

Electric Vehicles and the Gig Economy: Economic Opportunities and Challenges for Delivery Riders in Bengaluru Urban District

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Abstract:

The rapid growth of quick-commerce and food-delivery platforms has made app-based delivery riding one of the most visible forms of gig work in Indian metropolitan areas. At the same time, electrification of two-wheelers is being promoted through central and state policy as a route to cleaner urban logistics. This paper examines how electric vehicles (EVs) shape the earnings, costs, working conditions and outlook of delivery riders in Bengaluru Urban District, and identifies the barriers that limit their wider adoption. A descriptive and analytical cross-sectional design was adopted. Primary data were gathered through a structured questionnaire administered to 350 delivery riders working with Swiggy, Zomato, Zepto/Blinkit and other platforms, complemented by secondary literature and policy documents. The data were analysed with percentages, means, cross-tabulation, Welch's t-test, chi-square test, one-way ANOVA and Pearson correlation. Findings indicate that EV riders spend substantially less on energy and maintenance than petrol riders (mean ₹1,920 versus ₹9,079 per month) and report significantly higher net monthly earnings (₹23,251 versus ₹17,446; $p < .001$), although riders on rented or leased EVs retain a smaller share of this gain because of recurring lease payments. Riders also reported greater satisfaction with EVs. However, inadequate charging and battery-swap infrastructure, waiting time, range anxiety, high upfront and lease costs, battery-replacement risk, algorithmic pressure and the near-absence of social security limit the benefits. The study concludes that EVs offer a real but unevenly distributed economic opportunity and recommends coordinated action by platforms, government, financial institutions and charging operators to make the transition equitable.

Keywords: electric vehicles, gig economy, delivery riders, platform work, Bengaluru, livelihoods, quick commerce

1. Introduction:

Platform-mediated work has become a defining feature of contemporary urban labour markets. Digital labour platforms match customers, workers and tasks through algorithms and smartphones, and in doing so they have created new opportunities for income generation with low entry barriers, while also shifting risk and cost from firms to workers (Graham et al., 2017; Kenney & Zysman, 2016). In India, the gig and platform economy are expanding quickly. NITI Aayog (2022) estimated that about 7.7 million workers

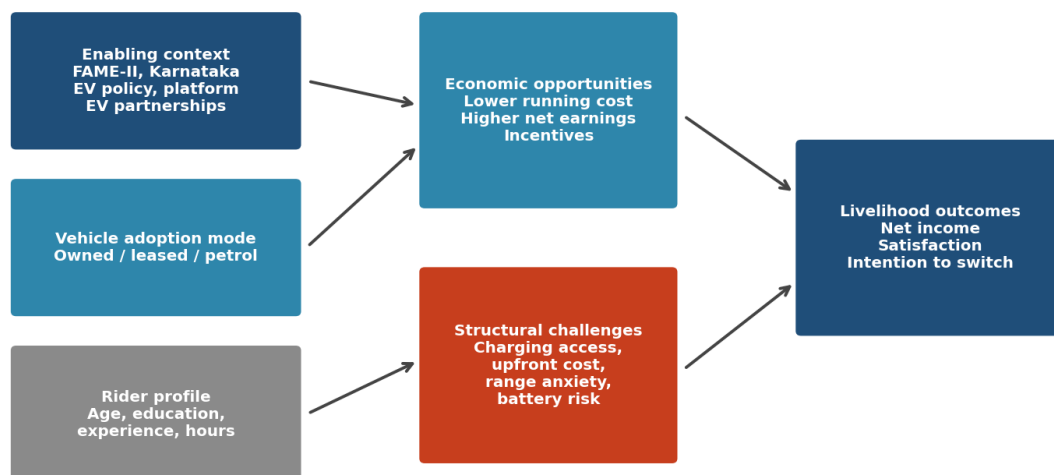
were engaged in the gig economy in 2020–21 and projected that this number could rise to roughly 23.5 million by 2029–30, with a growing share in transportation and delivery services.

Bengaluru, the capital of Karnataka and India's leading technology hub, is among the most intensive markets for app-based food and grocery delivery. Dense residential clusters, a large young workforce of migrants and professionals, and the rise of ten- to fifteen-minute quick-commerce services have increased demand for two-wheeler riders. Delivery riders in this ecosystem typically use their own or rented motorcycles and scooters and bear the costs of fuel, maintenance, insurance and repairs. Because these costs are largely fixed by the vehicle and not by the platform, any change in the vehicle technology directly alters the rider's take-home income.

