EV Policies and Two-Wheeler EV Adoption: Evidence from Indian States

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The adoption of electric vehicles (EVs) in India is in a nascent stage, with two-wheelers (2Ws) playing a critical role in the transition to sustainable mobility. While supportive policies have accelerated EV adoption, regional disparities persist. This paper examines the impact of state-level EV promotion policies on 2W-EV adoption using a panel data of 23 Indian states. The empirical findings suggest that state-level supportive policies boost adoption rates. Further, robust charging infrastructure, when combined with even moderate fiscal incentives can drive adoption.

Introduction

To accelerate the adoption of electric vehicles (EVs), governments (both centre and states) have implemented several policies and initiatives. This push aligns closely with India's commitment under the *Panchamrit* agenda presented at Conference of the Parties-26 to reduce the emission intensity of gross domestic product by 45 per cent from 2005 levels by 2030 and achieving net zero by 2070. The shift to EVs is crucial, *inter alia*, not only for meeting India's climate goals but also for addressing domestic challenges such as reducing oil imports, combating air pollution, and facilitating employment growth in a sunrise sector. With about three-fourths of vehicle registrations in India being two-wheelers in 2024-25, any initiative aimed at tackling the challenges posed by fossil fuels in the automobile sector must prioritise accelerating the adoption of two-wheeler electric vehicles (2W-EVs). India, being the third largest automobile market (of passenger and commercial vehicles) and the second largest manufacturer of two-wheelers in the world, is uniquely positioned to capitalise on the decarbonisation of the 2W vehicle segment (Rajya Sabha, 2023). Although, the share of 2W-EVs in total EVs (2W+3W+4W) has been rapidly climbing upwards, it is yet to catch up with the same share as 2Ws in overall sales (Chart 1). Estimates suggest that with supportive policies, 80 per cent of 2Ws can become electric by 2030-31 (JMK Research & Analysis, 2022).

A host of factors have contributed to enable EVs to enter mass market globally (Chart 2). Over the past decade, numerous supportive policies for EVs have been initiated in global markets, driving a significant expansion of EVs. These initiatives were launched as early as the 1990s in Norway, by the United States in 2008, and China in 2014 (IEA, 2021).

Supportive government policies have been central to the global growth of EVs, addressing barriers like high upfront costs and limited charging infrastructure. From tax incentives to subsidies, such measures have proven effective in fostering EV adoption by making them accessible and affordable to consumers (Münzel *et al.*, 2019). In India, with its significant market potential, a combination of fiscal and infrastructural initiatives across states can play a critical role in driving this transition, particularly in the 2W segment. These policies can provide the necessary impetus for the transition to sustainable mobility.

Globally, India, China, and the Association of Southeast Asian Nations (ASEAN) countries represent the largest markets for two and three-wheelers.

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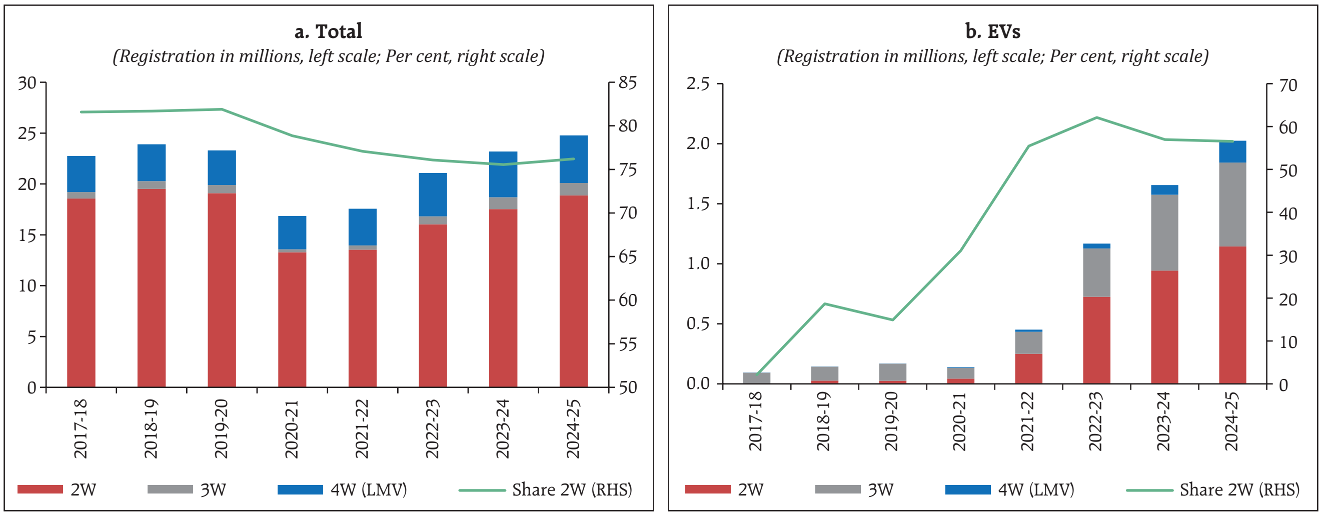
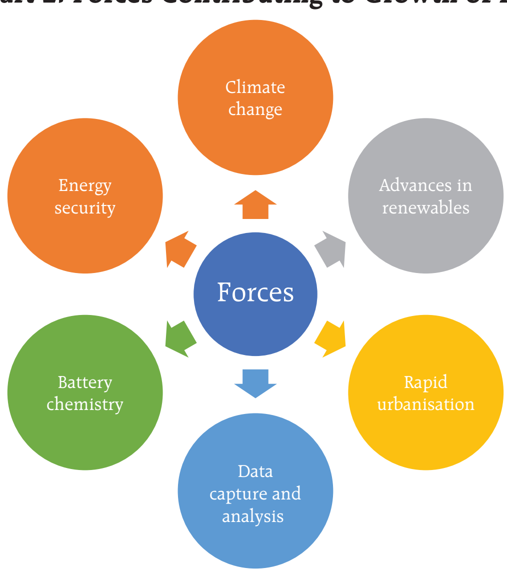
Chart 1: Vehicle Sales in India



Notes: 1. Light Motor Vehicle (LMV) include cars, jeeps, vans, and small trucks used with the gross weight of under 7.5 tons. Here only passenger LMVs are considered.
2. Total refers to both conventional fossil fuel powered vehicles and EVs.
Sources: CMIE Industry Outlook; and author's calculations.

