

A Brief study on the Scope of AFV Market Growth in Bihar

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Abstract: The global automotive industry is undergoing a decisive shift away from conventional petroleum-based vehicles toward Alternative Fuel Vehicles (AFVs), a category that includes battery electric vehicles (BEVs), hybrid electric vehicles (HEVs), and other non-conventional fuel platforms. India, as one of the fastest-growing large economies, has emerged as an important participant in this transition, and Bihar—historically viewed as a late adopter of automotive innovation—has shown a notable acceleration in AFV uptake following the introduction of the Bihar Electric Vehicle Policy, 2023. This study examines the relationship between the growth of the AFV market and broader economic growth in Bihar, using secondary data drawn from government transport records, the state Economic Survey, and industry and academic publications. The study adopts a descriptive-analytical research design and employs trend analysis, percentage growth computation, and correlational reasoning to examine patterns between AFV registrations and macroeconomic indicators such as Gross State Domestic Product (GSDP) and sectoral growth in transport and services. The findings indicate that AFV registrations in Bihar increased by 113 percent between 2023–24 and 2024–25, a period that coincided with the state recording one of the highest GSDP growth rates among Indian states. While a direct causal relationship cannot be established from secondary data alone, the study finds a discernible positive association between policy-driven AFV market expansion and indicators of transport-sector and overall economic growth, alongside emerging opportunities for employment generation, energy security, and industrial investment. The study concludes with policy-oriented recommendations for strengthening charging infrastructure, manufacturing incentives, and rural market penetration in Bihar.

Keywords: Alternative Fuel Vehicles, Electric Vehicles, Economic Growth, Bihar, Sustainable Transportation, Gross State Domestic Product, EV Policy

1. Introduction

The transportation sector occupies a central position in any regional economy, functioning simultaneously as a driver of mobility, a source of employment, and a significant contributor to energy consumption and environmental externalities. Across the world, rising concerns over climate change, volatile crude oil prices, and energy security have accelerated the transition toward Alternative Fuel Vehicles (AFVs)—a category encompassing battery electric vehicles, hybrid electric vehicles, plug-in hybrids, and vehicles powered by compressed natural gas, biofuels, and hydrogen fuel cells. Industry estimates place the global AFV market at approximately USD 590–796 billion in 2024, with projected compound annual growth rates in the range of 13 to 15 percent through the early 2030s, driven substantially by battery electric vehicles and supportive government policy. The global electric vehicle segment alone was valued at roughly USD 917 billion in 2025 and is forecast to approach USD 4,886 billion by 2034, reflecting a compound annual growth rate exceeding 20 percent.

India has positioned itself as an active participant in this global transition. The Indian electric vehicle market alone was valued at roughly USD 3.7 billion in 2025 and is projected to expand considerably over the coming decade, aided by national schemes such as the Faster Adoption and Manufacturing of Electric Vehicles (FAME) programme, the Production Linked Incentive (PLI) scheme, and the PM E-DRIVE initiative. National EV sales rose from



approximately 50,000 units in 2016 to 2.08 million units in 2024, taking the total EV stock on Indian roads to around 5.45 million vehicles, or nearly 9 percent of the global EV stock. The Government of India has set an ambitious target of achieving 30 percent EV penetration in private car sales, 70 percent in commercial vehicles, and 80 percent in two- and three-wheelers by 2030, implying roughly 80 million electric vehicles on Indian roads by the end of the decade.

Within this national landscape, Bihar—one of India's most populous states and historically among its less industrialised economies—has begun to emerge as an unexpected participant in the AFV growth story. An earlier Bihar Electric Vehicle Manufacturing and Mobility policy framework (2020–2024) had already sought to build a manufacturing ecosystem for e-vehicles in the state, but it was the Bihar Electric Vehicle Policy, approved by the state cabinet in December 2023, that substantially widened the scope of incentives. The 2023 policy offers road tax exemptions, registration fee waivers, purchase subsidies, and incentives for charging infrastructure, with the explicit target of raising the share of electric vehicles in total vehicle registrations to 15 percent by 2028, alongside a vision of making Bodh Gaya and Rajgir fully electric-mobility, zero-emission destinations.

