooperation strategy. Analyzing data from six leading motorcycle manufacturers from 2015 to 2024, this study employed the regression model by using data collection from the exploring from internet. The results highlight Electrification Investment as the only variable with a statistically significant and positive influence on profit margins, underscoring the importance of long-term commitment to technological advancement. Other variables exhibit weaker or delayed effects, and their influence may unfold over time or under different contextual conditions. These findings contribute to the understanding of the economic mechanisms behind the EV transition and offer actionable insights for business managers and policymakers.

Key words: EV Transition Strategy, Motorcycle Industry, Profitability, Firm Theory, Electrification Investment, Brand Value, Supplier Cooperation, Policy Responsiveness.

I. Introduction

In 2024, the global motorcycle market was valued at approximately USD 71.92 billion. It is expected to grow steadily from USD 75.82 billion in 2025 to USD 119.09 billion by 2032, reflecting a compound annual growth rate (CAGR) of 6.7%. The Asia-Pacific region, which accounted for 61.61% of the global market in 2024, continues to dominate in large part to major motorcycle producers based in India and Japan. While India and China remain key manufacturing centers, many African and Asian countries are also emerging as important consumer markets. A significant shift began between 2021 and 2023, as growing concerns about climate change and global energy transition pushed the motorcycle industry toward electrification. With increasing pressure from carbon regulations, urban traffic restrictions, and volatile fuel prices, electric motorcycles known for their clean energy use, simpler design, and smart features are gaining momentum as the industry's next growth engine. Leading manufacturers such as Honda, Yamaha, Hero, TVS, Bajaj, and Yadea have all introduced clear electrification strategies. Market competition is evolving into a three-pronged race centered around brand strength, technological advancement, and strategic partnerships. Looking ahead, electric motorcycles are expected to play a key role in the sustainable mobility landscape. However, the transition is not without challenges: firms must navigate complex cost restructuring, supply chain coordination, diverse regional policies, and the absence of unified technical standards. Future trends point to the development of smart platforms, ecosystem integration, regional adaptation, and targeted market segmentation. Despite the clear direction toward electrification, manufacturers are pursuing different strategies. Established internal combustion engine (ICE) producers often struggle with legacy systems and sunk costs, while newer entrants benefit from asset-light operations

and flexible technologies. These differences highlight deeper economic forces that require systematic exploration. Firm theory offers a valuable lens for understanding how companies aim to maximize profits, streamline production, and adjust pricing strategies in response to market changes. Especially during times of technological disruption and institutional shifts, firm behavior models can shed light on strategic trade-offs, collaboration dynamics, and market entry or exit decisions. This study applies firm theory to build a framework for analyzing how motorcycle manufacturers are transitioning to electric vehicles. Specifically, it explores how policy incentives and R&D investments affect electric vehicle output, market presence, and overall profitability.

II. Literature Review

By investigating EV strategy and firm theory researches which provide the framework, the reviews show current understanding motorcycle manufactures' approach to EV transformation.

1. Eastern Europe's Transition to EV Production: Pavlínek (2023) examines how the automotive industry's reliance on low production costs in Eastern Europe influences its slower transition to EVs. This dependency reflects the broader challenge of aligning local industrial conditions with global sustainability demands, a dynamic relevant to Honda's global EV strategy, particularly in cost-sensitive markets.
2. Toyota's EV Strategy: Kawai (2022) critiques Toyota's slow entry into the EV market, linking it to a lack of dynamic managerial capabilities and insufficient preparation for competition from IT platforms and established EV players. This analysis is valuable for understanding Honda's efforts to balance cost efficiency and innovation in its EV strategy.
3. China's NEV Market Creation: Gomes et al. (2023) explore how industrial policies in China successfully created demand for EVs by aligning infrastructure development, fiscal incentives, and market regulations. Honda's focus on partnerships and battery innovation resonates with these insights, underscoring the importance of coordinated strategies in fostering EV adoption.

These studies highlight the cost structures, market dynamics, and policy frameworks in shaping EV strategies. However, the current research gap lies in the underdeveloped construction of strategic behavior variables related to electrification. There is a lack of micro-level strategic analysis models tailored to the motorcycle industry, and empirical studies integrating firm theory with electrification behavior indicators remain scarce.