In 2023, China accounted for 78 per cent of global 2W-EVs sales followed by India which is the second largest 2W-EV market globally. India had around five per cent of its 2W sales being electric in 2023. Electric cars are also steadily advancing towards becoming a mass-market product in an increasing number of countries. In 2023, majority of electric car sales occurred in China, Europe, and the United States, accounting for about 95 per cent of global electric car sales. Thus, sales of both 2W-EVs and electric cars are still geographically concentrated, *albeit* in different regions[1]. In large emerging car markets like India and Brazil, share of EVs remain relatively low, but several factors indicate potential for further growth (IEA, 2024) [Chart 3].

Chart 2: Forces Contributing to Growth of EVs

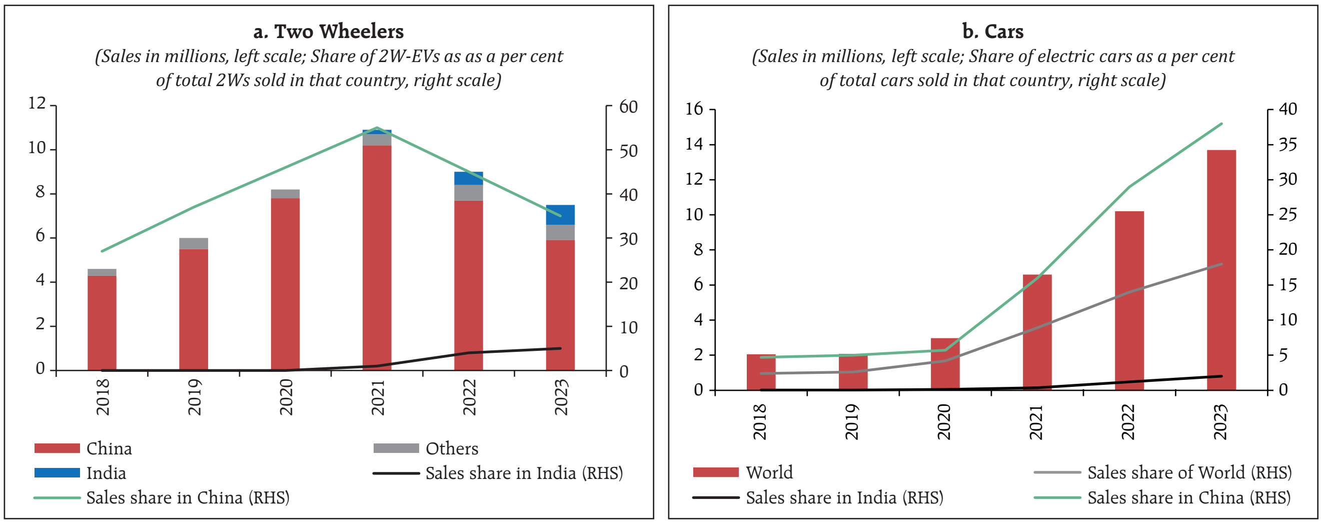


Source: NITI Aayog, 2018.

Against the backdrop of India's significant position as the second largest 2W-EV market globally, the 2W-EV market holds immense promise, and the role of targeted governmental action comes to the fore. Consequently, this article analyses the impact of state government policies in driving the growth of the 2W-EVs in India. The rest of the article is divided into the following sections. Section II provides an overview of the landscape for EV policies. Section III provides a brief literature review. Section IV outlines the sources of data and methodology. The empirical estimation and results are discussed in Section V, followed by section VI, which concludes with the way forward.

[1] Electric car sales are concentrated in China, Europe, and the US, while 2W-EVs are concentrated in China, India, and ASEAN countries.

Chart 3: Sales and Share of Electric Personal Vehicles



Notes: Others in Chart a includes Europe, Latin America, North America, Vietnam, Afghanistan, Bangladesh, Brunei, Cambodia, Lao People's Democratic Republic, Myanmar, Mongolia, Nepal, Pakistan, Singapore, Sri Lanka and Chinese Taipei.
Sources: IEA, 2024.

II. Policy Landscape

Countries around the world are adopting multifaceted policies to promote EVs *viz.*, prescribing emission standards, providing industrial incentives, intensifying competition in the EV manufacturing sector, installation of public charging points, *etc.* Apart from these supply side measures, demand side measures like upfront subsidy to buyers of EVs have also been at play simultaneously (Table 1). However, inadequate financial incentives on account