Simultaneously, Bihar has recorded some of the strongest state-level economic growth figures in India in recent years. The state's Gross State Domestic Product (GSDP) grew by 13.1 percent at current prices in 2024–25, its real (constant-price) GSDP growth of 8.6 percent ranked among the highest of major Indian states, and its transport and communication sector alone recorded a 7.6 percent growth rate between 2011 and 2024. Against this backdrop, this study investigates whether the expansion of Bihar's AFV market is meaningfully associated with the state's broader economic growth trajectory, and what this relationship implies for future policy, investment, and infrastructure planning.

The relevance of this study is fourfold. First, most existing literature on AFV and electric vehicle adoption in India has concentrated on metropolitan and industrially advanced states such as Delhi, Maharashtra, Karnataka, and Tamil Nadu, leaving a research gap concerning less industrialised, primarily agrarian states such as Bihar. Second, understanding the economic dimensions of AFV adoption—beyond its well-documented environmental benefits—is essential for policymakers seeking to design incentive structures that simultaneously advance sustainability and regional economic development goals. Third, Bihar's demographic profile, with a very large rural population and a fast-growing e-rickshaw and two-wheeler segment, presents a distinctive adoption pattern that differs meaningfully from the four-wheeler-led adoption observed in wealthier states, warranting dedicated empirical attention. Fourth, as the AFV sector is increasingly discussed nationally in terms of its employment potential—industry estimates suggest the sector could generate several hundred thousand direct jobs and several million indirect jobs nationally by 2030—it is important to examine what share of this opportunity a state such as Bihar, with its large under-employed workforce, might realistically capture.

This study is structured as follows. Following this introduction, the second section reviews existing literature on the economic dimensions of AFV and EV adoption in India. The third section states the specific objectives guiding the study. The fourth section details the research methodology, data sources, and limitations. The fifth section presents the data analysis, covering AFV registration trends, macroeconomic indicators, charging infrastructure development, and comparative state-level positioning. The sixth section discusses the results in light of the study's objectives and the existing literature, and the study concludes with policy recommendations and directions for future research.

2. Review of Literature

A growing body of research has examined the economic and policy dimensions of electric and alternative fuel vehicle adoption, both globally and within the Indian context, though state-specific studies on emerging markets such as Bihar remain scarce.

Rajagopal (2023) examined the fiscal and employment implications of the energy transition in India's transport sector, analysing how the shift toward electric vehicles affects government revenues, energy import dependence, and labour markets. The study noted that while reduced fossil-fuel consumption lowers import expenditure and enhances energy security, the transition also necessitates the redeployment of labour from conventional automotive value chains

toward battery manufacturing, charging infrastructure, and allied services, indicating that the net economic effect of AFV adoption depends heavily on how effectively states manage this structural shift.

Dixit and Singh (2022) developed a machine learning-based model to identify the behavioural and socio-economic determinants of electric vehicle purchase intention among Indian consumers. Their analysis suggested that affordability, government subsidies, and awareness levels were significant predictors of adoption, while education level alone was not a strong determinant, implying that targeted financial incentives—rather than general awareness campaigns—are likely to be more effective in price-sensitive and developing markets such as Bihar.

Kaur and Kumar (2026), in an integrative review of India's electric vehicle ecosystem, concluded that EV adoption contributes to multiple Sustainable Development Goals, including affordable and clean energy, decent work and economic growth, and sustainable cities, primarily through green employment creation, reduced fuel-import expenditure, and support for domestic manufacturing under schemes such as FAME and the Production Linked Incentive programme. Their review also emphasised that despite strong policy momentum, high upfront costs, inadequate charging infrastructure, and fragmented state-level implementation continue to restrain broader adoption across India.

A macroeconomic assessment of India's electric vehicle transition estimated that expansion of the domestic battery and vehicle manufacturing ecosystem could yield a net-positive impact on national output, gross domestic product, and employment, with minerals-linked industries such as copper and manganese processing among the principal beneficiaries, underscoring that the economic benefits of AFV growth extend well beyond the automotive retail segment into upstream manufacturing and mineral processing sectors.

Similarly, an analysis of India's regional electric vehicle transition observed considerable geographic disparity in adoption, noting that states with stronger vocational and technical education infrastructure and more proactive state-level policy frameworks—covering skill development, research incentives, and employment generation subsidies—tend to record faster and more economically integrated AFV market growth than states relying solely on demand-side purchase subsidies, a finding directly relevant to Bihar's policy design going forward.