III. Key Strategic Parameters Influencing the Electrification Transition in the Motorcycle Industry

This study adopts firm theory as analytical foundation and utilizes regression mode to examine the behavioral logic and key drivers behind motorcycle manufacturers' electrification strategies. The dataset is structured around multiple dimensions of firms' transition strategies, enabling an evaluation of how specific strategic actions affect profit margins and help identify the causal impact of these actions.

1. Brand Value Strategy:

In this study, Brand Value is defined as the outcome of a firm's intangible assets, measured through market share (consumer choice and competitive strength) and brand awareness (recognition and trust), following the consumer-based brand equity perspective (Aaker, 1991; Keller, 1993) within the context of network economics in the mobility industry.

Formula: BrandValue = w1 · MarketShare + w2 · Brand Awareness

Following prior studies and industry practice (e.g., Interbrand, 2024), the weights of market share and brand awareness are set under the assumption that market performance contributes more directly to brand value than consumer recognition. Specifically, w1=0.7 and w2=0.3, show that market share is approximately 2.3 times as important as brand awareness. This choice is consistent with industry practice (e.g., Interbrand-style frameworks), where financial/market performance typically receives 50–70% weight and perceptual factors receive 20–40%.

2. **Electrification Investment Strategy**:
   This variable reflects a firm's investment intensity in electric vehicle R&D, platform development, and core technologies like battery systems. Such investments initially raise marginal costs and reduce average costs over time and improve long-term profitability through innovation and operational efficiency.

   Formula: $EI = \alpha \cdot RDShare + \beta \cdot PlatformScore + \gamma \cdot BatteryInvestScore$

   The higher weight on BatteryInvest (0.4) reflects its more direct impact on EV cost/performance and long-run profitability. RDShare and PlatformScore are assigned equal weights (0.3/0.3) given their comparable roles in innovation and operational efficiency.
3. **Policy Responsiveness Strategy:**
   This metric assesses how promptly and effectively a firm adapts to government policies, including EV subsidies, tax incentives, and credit mechanisms. Timely alignment with these policies increases access to support resources and boosts short-term liquidity and investment returns. The Policy Response Index (PRI) is used to measure this factor on a scale of 0–10.
   Formula: $PRI = \sum_{i=1}^{n} W_i S_i$ where Wi are the weights and Si are the sub-item scores.
4. **Supplier Cooperation Strategy:**
   This indicator measures the level and quality of collaboration between a firm and its key suppliers—especially in areas like battery production, technical integration, and parts procurement. Strong supplier relationships reduce the risk and cost of in-house R&D, enable faster technology adoption, and improve cost efficiency.

   Formula: $SC = a \cdot BatteryFactory + b \cdot TechnicalSupport + c \cdot PartsPurchasing$

   I normalize all inputs and determine weights via a simple 100-point allocation by domain experts; averaged scores yield a=0.4, b=0.25, c=0.35, reflecting the higher strategic impact of battery-factory collaboration, followed by parts purchasing and technical support.

IV. Research Hypothesis and Model

To evaluate the impact of strategic decisions on firm performance during the electrification transition, this study proposes the following research hypothesis. The aim is to identify the relative importance and prioritization of different strategies implemented throughout the transition process:

- Research Hypothesis:

  During the transition to electric mobility, motorcycle manufacturers are more likely to prioritize investments in electrification investment of technologies and battery and responsiveness to government policies. In contrast, strategies related to brand development and supplier cooperation, while influential in traditional internal combustion engine markets, exert comparatively less impact on firm performance within the emerging EV market context.

- Model Formula:

$$ProfitMargin = \beta 0 + \beta 1 \cdot (BrandValue) + \beta 2 \cdot (ElectrificaionInvest) + \beta 3 \cdot (PolicyResponse) + \beta 4 \cdot (SupplierCooperation) + \epsilon$$

□. Data collection

The data used to evaluate the proposed hypotheses in this study were collected data from publicly available online sources, annual reports, market research institutions, financial data terminals, and official corporate publications.

- Data Period: 2015–2024
- Sample Firms: Six major motorcycle manufacturers: Honda, Yamaha Motor, Bajaj Auto, Hero, TVS Motor, Yadea.

Data 1: Profit Margin (2015–2024)

Profit Margin is used to indicate the proportion of revenue retained as profit after accounting for operating costs. This metric is central to evaluating firm performance in the context of electrification strategy.