Table 1: Key Developments in Global EV policies

Region	Key Initiatives	Brief overview
United States	Inflation Reduction Act	Tax incentives, manufacturing linked credits support, and supply chain agreements to boost clean energy and EV production.
European Union	Green Deal Industry Plan	Deployment of public charging stations, focus on net-zero technologies, raw material sourcing, recycling and domestic battery production to meet 90 per cent of EU demand by 2030 (as part of Net-Zero Industry Act).
China	EV Subsidy Program	Trade-in subsidy scheme with a higher premium for purchase of EVs, exemption of EVs from purchase tax applicable on other segments, significant investment in strengthening charging infrastructure, and battery manufacturing leadership.
Japan	Green Growth Strategy	Goal to phase out sale of new gasoline-only cars by 2035, purchase subsidies for electric and fuel cell cars, and boosting battery supply chains.
Canada	Zero-Emissions Vehicle (ZEV) Mandate	Provincial ZEV mandates, federal purchase incentives, and supply chain investments for batteries and critical minerals.
Australia	National Electric Vehicle Strategy	Government-led incentives for EV adoption, development of charging networks, and plans for local battery and EV component manufacturing.
United Kingdom	Zero Emission Vehicle (ZEV) Mandate	All new cars and vans to be zero emission vehicles by 2035, investment in nationwide charging infrastructure, and tax rebates for company cars, Vehicle Emission Trading Scheme setting targets for zero-emission car sales
Norway	EV Tax Exemptions	Exemptions from registration fees, tolls, and VAT on EV purchases; target to phase out internal combustion vehicles by 2025.
India	FAME I and FAME II; PM E-DRIVE	Incentives to promote demand, creating necessary charging infrastructure for EVs and R&D support.

Sources: IEA, 2025; and authors' compilation.

Table 2: Evolution of EV Policy in India

Policy	Goals	Incentives
Alternate fuels for surface transportation (AFST) [2011]	Developing indigenous technology and encouraging domestic manufacturing.	Central financial assistance as a subsidy to direct end-users; Incentives for R&D and domestic manufacturing.
National electric mobility mission plan (NEMMP) 2020 [Launched in 2013]	Achieve 6-7 million sales of electric and hybrid vehicles year on year from year 2020 onwards.	Tax incentives; support for charging infrastructure; Pilot projects; Market creation; and R&D support.
Faster Adoption and Manufacturing of (Hybrid and) Electric Vehicles in India (FAME India) Scheme Phase I (2015) [Launched as part of NEMMP]	Four focus areas: • Demand creation • Technology platform • Pilot projects • Charging infrastructure.	Demand incentives for buyers of EVs in the form of an upfront-reduced purchase price, grants for specific projects under pilot projects, R&D/ technology development, and public charging infrastructure.
FAME India Scheme Phase-II (2019) [Extension of FAME India Scheme Phase-I]	Encourage faster adoption of EVs; Establishing necessary charging infrastructure for EVs; Carrying out various awareness activities.	Financial subsidies to buyers by offering upfront incentives on purchase; State-level incentives in addition to central subsidies; and R&D support.
Production Linked Incentive (PLI) Scheme for Automobile and Auto components (2021)	Enhance India's Manufacturing Capabilities for Advanced Automotive Products'.	Financial incentives to boost domestic manufacturing of Advanced Automotive Technology products and attract investments in the automotive manufacturing value chain.
Electric drive revolution in innovative vehicle enhancement (PM E-DRIVE) [2024]	Promote electric mobility, reduce the environmental impact of transportation, and improve air quality; Expedite adoption of EVs. Efficient, competitive, and resilient EV manufacturing.	Subsidies/Demand incentives for 2 & 3W-EVs, e-ambulances, e-trucks and other emerging EVs; Installation of EV public charging stations in selected cities with high EV penetration and highways.

Sources: PIB; Bureau of Energy Efficiency (BEE); and authors' compilation.

of limited fiscal space can hinder the adoption of EVs in emerging and developing countries (IEA, 2024).

In line with global policy trends, India has also introduced policy support for adoption of EVs (Table 2). Early efforts began with fiscal incentives under Alternate Fuels for Surface Transportation (AFST) in 2011. Most recently Electric Drive Revolution in Innovative Vehicle Enhancement (PM E-DRIVE) scheme was introduced which came into effect from October 1, 2024, and will remain in force until end-March 2028[2] (PIB, 2024). The scheme seeks to reduce transportation-related environmental impacts and improve air quality while also promoting an efficient and competitive EV manufacturing sector.

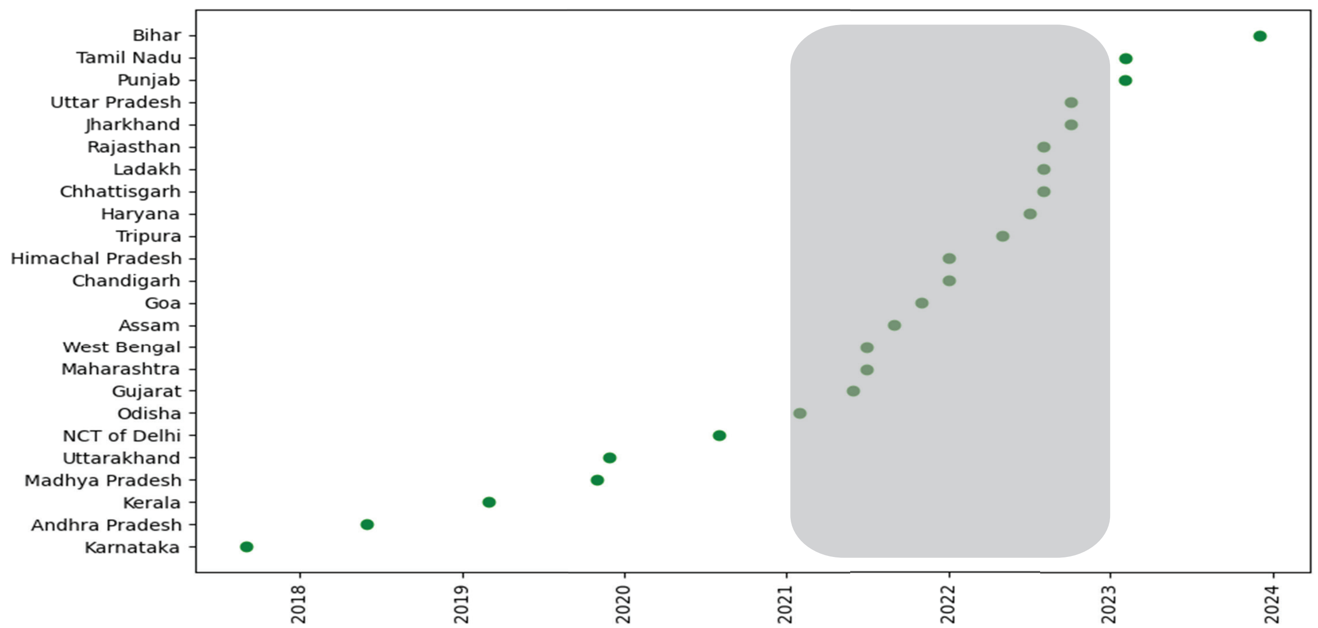
In line with policies of the centre, state governments have also introduced complementary policies for EVs. Notably, southern states like Karnataka, Andhra Pradesh and Kerala were the early movers in this regard (Chart 4). Most of the policies at state-level were introduced between 2021 and 2023. A state EV policy broadly has three main pillars *viz.*, demand incentives, improving charging infrastructure and boosting skill development and R&D.