Industry-level analysis of India's electric vehicle investment landscape has documented that states offering a combination of fiscal incentives, streamlined regulatory clearance, reliable logistics, and available industrial land—such as Karnataka, Tamil Nadu, and Uttar Pradesh—have attracted disproportionately higher shares of EV and component-manufacturing investment. Uttar Pradesh's Electric Vehicle Manufacturing and Mobility Policy, 2022, for instance, targets ₹30,000 crore in investment and one million jobs, and the state already leads national EV registrations, driven overwhelmingly by e-rickshaws, a segment with strong structural similarity to Bihar's own emerging AFV market.

Research on the informal-sector employment effects of e-rickshaw adoption has shown that this vehicle category functions as a significant channel of self-employment and daily-wage income generation, particularly for previously under-employed workers in northern Indian states. National e-rickshaw registrations rose roughly five-fold between 2020 and 2023, and industry commentary suggests that the segment's low capital requirement and simple technology make it especially suited to income-constrained, largely rural states such as Bihar, reinforcing the potential relevance of two- and three-wheeler AFVs to local livelihood generation, distinct from the four-wheeler-centric adoption patterns studied in wealthier states.

Collectively, this literature suggests that AFV market growth is linked to economic outcomes through multiple channels—reduced energy import dependence, green employment creation, manufacturing investment, and consumer expenditure patterns—but also indicates that the strength of this relationship is contingent on state-specific policy design, infrastructure readiness, and the depth of local manufacturing ecosystems. It further suggests that for large, primarily rural states, the two- and three-wheeler AFV segment may be a more economically significant channel than the four-wheeler segment emphasised in much of the existing literature on metropolitan markets. Few studies, however, have examined this relationship specifically for Bihar, a state that only introduced a dedicated,

comprehensive EV policy in late 2023 and where empirical evidence on the economic contribution of the sector remains limited. This study seeks to address that gap.

3. Objectives of the Study

The present study has been undertaken with the following objectives:

1. To examine the growth trend of the Alternative Fuel Vehicle (AFV) market in Bihar over recent years, with particular reference to the period following the implementation of the Bihar Electric Vehicle Policy, 2023.
2. To analyse the relationship between the growth of the AFV market and key indicators of economic growth in Bihar, including Gross State Domestic Product (GSDP) and sectoral (transport and services) growth rates.
3. To identify the major policy measures, incentives, and infrastructural initiatives that have influenced AFV market expansion in the state.
4. To assess the potential economic contribution of the AFV sector to employment generation, industrial investment, and energy-cost savings in Bihar.
5. To suggest policy recommendations for strengthening the economic linkages between AFV market development and sustainable regional growth in Bihar.

4. Research Methodology

4.1 Research Design

This study adopts a descriptive and analytical research design based entirely on secondary data. Given that primary survey data on AFV ownership and usage patterns in Bihar is not presently available in the public domain in a form suitable for statistical inference, the study relies on documented, verifiable secondary sources to construct a trend-based and comparative analysis of AFV market growth and associated economic indicators.

4.2 Sources of Data

Data for this study were drawn from the following categories of secondary sources:

- a) Government and official sources: the Bihar State Transport Department and Electric Vehicle Cell records, the Bihar Economic Survey (2024–25 and 2025–26 editions) published by the Finance Department, Government of Bihar, and national records maintained under the Vahan portal of the Ministry of Road Transport and Highways.
- b) Industry and market research reports: publications from established market research organisations providing global and Indian AFV/EV market size, segment, and growth-rate estimates.
- c) Academic and peer-reviewed literature: journal articles addressing the economic, behavioural, and policy dimensions of electric and alternative fuel vehicle adoption in India.
- d) News and policy-tracking sources: verified reporting on the implementation and outcomes of the Bihar Electric Vehicle Policy, 2023.

4.3 Period of Study

The study primarily covers the period from the financial year 2019–20 to 2025–26, with particular emphasis on the two-year period following the notification of the Bihar Electric Vehicle Policy in December 2023, which represents the most significant policy intervention affecting the state's AFV market to date.