- Honda and Bajaj Auto consistently demonstrate high and stable profit margins, suggesting successful strategic investments in electrification and efficient cost structures.
- Yamaha and Yadea show greater volatility in margins, possibly reflecting transitional challenges or external market pressures during EV adoption.
- TVS Motor reports comparatively lower margins, which may be attributed to high transformation costs, pricing competition, or gradual scaling of electric operations.

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Honda	10.06%	9.95%	13.10%	13.88%	13.87%	12.57%	14.25%	16.80%	17.27%	18.29%
Yamaha Motor	11.66%	3.87%	8.61%	13.78%	6.92%	2.31%	18.87%	6.56%	8.68%	8.05%
Bajaj Auto	19.94%	16.34%	16.78%	22.62%	16.23%	19.51%	20.14%	20.34%	20.80%	23.59%
Hero MotoCorp	8.57%	10.15%	11.47%	11.47%	15.20%	7.44%	9.57%	7.13%	10.67%	11.27%
TVS Motor	4.54%	5.03%	6.97%	4.35%	3.68%	3.02%	2.30%	5.35%	6.78%	7.48%
Yadea	4.52%	7.59%	5.16%	4.50%	12.50%	12.80%	12.90%	12.70%	7.60%	4.51%

Figure 1: Six Motorcycle Manufacturers' Profit Margin from 2015 to 2024

Data 2: Brand Value Trends (2015–2024)

The "Motorcycle Brand Value" chart illustrates the evolution of brand strength among major motorcycle manufacturers over a ten-year period. Brand value is a key intangible asset reflecting consumer recognition, market trust, and perceived quality.

- Honda consistently maintains the highest brand value across the sample, reinforcing its leadership position and strong global reputation.
- Yadea, as a representative of emerging EV manufacturers, demonstrates a remarkable rise in brand value—particularly after 2020—signifying growing market recognition and consumer acceptance in the electric segment.

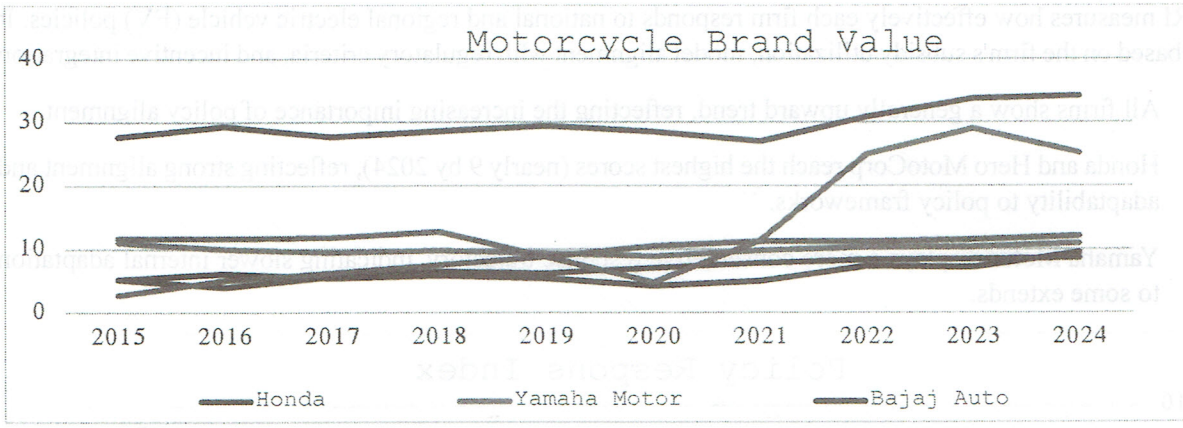

Figure 2: Motorcycle Brand Value Chart from 2015 to 2024

Data 3: Electrification Investment Scores (2015–2024)

The "Electrification Investment" metric captures each firm's intensity of investment in electric vehicle (EV) technologies, including battery systems, motor platforms, and related innovation efforts. It reflects the strategic prioritization of electrification within R&D portfolios.

- Honda exhibits a steady increase in investment scores, rising from 1.6 in 2015 to 3.0 in 2022, then stabilizing. This trend reflects consistent and proactive engagement in EV R&D.
- Yamaha Motor starts with relatively modest scores but shows a notable acceleration post-2020, reaching 2.6, suggesting a more recent but focused push toward electrification.
- Bajaj Auto maintains a relatively stable investment level around 2.3 throughout the period, indicating a conservative but steady approach to EV development.
- Yadea experiences a sharp increase in investment after 2020, signaling a strong strategic shift and resource reallocation toward EV technologies, aligning with its positioning as a leading electric two-wheeler brand.