III. Literature Review

Subsidies and financial incentives influence consumer behaviour, especially in sectors like EVs, where high upfront costs can be prohibitive. Several studies have shown that monetary incentives such as rebates, tax credits, and reduced registration fees enhance EV adoption by lowering the initial purchase cost for consumers (Jenn *et al.*, 2018; and Sierzchula *et al.*, 2014). In markets such as Europe, targeted fiscal incentives have significantly reduced the price gap between EVs and conventional vehicles, making EVs more accessible (Lévay *et al.*, 2017).

[2] https://www.pib.gov.in/PressReleasePage.aspx?PRID=2154408

Chart 4: Timeline of EV Policy Notifications by States/UTs



Note: The shaded region indicates that majority of state policies were notified between 2021 and 2023.
Source: BEE

Empirical evidence from the U.S. demonstrates that incentives closer to the point of sale, like rebates, are more effective in driving EV sales than tax credits (Narassimhan and Johnson, 2018). Wee, Coffman, and La Croix (2018) found that a $1000 increase in state-level subsidies in the U.S. results in a 5–11 per cent increase in EV registrations. Similarly, in Europe, a study by Münzel *et al.* (2019) found that a €1000 increase in financial incentives leads to a 5-7 per cent rise in EV market share, underscoring the importance of both the availability and magnitude of monetary benefits in influencing market penetration. The adoption of EVs in India is still in a nascent stage (Saw *et al.*, 2023), and hence the presence of appropriate incentives is crucial. In India, government policies have been geared towards promoting EVs, as part of efforts to decarbonise the transport sector and reduce dependence on oil imports. Chakraborty *et al.* (2022) underscores the importance of demand-side incentives such as price subsidies, preferential tax treatments, and improvements in charging infrastructure in accelerating the adoption of electric two-wheelers. Further, Srivastava *et al.* (2022) highlight through a game-theoretic model that a well-balanced mix of demand-side and supply-side measures, such as differential taxes, can maximise social welfare, stimulate EV adoption, and help achieve long-term sustainability goals.

Charging infrastructure has been repeatedly identified as a critical enabler of EV adoption. Li *et al.* (2017) finds that greater availability of public charging stations is associated with higher EV sales, emphasising the complementarity between charging availability and consumer demand. Hall and Lutsey (2017) show that markets with more developed charging networks, like Norway and the Netherlands, have experienced significantly higher EV adoption rates. In the Indian context, Nigam *et al.* (2024) show that the availability of charging stations influences EV uptake, highlighting the importance of robust infrastructure in supporting the growth of the EV market.

The paper contributes to the growing literature by examining the differential impact of state-level EV promotion policies on the adoption of 2W-EVs, a relatively underexplored segment in India. Further, it uniquely integrates state-level policy variations with the role of charging infrastructure to provide insights into regional adoption disparities.

IV. Data and Methodology

This study utilises quarterly data on state-wise registration of electric and non-electric 2W sales (Q1:2021 to Q2:2024), number of public charging stations (as on August 2024), state-wise road length (as per Basic Road Statistics of India 2018-19), and state EV policy notifications[3] to capture multiple dimensions of developments in the 2W-EVs (Table 3, Annex 1 and 2).

To assess the uptake of 2W-EVs across the Indian states, an adoption ratio (AR) is calculated, which is defined as:

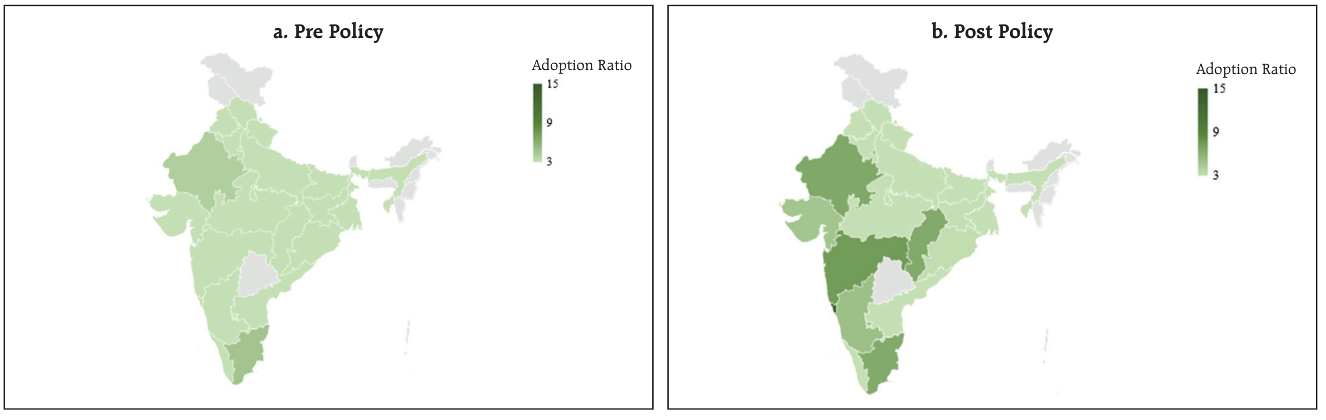
$$AR_{i,t} = \frac{Total\ 2W\text{–}EVs\ registered\ in\ state\ i\ in\ period\ t}{Total\ non\ electric\ 2Ws\ registered\ in\ state\ i\ in\ period\ t} * 100$$