4.4 Tools of Analysis

The study employs descriptive statistical tools, including year-on-year percentage growth computation, trend analysis, and comparative tabulation, to examine the pattern of AFV market growth alongside macroeconomic indicators. Given the descriptive, secondary-data-based nature of the study, the findings should be interpreted as indicative of association and co-movement rather than as evidence of statistical causation. This limitation is discussed further in the concluding section.

4.5 Limitations of the Study

The study is subject to certain limitations. First, it relies exclusively on secondary data, which restricts the analysis to the variables and time periods for which official figures are publicly available. Second, in the absence of primary survey data, the study cannot capture household-level or firm-level behavioural determinants of AFV adoption in Bihar. Third, because both AFV registrations and GSDP growth in Bihar have risen concurrently over the same short period, the observed association should not be interpreted as proof of a direct causal relationship, as both variables may be influenced by broader factors such as overall infrastructure investment and post-pandemic economic recovery.

5. Data Analysis

5.1 Growth of AFV (Electric Vehicle) Registrations in Bihar

According to data released by the Bihar Transport Department, electric vehicle registrations in the state rose sharply following the notification of the Bihar Electric Vehicle Policy in December 2023. A total of 10,850 electric vehicles were registered in the state during 2023–24, which increased to 23,096 units in 2024–25—a growth of approximately 113 percent in a single year. Within this total, two-wheeler EV registrations rose from 10,500 to 22,133 units (an increase of about 111 percent), while four-wheeler EV registrations rose from 350 to 963 units, an increase of approximately 175 percent, reflecting a notable shift beyond government and institutional buyers toward middle-class private consumers.

Category	2023–24 (Units)	2024–25 (Units)	Growth (%)
Two-wheeler EVs	10,500	22,133	+110.8%
Four-wheeler EVs	350	963	+175.1%
Total EV Registrations	10,850	23,096	+112.9%

Table 1: Growth in EV (AFV) registrations in Bihar, 2023–24 to 2024–25. (Source: Bihar Transport Department, as reported in Entrepreneur India, 2025.)

This growth has occurred against a policy backdrop that includes exemption from road tax and registration fees for the first 10,000 electric two-wheelers, a 75 percent motor vehicle tax rebate thereafter, purchase subsidies of ₹5,000–7,500 per two-wheeler, and a 15 percent capital subsidy for EV manufacturing units establishing operations in the state. The Bihar Transport Department has set a target of achieving a 15 percent share of electric vehicles in total new vehicle registrations by 2028, alongside mandated electrification targets for licensed vehicle aggregators of 20 percent by 2025, rising to 50 percent by 2027.

5.2 Trends in Bihar's Economic Growth Indicators

Over the same period, Bihar recorded some of the strongest macroeconomic growth figures among Indian states. According to the Bihar Economic Survey, the state's GSDP grew by 14.5 percent at current prices in 2023–24,

followed by 13.1 percent growth at current prices (8.6 percent at constant 2011–12 prices) in 2024–25. Sector-wise, the tertiary (services) sector—within which transport and communication are classified—grew by 13.5 percent at current prices in 2024–25, while the secondary sector grew by 15.5 percent. Over the longer period from 2011 to 2024, the transport and communication sector specifically recorded a growth rate of 7.6 percent.

Indicator	2022–23 / 2023–24	2024–25	Growth Trend
GSDP (current prices)	₹8,54,429 crore (2023–24)	₹9,91,997 crore	+13.1%
GSDP (constant 2011–12 prices)	₹4,64,540 crore (2023–24)	₹5,31,372 crore	+8.6%
Per capita income (current prices)	₹66,828 (2023–24)	₹69,321–76,490	Rising
Tertiary sector share of GSDP	58.6%	54.8–54.07%	Dominant sector
Transport & communication growth (2011–2024)	—	7.6% (period average)	Sustained

Table 2: Selected macroeconomic indicators for Bihar. (Source: Bihar Economic Survey 2024–25 and 2025–26, Finance Department, Government of Bihar.)