Electric two-wheelers and three-wheelers have therefore become an important topic at the intersection of transport policy and labour economics. The Government of India's FAME India Phase II scheme provides demand incentives for electric vehicles with a focus on public transport and commercial fleets (Government of India, 2019), and the Government of Karnataka's Electric Vehicle and Energy Storage Policy was designed to attract manufacturing and support adoption (Government of Karnataka, 2017). Large platforms have also announced targets to electrify their delivery fleets. For riders, an EV promises lower running cost, quieter operation and reduced exposure to petrol price volatility. Yet the same riders are often young, low-income, indebted and dependent on a single platform, which raises the question of whether they can actually capture the benefits of electrification or whether the transition will simply reproduce existing inequalities.

Existing research on EVs in India has concentrated mainly on consumer adoption, technology, grid integration and emissions (Dhar et al., 2017; Goel et al., 2021; Kumar & Alok, 2020), while research on platform work has focused on algorithmic management, autonomy and precarity (Wood et al., 2019; Rani & Furrer, 2021). Very few studies bring the two strands together at the level of the individual worker. This paper addresses that gap by studying delivery riders in Bengaluru Urban District, treating the EV as both an economic asset and a source of new dependencies.

Figure 1. Conceptual framework of the study



Source: Authors' conceptualisation.

Study area

The study was conducted in Bengaluru Urban District, covering major delivery-intensive areas such as Koramangala, HSR Layout, Indiranagar, Whitefield, Malleshwaram, Jayanagar, Rajajinagar, Yelahanka, Electronic City, and central business locations. Its topography is largely flat, distances between dark stores, restaurants and customers are moderate, and traffic congestion makes two-wheelers the preferred delivery vehicle. These characteristics make the district a suitable setting in which to assess the practical viability of low-range electric two-wheelers. It should be noted that no comprehensive official register of app-based delivery riders exists for the district, so the study population cannot be enumerated exactly; the sampling approach described in Section 6 addresses this limitation.

Objectives of the Study

The broad aim of the study is to assess the economic opportunities and challenges that electric vehicles create for delivery riders working on digital platforms in Bengaluru Urban District. The specific objectives are:

1. To profile the socio-economic and work characteristics of delivery riders in Bengaluru Urban District.
2. To compare monthly costs and net earnings of riders using electric vehicles (owned and leased) with those using petrol vehicles.
3. To examine riders' perceptions of the economic opportunities offered by EVs, including cost savings, incentives and ride quality.
4. To identify the infrastructural, financial, technological and institutional challenges faced by EV riders.
5. To assess the effect of vehicle type on rider satisfaction and the intention to switch to EVs.
6. To suggest policy and managerial measures for an inclusive EV transition in the gig delivery sector.

Hypotheses

H1: There is a significant difference in mean monthly net earnings between EV riders and petrol riders.

H2: There is a significant difference in mean monthly running cost (energy plus maintenance) between EV riders and petrol riders.

H3: Vehicle type is significantly associated with the platform on which the rider works.

H4: Mean satisfaction with vehicle-based earnings differs significantly across owned-EV, leased-EV and petrol riders.

Need for the Study

The need for this study arises from five considerations. First, delivery work is a mass-employment sector for young and semi-skilled urban workers, yet it is largely unregulated and poorly documented; evidence on how technology choices affect these workers' incomes is scarce. Second, electrification is being promoted mainly on environmental and industrial grounds, and the distribution of its economic gains and costs among the workers who actually operate the vehicles is rarely examined. Third, the cost structure of a delivery rider is dominated by vehicle expenses, so a shift from petrol to electric propulsion could change take-home pay more than a marginal change in per-order platform payment. Fourth, riders on leased EVs may exchange fuel costs for fixed rental obligations, which alters income risk. Fifth, policy makers designing charging networks, financing schemes and social security for platform workers need location-

specific, worker-level data. By generating primary evidence from Bengaluru, this study offers inputs for evidence-based decisions by platforms, regulators and financial institutions.

Review of Literature

The literature relevant to this study is organised into five thematic strands: (i) the gig and platform economy, (ii) algorithmic management and work quality, (iii) platform work in India and Bengaluru, (iv) EV adoption in developing countries and India, and (v) policy and social protection.

The gig and platform economy

Kenney and Zysman (2016) argued that platforms restructure markets by acting as intermediaries that control access to demand while transferring capital and risk to individual providers. Kalleberg and Dunn (2016) contended that gig work contains both good and bad jobs, with the outcome depending on skills, bargaining power and the availability of alternatives. De Stefano (2016) described the emerging 'just-in-time workforce' in which workers are mobilised on demand and rewarded only for the time spent on tasks, raising concerns about income insecurity and the erosion of labour protections. Graham et al. (2017), studying digital labour in developing regions, found that platforms provide income opportunities and flexibility but also expose workers to isolation, uncertainty and weak bargaining positions. These studies establish that the economic value of platform work depends heavily on who bears the cost of the tools of work, which is directly relevant to vehicle choice.