Table 3: Sources of Data

S. No.	Data (State-wise)	Source
1.	2- W sales (electric and non-electric)	Vahan Portal
2.	Number of public charging stations	BEE
3.	Road length	Database of Basic Road Statistics of India, Ministry of Road Transport and Highways
4.	EV policy notification dates	BEE

The ratio calculates the proportion of sales of 2W-EVs *vis-à-vis* the non-electric 2W equivalent. Higher AR signifies a greater share of EV sales relative to non-EVs, hence a deeper penetration of 2W-EVs. To visualise change in AR post EV policy-adoption by states, a geographical heat map depicting pre and post policy adoption scenarios are presented in Chart 5. The dark green regions in the post-policy heat map indicates that southern and the western regions of India have exhibited a stronger policy effect in adoption of 2W-EVs. In contrast, the lighter shaded

Chart 5: EV Adoption in India (Before and After State EV Policy Introduction)



Notes: 1. The pre-policy adoption ratios for each state are calculated as the average adoption ratio for six quarters preceding the EV policy notification quarter.
2. The post-policy adoption ratios for each state are determined by averaging the adoption ratios for the six quarters following the EV policy announcement quarter.
3. For states where the EV policy was implemented before the study period, the post-policy adoption ratio is computed as the average of adoption ratios starting from the March 2021 quarter onwards.
4. For states where the policy has been implemented between March 2021 and September 2022, the averages were taken for six quarters or less preceding EV policy notification for calculating pre-policy adoption ratios.

Sources: Vahan Portal; BEE; and authors' calculations.

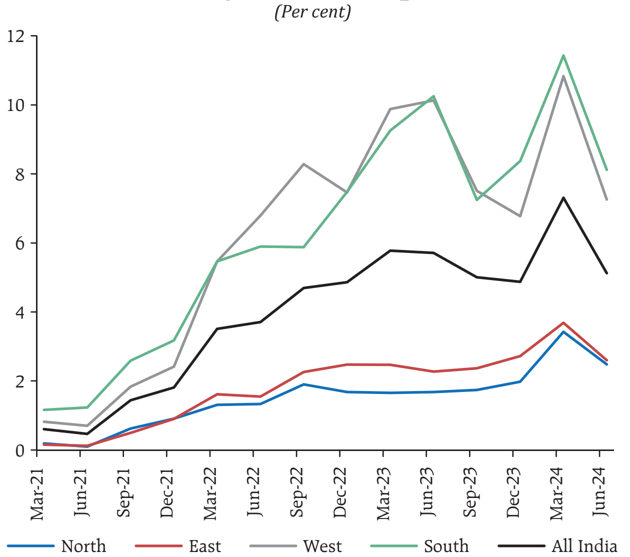
[3] These notifications give details about the starting of scheme, information pertaining to demand incentive, government initiative to strengthen its charging infra, R&D and manpower training.

region of heat map in the northern and eastern states indicate a comparatively modest growth in adoption rates.

In light of the above, evolution of AR is plotted for different regions of India (North, South, East and West)[4] in Chart 6. The preferences for 2W-EVs in India have been driven by multiplicity of factors. For *e.g.*, in the aftermath of Covid-19, the high demand for personal mobility encouraged the bike rental companies to add more 2W-EVs in their fleet[5]. Southern and Western regions, early movers in formulating state-level EV policies, have exhibited consistently better AR than all-India AR, while northern and eastern regions lag. Thus, the adoption trajectory across India is clearly non-uniform and non-synchronous which can be attributed to both local and a few common factors that played out differently across regions. Additionally, inadequate charging infrastructure has been repeatedly highlighted as hinderance to the long-term growth of EVs.

Chart 6: Region-wise Adoption Ratio

(Per cent)



Sources: Vahan Portal; BEE; and Authors' calculations.

A major bottleneck in adoption of an EV over an internal combustion engine powered vehicle is lack of adequate charging infrastructure. To capture this, an EV charging index[6] is constructed as shown below:

$$EV\ Charging\ Index_i = \frac{Number\ of\ public\ charging\ stations\ in\ state\ i}{Total\ road\ length\ in\ the\ state\ i} * 100$$

The state wise EV charging index provides a comparative picture of the status of charging infrastructure across India. Out of five leading states with robust charging infrastructure, three states *viz.*, Karnataka, Goa and Maharashtra belong to the south-west coast of India. Moreover, Delhi and Haryana from the north India feature in the top five (Chart 7). Besides framing the relevant EV policies, several state governments have worked upon strengthening their charging infrastructure. States like Andhra Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Kerala, *etc.* have been providing capital subsidies ranging between 25-60 per cent on total cost of charging station equipment/machinery and components. Delhi has provision to sanction 100 per cent grant on purchase of charging equipment.[7]

In June 2023, the central government reduced the subsidy provided to customers purchasing 2W-EVs under the ongoing FAME II policy as part of its strategy to rationalise subsidies and promote a more sustainable and self-reliant EV ecosystem in the long term as well as concerns over non-compliance to localisation norms.[8] The subsidy was capped at 15 per cent of the ex-factory price, reduced from the

[4] North: Haryana, Himachal Pradesh, Punjab, Uttar Pradesh; Uttarakhand; South: Andhra Pradesh, Karnataka, Kerala, Tamil Nadu; East: Bihar, Odisha, Jharkhand, West Bengal; West: Rajasthan, Gujrat, Goa, Maharashtra.