5.3 Development of Charging Infrastructure in Bihar

The availability of charging infrastructure is a well-documented determinant of AFV adoption, and Bihar's trajectory in this regard reflects the state's broader policy push. As of the mid-2020s, Patna city had approximately 20 publicly listed EV charging stations, with the wider state possessing over 300 charging points located at petrol stations and other key sites. In March 2025, the Bihar Transport Minister announced a phased plan to establish 277 additional EV charging stations over five years, with 136 stations to be commissioned within the first three years and a further 141 in the subsequent two years, to be located at railway stations, airports, national and state highways, and government buildings. A parallel, more ambitious departmental target has aimed at over 1,000 charging stations by 2025–26, with installations planned along national highways, at petrol pumps, bus terminals, and educational institutions. The original Bihar EV Policy framework also specifies that normal, fast-charging, and battery-swapping stations should be installed at intervals of approximately 25 kilometres on state and national highways, and every 3 kilometres within city limits.

Charging Infrastructure Metric	Approximate Figure	Reference Period
Public EV charging stations, Patna city	~20	2025–26
EV charging points statewide (existing)	300+	2024–25
Planned charging stations (phased, 5-year target)	277	2025–2030
Departmental target (accelerated plan)	1,000+	By 2025–26
Public EV charging stations, India (national)	29,277	August 2025

Table 3: Charging infrastructure development in Bihar relative to national figures. (Source: Bihar Transport Department press statements as reported by Patna Press, 2024–2025; India Employer Forum, 2025.)

Even accounting for the more ambitious departmental target, Bihar's charging-station density remains modest in relation to the national count of 29,277 public charging stations as of August 2025, underscoring that infrastructure remains an area of active development rather than a completed foundation. Nonetheless, the pace of planned expansion—from roughly 300 to a stated target of over 1,000 points within a single year in departmental announcements—indicates that infrastructure investment is scaling broadly in step with the growth in vehicle registrations documented in Table 1.

5.4 Employment and Investment Potential of the AFV Sector in Bihar

Beyond vehicle sales themselves, the AFV sector carries employment implications across manufacturing, sales and servicing, and charging-infrastructure operation. At the national level, the Ministry of Skill Development and Entrepreneurship and industry bodies have estimated that the EV industry could create approximately 500,000 to one crore (10 million) direct jobs by 2030, with a multiplier effect suggesting an additional four to five indirect jobs for every direct job created across component supply chains, servicing, and charging operations—implying a cumulative employment opportunity running into tens of millions nationally. As of 2025, an estimated 150,000–180,000 professionals were already employed in EV-related roles nationally, concentrated in research and development, battery manufacturing, and charging-infrastructure deployment.

Bihar's own incentive structure is explicitly designed to capture a share of this opportunity. The state's EV policy offers a 15 percent capital subsidy on fixed capital investment for EV manufacturing units, full reimbursement of state GST for an initial period, and a 75 percent reimbursement of stamp duty and registration charges for land acquired for manufacturing purposes—incentives comparable in structure, though smaller in scale, to those offered by more industrially advanced states such as Uttar Pradesh, which targets ₹30,000 crore in EV-related investment and one million jobs under its own policy. Within Bihar specifically, the e-rickshaw and light electric two-wheeler segment has been identified as carrying a particularly large addressable opportunity, with projections suggesting a combined five-million-unit addressable e-rickshaw market across Bihar and neighbouring Jharkhand by 2030. Given that e-rickshaws function largely as vehicles of daily-wage self-employment rather than conventional salaried employment, this segment is likely to be an economically significant, if informally structured, channel through which AFV market growth translates into household income generation in the state.

5.5 Comparative Perspective: Bihar Relative to Other Indian States

Placing Bihar's AFV market within the broader national context helps to contextualise the scale of the growth documented above. National market intelligence estimates place Bihar's share of the country's electrified-vehicle market at approximately 1.5 percent as of the mid-2020s, below the national average and behind states such as Uttarakhand, Chhattisgarh, and Manipur in relative market share, though still ahead of several other states with less developed EV policy frameworks. By contrast, Uttar Pradesh led national EV registrations with over 400,000 units recorded as of May 2025, driven overwhelmingly by e-rickshaws, while established EV manufacturing hubs such as Karnataka and Tamil Nadu have attracted substantially larger volumes of component-manufacturing investment, benefiting from more mature supply ecosystems, port proximity, and longer-established investor-facilitation frameworks.