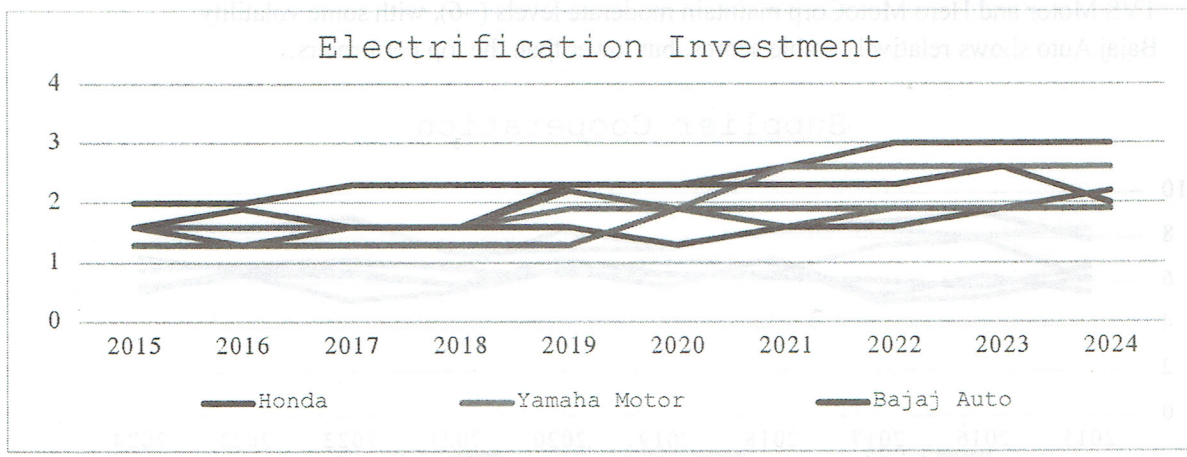

Figure 3: Electrification investment

Data 4: The Policy Responsiveness Index (PRI) (2015–2024)

PRI measures how effectively each firm responds to national and regional electric vehicle (EV) policies. It is based on the firm's subsidy utilization, model alignment with regulatory criteria, and incentive integration.

- All firms show a generally upward trend, reflecting the increasing importance of policy alignment.
- Honda and Hero MotoCorp reach the highest scores (nearly 9 by 2024), reflecting strong alignment and adaptability to policy frameworks.
- Yamaha Motor displays a more conservative response trajectory, indicating slower internal adaptation to some extends.

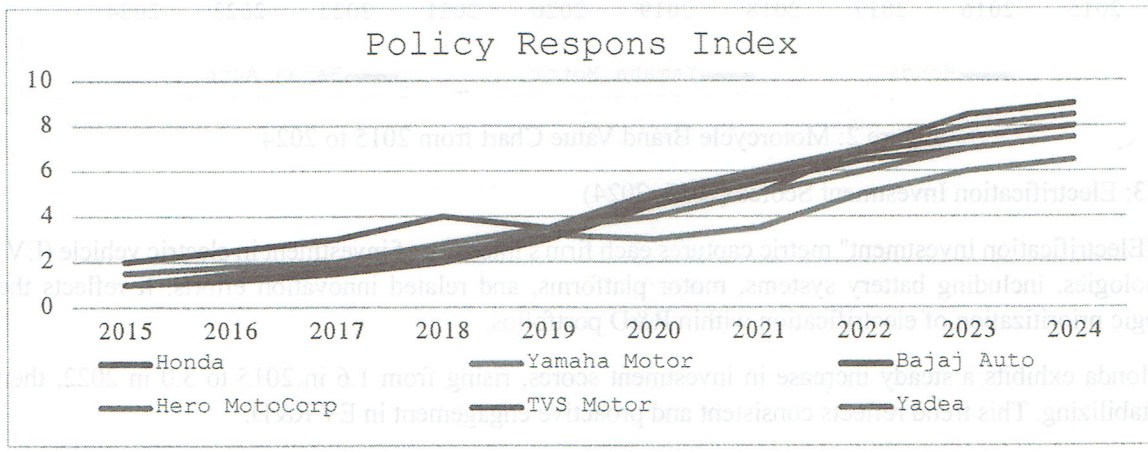

Figure 4: Policy response index

Data 5: Supplier Cooperation Index (2015–2024)

The Supplier Cooperation Index is a composite indicator measuring the strategic depth of collaboration with key supply chain partners in the electric powertrain ecosystem. This includes battery manufacturers, motor and controller suppliers, and technology collaborators.