[5] https://timesofindia.indiatimes.com/blogs/voices/rise-in-ev-rental-of-2-wheelers-in-india/

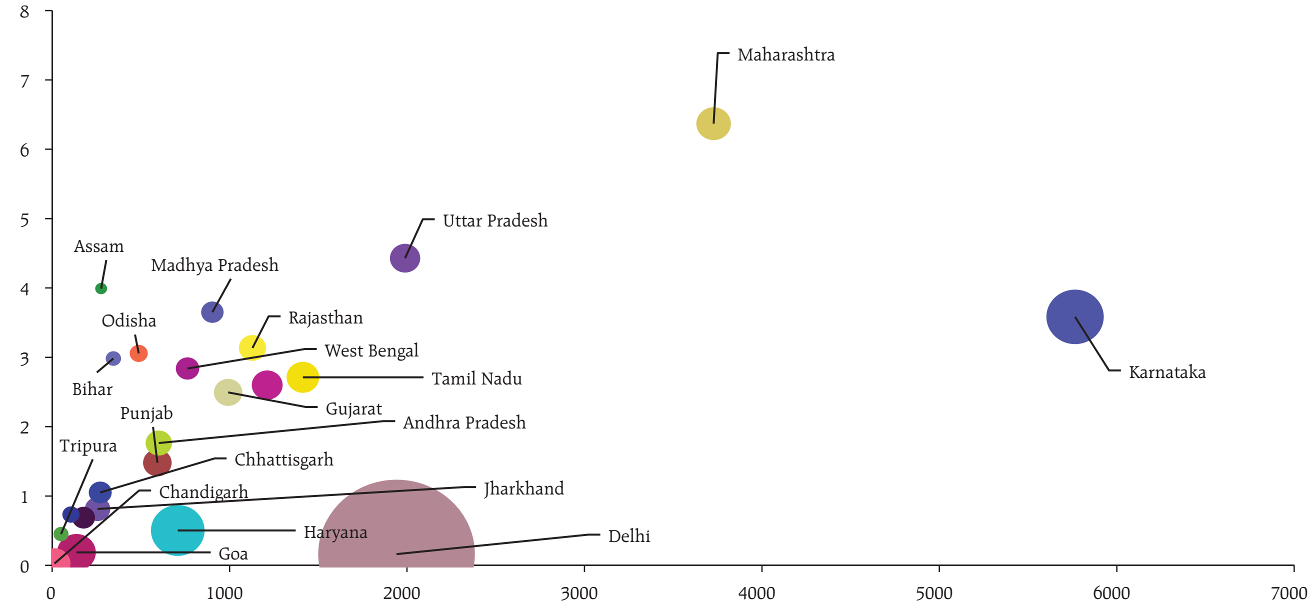
[6] The index is based on August 2024 data due to unavailability of time-series data on number of charging stations.

[7] The Government of National Capital Territory of Delhi (GNCTD) vide Delhi Electric Vehicles Policy, 2020, aims to provide a grant of 100% for the purchase of charging equipment up to Rs. 6000/- per charging point for the first 30,000 charging points.

[8] https://indbiz.gov.in/govt-reduces-fame-ii-subsidies-for-electric-two-wheelers/

Chart 7: EV Charging Infrastructure Index

(Road length in lakh kms, vertical scale; Number of public charging stations, horizontal scale)



Note: Larger the size of the bubble, higher is the number of public charging stations per kilometre of road length.
Sources: Ministry of Road Transport and Highways of India; BEE; and authors' compilation.

previous limit of 40 per cent of the cost of the vehicle. Additionally, the subsidy rate was set at ₹10,000 per kWh of battery capacity, lower than the earlier incentive of ₹15,000 per kWh for manufacturers.[9] This move impacted the sales in the September 2023 quarter across India (Chart 8).

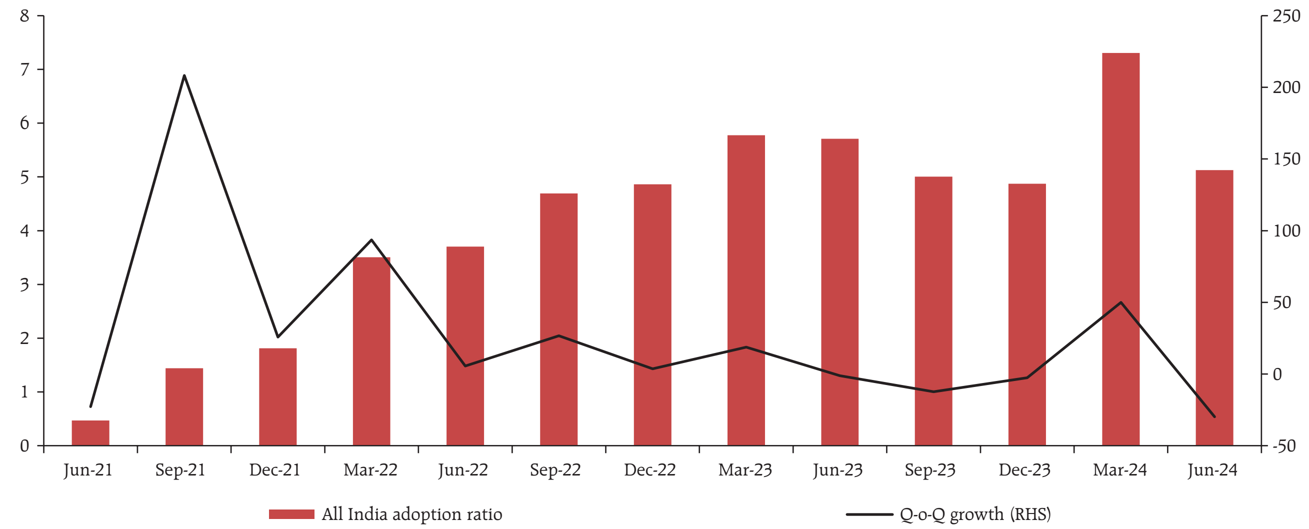
Most state governments have been offering incentives such as subsidies along with tax and registration fee waivers on every new 2W-EV purchase. On the other hand, a few states did not offer any additional subsidies beyond tax and registration fee waivers. An analysis of the 2W-EV adoption ratio in 23 states–six states that offered only tax and registration fee waivers without any additional subsidies, and 17 states that provided a top-up subsidy along with these waivers—revealed notable differences in adoption trends. In the aftermath of the policy change in June 2023, the average adoption ratio in the six states without additional subsidies contracted by 24 per cent quarter-on-quarter (Q-o-Q) in the September 2023 quarter. In contrast, the 17 states offering additional subsidies experienced a smaller decline, with average adoption rate falling by 17 per cent Q-o-Q during the same period. This suggests that states providing higher levels of support helped cushion the impact of the subsidy reduction under FAME II, to some extent.