State	Distinguishing Feature	Policy Emphasis
Bihar	Rapid percentage growth (113% in 2024–25) from a small base; large e-rickshaw potential	Tax exemption, purchase subsidy, manufacturing capital subsidy
Uttar Pradesh	Highest absolute EV registrations nationally (400,000+), e-rickshaw led	₹30,000 crore investment target, 1 million jobs target
Karnataka	First comprehensive state EV policy; established R&D and manufacturing hub	Investor facilitation, ancillary manufacturing ecosystem

Tamil Nadu	Strong supply-chain ecosystem, port access, land availability	Skill development, R&D incentives, employment generation subsidy
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Table 4: Comparative positioning of Bihar's AFV market relative to selected Indian states. (Source: compiled from India Briefing, 2023; India Employer Forum, 2025; and state EV policy documents.)

This comparison suggests that while Bihar's absolute market size remains modest, its rate of growth following the 2023 policy intervention is broadly comparable to the acceleration observed in other states following their own major policy announcements, and that the state's e-rickshaw-oriented growth pattern mirrors the trajectory that has made Uttar Pradesh the current national leader in registration volumes.

5.6 SWOT Assessment of Bihar's AFV Market

To synthesise the preceding analysis, Table 5 presents a structured strengths–weaknesses–opportunities–threats (SWOT) assessment of Bihar's AFV market as it relates to the state's economic growth prospects.

Strengths	Weaknesses	Opportunities	Threats
Strong policy framework since 2023; tax exemptions; rapid percentage growth (113% in one year)	Small absolute market base; charging infrastructure still developing; below national-average market share	Large addressable e-rickshaw/two-wheeler market; low-cost self-employment channel; manufacturing subsidy attracting investment	Competition from more industrially advanced states for manufacturing investment; grid and power-supply constraints in rural areas

Table 5: SWOT assessment of Bihar's Alternative Fuel Vehicle market.

5.7 Observed Association Between AFV Growth and Economic Indicators

Placing the two data series side by side reveals a temporal co-movement: the sharpest recorded increase in Bihar's AFV registrations (113 percent in 2024–25) occurred in the same year that the state posted one of the highest GSDP growth rates among major Indian states, with real GSDP growth of 8.6 percent nationally ranked among the top performers. This period also coincided with a near doubling of Gross Fixed Capital Formation in the state, from ₹17,416 crore to ₹34,905 crore over five years, indicating a broader environment of rising capital investment of which AFV-related infrastructure and manufacturing incentives form a part.

While Bihar's EV market remains small in absolute national terms—the state's EV market share nationally has been estimated at around 1.5 percent, still below the national average—the rate of change is significant, and the underlying policy and investment linkages (tax incentives, manufacturing subsidies, charging-station capital support, and employment generation through vehicle assembly, sales, and servicing) provide a plausible economic transmission channel connecting AFV market growth to broader state income and employment indicators. It should be emphasised, however, that both series are also being driven by common underlying factors, including expanding road infrastructure, rising per capita income, and overall industrial investment promotion in the state, and the analysis in this study therefore identifies association rather than isolated causation.

6. Result and Discussion

The data analysis yields several findings relevant to the objectives of this study.

First, Bihar's AFV market has entered a distinct growth phase since the notification of the state's Electric Vehicle Policy in December 2023, with registrations more than doubling within a single financial year. This finding is consistent with the wider literature, which identifies government incentives and purchase subsidies as significant predictors of EV adoption in price-sensitive markets, as noted by Dixit and Singh (2022).

Second, the composition of this growth—dominated by two-wheelers but with four-wheeler adoption growing at an even faster percentage rate—suggests that AFV adoption in Bihar is beginning to move beyond institutional and

government fleet buyers toward private middle-class consumers, a transition that the state's Transport Secretary has publicly acknowledged. This shift has implications for consumer expenditure patterns, dealership and servicing employment, and demand for supporting infrastructure such as charging stations.

Third, the concurrent acceleration of Bihar's GSDP growth and AFV market expansion lends support to the broader proposition, advanced by Kaur and Kumar (2026) and in macroeconomic assessments of India's EV transition, that vehicle electrification is linked to economic growth through channels that extend beyond the automotive sector itself—namely reduced fuel-import expenditure, capital investment in manufacturing and charging infrastructure, and employment generation in allied service industries. Bihar's rising Gross Fixed Capital Formation and its stated ambition to attract EV component manufacturing investment (including in the state's rapidly growing e-rickshaw segment, estimated as a five-million-unit addressable market by 2030) are consistent with this pattern.