- Honda and Yadea consistently score above 8, indicating robust supply chain partnerships.
- TVS Motor and Hero MotoCorp maintain moderate levels (~6), with some volatility.
- Bajaj Auto shows relatively stable scores, but lower than the top performers.

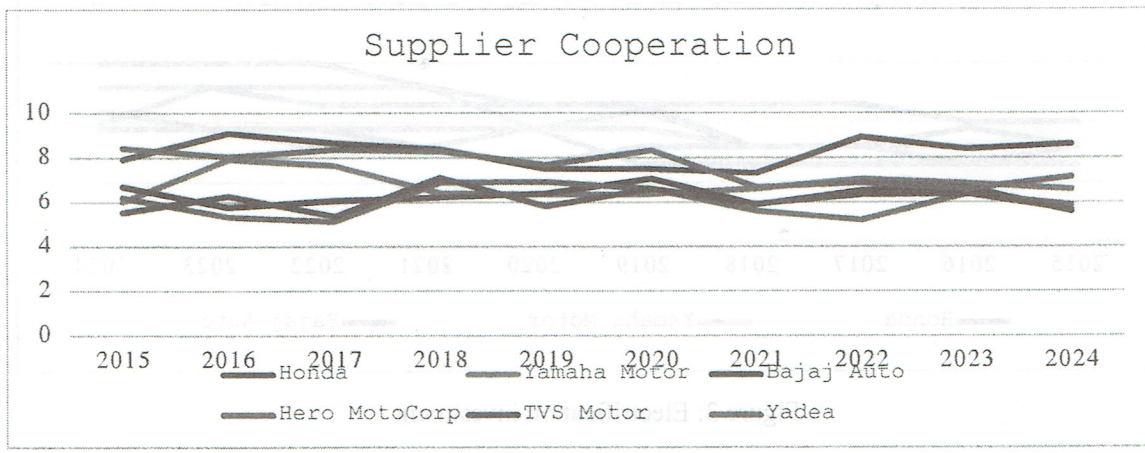

Figure 5: Supplier cooperation

VII. Regression Result

- R-squared = 0.312: The model explains approximately 31.2% of the variation in profit margin.
- F-test significance (P = 0.00148): The overall model is statistically significant.

Variable	Coefficient	Std. Error	T-Statistic	P-Value	Conclusion
BrandValue	-0.429	0.535	-0.802	0.427	Not Significant
ElectricInvest	2001.289	802.223	2.495	0.016	Significant, Positive effect
PolicyResponse	228.024	151.808	1.502	0.140	Marginally Significant
SupplierCooperation	-352.663	290.520	-1.214	0.231	Not significant

- Electrification Investment: Confirms the hypothesis. Electrification investment in EV technologies is a key driver of profit margin during the transition.
- Policy Responsiveness: Partially support the hypothesis. It indicates policy alignment contributes to firm performance, through the effect is not as robust as investment.
- Brand Value: Support the hypothesis. Brand strength may play a smaller or delayed role in EV-specific performance, especially during early transition.
- Supplier Cooperation: Support the hypothesis. The effect of supplier collaboration on short-term profitability is limited, perhaps due to lagged benefits.

VIII. Conclusion

This study examines how electrification transition strategies influence firm performance in the motorcycle industry. The analysis validates the core assumption of the hypothesis: investment in electrification and responsiveness to policy are currently the most impactful strategic factors for profitability in the electric motorcycle sector. In contrast, brand building and supplier partnerships do not yet show strong direct effects in the short-term financial data.

Despite offering important insights, this study has several limitations that should be acknowledged. The study relies primarily on publicly available firm-level data, such as financial reports and market research. However, not all companies disclose detailed information about their electrification strategies which creates potential gaps in variable construction.

In order to improve the analysis accuracy, future research should investigate more manufacturers economic strategy data, apply advanced econometric methods with lagged variables or non-linear modeling to capture their long-term contributions.

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