For the empirical design, data on state-wise policies for 2W-EVs across 23 states of India is utilised, covering a period from Q1:2021 to Q2:2024, with a total sample size of 322 observations. First, an EV policy indicator variable for policy incentives for each state was created, which takes a value of 1 for periods after the policy came into effect and 0 otherwise. The binary-level policy indicator encapsulates the information on the diverse set of policy instruments, including demand incentives, charging infrastructure development, R&D, and related aspects reflecting the impact of an overall EV policy in a state. To explore the combined impact of policy implementation and charging infrastructure, states are ranked based on EV charging index. A dummy variable representing

[9] https://egazette.gov.in/(S(vtvytkdyvv1cxyitlmdwjjih))/ViewPDF.aspx

Chart 8: All India 2W-EV Adoption Ratio

(Per cent, left and right scale)



Sources: Vahan portal; and authors' calculations.

the top seven or 12 states, based on their ranking in the EV charging index, is also used in different model specifications. This variable is employed to analyse the joint effect of policy measures and charging infrastructure on accelerating the adoption of EVs.

We employ a panel regression model, with the adoption ratio (AR) as the dependent variable, explained by a binary-type policy indicator variable.

$$AR_{it} = \beta_1 \text{ Policy.Indicator}_{it} + \alpha_i + \epsilon_{it} \quad (1)$$

- β_1 measures the effect of policy indicator on the adoption ratio.
- α_i captures the state-specific fixed effects on adoption ratio.

In the next specification, a dummy variable (rr) is utilised to restrict the policy-event effect to the leading states, focusing on the top seven or 12 with the highest concentration of EV charging stations. The regression model is formally expressed as follows:

$$AR_{it} = \beta_1 \text{ Policy.Indicator}_{it} + \beta_2 \text{ rr}_{it} + \beta_3 (\text{Policy.Indicator}_{it} \times \text{rr}_i) + \alpha_i + \epsilon_{it} \quad (2)$$

- β_1 measures the effect of policy indicator on adoption ratio, holding rr and state-specific effects constant.
- β_2 measures the effect of rr on the adoption ratio, holding policy indicator and state-specific effects constant.
- β_3 represents the additional effect on the adoption ratio due to the interaction between the policy indicator and rr.
- α_i captures the state-specific fixed effects on adoption ratio.

Demand-driven incentives introduced by states aim to lower the overall cost of EV ownership, making 2W-EVs more affordable to potential buyers. The benefits range from moderate incentives, such as registration fee waivers and tax exemptions, to more aggressive incentives that include subsidies in addition to these waivers. The demand-supporting policy incentives are categorised into two approaches: moderate and aggressive. The policy indicator classified as 'aggressive' takes a value of 1 when the state government offers subsidies along with tax/registration fee waivers, and 0 otherwise. The 'moderate' policy indicator takes a value of 1 if only tax/registration fee exemptions are provided, without an additional subsidy, and 0 otherwise. The model is formally defined as follows:

$$AR_{it} = \beta_1 \cdot policy\_agg_{it} + \beta_2 \cdot policy\_mod_{it} + \alpha_i + \epsilon_{it} \quad (3)$$

- AR_{it} is the adoption ratio for an individual state *i* at time *t*.
- β_1 and β_2 are the coefficients associated with aggressive policy and moderate policy indicators respectively.
- α_i captures the state-specific fixed effects on adoption ratio.

In conjuncture, the next model incorporates a dummy variable (rr) for charging infrastructure, indicating whether a state ranks in the top seven or 12 based on the EV charging index. The model seeks to determine how these two categories of incentives—moderate and aggressive—affect the adoption of 2W-EVs. The model is formally defined as follows:

$$AR_{it} = \beta_1 \cdot policy\_agg_{it} + \beta_2 \cdot rr_i + \beta_3 \cdot (policy\_agg_{it} \times rr_i) + \beta_4 \cdot policy\_mod_{it} + \beta_5 \cdot (policy\_mod_{it} \times rr_i) + \alpha_i + \epsilon_{it} \quad (4)$$

- β_1 and β_4 are the coefficients associated with the aggressive policy and moderate policy indicators respectively.
- β_2 measures the effect of rr on the adoption ratio, holding other effects constant.
- β_3 and β_5 represent the additional effect on the adoption ratio due to the interaction between rr and aggressive and moderate policy respectively.
- rr_i is the dummy variable for the leading state *i* possessing a sound EV charging infrastructure.
- α_i captures the state-specific fixed effects on adoption ratio.