Fourth, however, the discussion must be tempered by important caveats. Bihar's absolute EV market share remains below several other Indian states, and its economic growth is driven predominantly by the services and agriculture sectors rather than by automotive manufacturing. The transport and communication sector's 7.6 percent long-run growth rate, while respectable, reflects a broad set of factors including road-network expansion and logistics growth, of which AFVs are only one contributing element. As such, the relationship identified in this study should be read as a positive and policy-relevant association rather than as direct statistical proof that AFV market growth is driving Bihar's overall economic expansion.

Fifth, the analysis highlights specific policy levers with demonstrated influence on the AFV market's trajectory: road tax and registration fee exemptions, capital subsidies for manufacturing units, aggregator electrification mandates, and charging infrastructure subsidies. These instruments align with the factors identified as significant in the wider literature and offer a template for further state-level policy refinement.

Sixth, the charging infrastructure data presented in Table 3 indicates that while Bihar's existing charging network remains modest relative to national figures, the pace of planned expansion is substantial, and departmental announcements suggest an intention to more than triple the number of charging points within a short period. Insofar as infrastructure availability is a recognised determinant of consumer confidence in AFV adoption, continued follow-through on these announced targets will likely be a precondition for sustaining the registration growth rates observed in 2024–25.

Seventh, the comparative analysis in Table 4 situates Bihar's experience within the broader national pattern of state-level EV competition. Bihar's growth trajectory—rapid percentage expansion from a small base, concentrated in the e-rickshaw and two-wheeler segment—closely parallels the pattern that propelled Uttar Pradesh to national leadership in EV registrations. This suggests that Bihar's most realistic near-term economic opportunity in the AFV space may lie less in competing with established manufacturing hubs such as Karnataka and Tamil Nadu for large-scale component investment, and more in consolidating its position in low-cost, high-volume electric two- and three-wheeler adoption, where the employment and income-generation effects—particularly through informal self-employment in e-rickshaw operation—are likely to be most immediate and most widely distributed across the state's large rural population.

6.1 Scope for Future Research

This study's reliance on secondary, state-level aggregate data means that several important questions remain open for future empirical work. Primary survey-based research, covering a representative sample of AFV owners, dealers, and charging-station operators across Bihar's districts, would allow researchers to test the association identified here using formal statistical techniques such as regression or panel-data analysis, and to control for confounding factors such as fuel-price trends, road-infrastructure investment, and rural electrification levels. District-level analysis, given Bihar's considerable internal economic disparity between districts such as Patna and less-developed regions such as Sheohar, would also help clarify whether AFV-linked economic benefits are concentrated in urban centres or are diffusing into rural and semi-urban markets as intended by the state's policy design. Finally,

given the employment-generation claims associated with the sector nationally, a dedicated labour-market study tracking actual job creation in Bihar's AFV manufacturing, sales, servicing, and charging-infrastructure segments would substantially strengthen the evidentiary basis for future policy design.

7. Conclusion

This study set out to examine the growth of the Alternative Fuel Vehicle market in Bihar and its relationship with the state's broader economic growth. The evidence assembled from official transport records and the state's Economic Survey indicates that Bihar's AFV market has grown rapidly since the introduction of a dedicated state EV policy in December 2023, with total registrations rising by approximately 113 percent in a single year. This growth has occurred alongside one of the strongest periods of GSDP growth recorded by the state in recent years, alongside a marked rise in capital investment. While the secondary-data-based design of this study does not permit a definitive causal claim, the co-movement of these indicators, together with supporting evidence from the wider literature on the economic channels linking EV adoption to employment, manufacturing investment, and energy-cost savings, suggests that Bihar's AFV market is emerging as a meaningful, if still modest, contributor to the state's economic development trajectory. For this contribution to deepen, sustained investment in charging infrastructure, continued fiscal incentives, expansion of local manufacturing capacity, and greater penetration into rural and semi-urban markets—where Bihar's population is overwhelmingly concentrated—will be necessary. Future research employing primary survey data and formal econometric modelling would be valuable in establishing more definitive causal linkages between AFV market development and regional economic growth in Bihar.

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