V. Results and Discussion

The results of the model (1 and 2) are presented in Table 4. The policy indicator variable shows a positive and statistically significant effect on the adoption ratio, signaling a positive relationship between policy implementation and 2W-EV adoption. To further understand the impact of timely policy interventions in states with better EV charging infrastructure, two panel regression models are employed. In the first model, a dummy variable (rr) for charging infrastructure is used to represent the top seven states with the best charging infrastructure (Model 2a). In the second model, the analysis is extended to include the top 12 states (Model 2b). These two specifications allow for a comparative assessment of the policy impact across different levels of infrastructure development. In these specifications, the interaction term between the policy indicator and the dummy variable for regions with better-developed charging infrastructure shows that charging infrastructure, alongside state localised policy interventions, has a multiplier effect on 2W-EV adoption, as evidenced by the higher coefficient of the interaction term in both models, although at lower significance levels.

As various states offer different demand incentives to encourage potential EV buyers, these

Table 4: Panel Regression Results

Dependent Variable: Adoption Ratio (23 States)
Period (March 2021- June 2024) Sample Size = 322

Explanatory Variables	Model 1	Model 2a (Top 7 states)	Model 2b (Top 12 states)
Policy Indicator	3.1** (0.85)	1.80*** (0.47)	1.53* (0.61)
Policy Indicator *rr		4.06^ (2.24)	2.72^ (1.49)

Notes: 1. ^, *, ** and *** indicate significance at 10, 5, 1 and 0.1 per cent level, respectively.
2. Figures in parentheses are standard errors clustered at states level.

Table 5: Panel Regression Results

Dependent Variable: Adoption Ratio (23 States)
Period (March 2021- June 2024) Sample Size = 322

Explanatory Variables	Model 3	Model 4a (Top 7 states)	Model 4b (Top 12 states)
Policy aggressive	3.25** (0.98)	1.88*** (0.512)	1.61* (0.72)
Policy moderate	2.03** (0.65)	1.02*** (0.00)	1.02*** (0.00)
Policy aggressive *rr		4.96^ (2.82)	2.84^ (1.72)
Policy moderate *rr		1.86*** (0.00)	1.86*** (0.00)

Notes: 1. ^, *, ** and *** indicate significance at 10, 5,1 and 0.1 per cent level, respectively.
2. Figures in parentheses are standard errors clustered at states level.

incentives are classified as moderate or aggressive, as described above. The results of the respective model specifications (3) and (4) are presented in Table 5. The empirical results indicate that direct monetary subsidies, combined with tax and registration fee waivers on 2W-EV sales, significantly boost 2W-EV adoption. The moderate incentive strategy having lower coefficient value underscores the importance of stronger incentivisation strategy (Model 3). The coefficient of interaction between moderate policy and charging infrastructure (rr), however, is significant suggesting that even moderate policy with robust charging infrastructure can drive adoption of 2W-EVs (Model 4 a and b).

VI. Conclusion

The adoption of 2W-EVs in India is critical for achieving decarbonisation goals. This study highlights the significant role of state-level policies in shaping the adoption trajectory of 2W-EVs across different regions in India. The findings underscore that policy measures, including financial incentives, tax waivers, and investments in charging infrastructure, significantly influence EV uptake, particularly when designed to address the price-sensitive nature of the Indian market.

The analysis reveals a clear regional disparity in adoption rates, with southern and western states showing greater adoption partly due to robust infrastructure and early formulation of EV policies. To achieve the EV 30@30 (GoI, 2024) target and sustain growth, continued investment in infrastructure and a phased policy approach are crucial. From policy makers' perspective, our results suggest that even moderate policy support with robust charging infrastructure can drive EV adoption.

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Annex 1

Region	Total Public Charging Stations	Road Length (Kilometres)	EV Charging Index	Ranking
NCT of Delhi	1941	16170	12.00	1
Karnataka	5765	358300	1.61	2
Haryana	708	50292	1.41	3
Goa	137	18697	0.73	4
Maharashtra	3728	636887	0.59	5
Tamil Nadu	1413	271137	0.52	6
Chandigarh	13	2573	0.51	7
Kerala	1212	259932	0.47	8
Uttar Pradesh	1989	442907	0.45	9
Punjab	593	147862	0.40	10
Gujarat	992	249373	0.40	11
Rajasthan	1129	313469	0.36	12
Andhra Pradesh	601	176351	0.34	13
Jharkhand	256	81245	0.32	14
West Bengal	763	283865	0.27	15
Chhattisgarh	271	105074	0.26	16
Uttarakhand	177	68727	0.26	17
Madhya Pradesh	903	365045	0.25	18
Odisha	488	305631	0.16	19
Himachal Pradesh	106	73230	0.14	20
Bihar	345	298205	0.12	21
Tripura	50	45120	0.11	22
Assam	276	399122	0.07	23

Sources: Ministry of Road Transport and Highways; BEE and Author's calculations.

Annex 2

Region	Subsidy	Tax/ Registration Fee Exemption	Monetary Benefit Rating
Goa	P	P	2
Delhi	P	P	2
Karnataka	O	P	1
Kerala	O	P	1
Maharashtra	P	P	2
Tamil Nadu	O	P	1
Uttar Pradesh	P	P	2
Andhra Pradesh	O	P	1
Rajasthan	P	P	2
Odisha	P	P	2
Madhya Pradesh	O	P	1
Gujarat	P	P	2
Chhattisgarh	P	P	2
Assam	P	P	2
Haryana	P	P	2
Himachal Pradesh	O	P	1
Jharkhand	P	P	2
Tripura	P	P	2
West Bengal	P	P	2
Punjab	P	P	2
Uttarakhand	P	P	2
Chandigarh	P	P	2
Bihar	P	P	2

Notes: 1. P refers to present and O refers to not present.
2. Rating of 1 signifies moderate approach while 2 signifies aggressive approach.

Sources: BEE, Climate Trends and Author's compilation.