Algorithmic management and work quality

Wood et al. (2019) showed that platform workers in the Global South value autonomy and flexibility but simultaneously experience algorithmic control, low pay and overwork. Vallas and Schor (2020) reviewed how platforms use ratings, dynamic pricing and automated allocation to govern workers while formally treating them as independent contractors. Woodcock (2020) documented an 'algorithmic panopticon' in food delivery, where continuous measurement of performance creates pressure while preserving an illusion of control. Schor et al. (2020) found that dependence on a single platform and reliance on gig income intensify precarity. For EV riders these findings imply that time lost in charging or battery swapping may be penalised by the algorithm even though it is beyond the rider's control.

Platform work in India and Bengaluru

Surie and Koduganti (2016) studied Uber and Ola drivers in Bengaluru and reported that platform work offered initial attractive earnings but that driver faced long hours, debt from vehicle purchase and declining incentives over time. Berg et al. (2018), in a global survey of digital labour platforms, documented low and irregular earnings and a lack of social protection for many workers. Rani and Furrer (2021), drawing on evidence from developing countries including India, showed how algorithmic management shapes work allocation, earnings and worker well-being in ways that workers can seldom contest. NITI Aayog (2022) highlighted the scale of platform employment in India and recommended social security, skilling and financial inclusion for gig workers. Collectively, these studies point to vehicle-related debt and cost exposure as a persistent source of vulnerability for Bengaluru's app-based transport and delivery workers.

EV adoption in developing countries and India

Rajper and Albrecht (2020) reviewed the prospects of EVs in developing countries and identified high purchase price, limited charging infrastructure, unreliable electricity supply, battery concerns and weak financing as major barriers, alongside benefits from lower operating costs. Dhar et al. (2017) assessed EVs

in India's passenger transport sector and highlighted the co-benefits for emissions and air quality when accompanied by a cleaner grid. Kumar and Alok (2020) reviewed adoption studies and reported that cost, range, charging availability and perceived reliability dominate adoption decisions. Goel et al. (2021) examined the barriers and challenges of EVs in India, emphasising infrastructure, battery technology and grid-related issues. These works are largely consumer- or system-oriented; commercial users such as delivery riders, for whom vehicle utilisation is a daily income question, remain under-studied.

Policy and social protection

FAME India Phase II offers purchase incentives for electric two-wheelers, three-wheelers and buses, with a policy emphasis on commercial and shared mobility (Government of India, 2019). The Karnataka Electric Vehicle and Energy Storage Policy sought to position the state as a hub for EV manufacturing and deployment (Government of Karnataka, 2017). On the labour side, the Code on Social Security, 2020 formally recognises gig and platform workers and provides for schemes funded partly by aggregator contributions (Government of India, 2020). Together these instruments create an enabling but still incomplete framework: incentives target vehicle buyers rather than riders who rent, and social security provisions depend on implementation.

Research gap

The literature reveals three gaps. There is little worker-level evidence on how EV use changes rider costs and net earnings. Differences between owned and leased EVs are seldom analysed. And the interaction between EV infrastructure constraints and algorithmic work pressure has received almost no empirical attention in the Indian city context. This study responds to these gaps for Bengaluru Urban District.

Background: Policy Context and Secondary Statistics

Table 1 summarises the main secondary indicators and policy instruments that frame the study. The figures are drawn from the cited official documents and should be updated to the latest available release at the time of submission.

Table 1. Key secondary indicators and policy instruments

Indicator / instrument	Description	Source
Gig workers in India, 2020–21	About 7.7 million	NITI Aayog (2022)
Projected gig workers, 2029–30	About 23.5 million	NITI Aayog (2022)
FAME India Phase II (from 2019)	Demand incentives for electric two- and three-wheelers, buses; ₹10,000 crore initial outlay	Government of India (2019)
Karnataka EV & Energy Storage Policy	State incentives for EV manufacturing and adoption	Government of Karnataka (2017)
Code on Social Security, 2020	Recognises gig and platform workers; aggregator contribution of 1–2% of turnover, capped at 5% of payments to workers	Government of India (2020)

2. Research Methodology

Research design and data sources

The study follows a descriptive and analytical cross-sectional design. Primary data were collected through a structured, pre-tested interview schedule administered to delivery riders across Bengaluru Urban District. Secondary data were drawn from journal articles, policy documents and government reports listed in the references.

Sample size and sampling

Because the population of riders is not enumerated, the sample size was determined using Cochran's (1977) formula for an unknown population, $n = z^2pq/e^2$, with 95% confidence and $p = 0.5$, which gives about 384 for a $\pm 5\%$ margin of error. Given field constraints, a sample of 350 respondents was achieved, corresponding to a margin of error of about ± 5.2 percentage points for a proportion of 50%. Respondents were selected through quota-based purposive sampling at high-density pickup points (restaurant clusters, dark stores and rider hubs) in different zones of the district. Quotas were set by platform and vehicle type so that EV riders, who are a minority in the wider population, were adequately represented. Consequently, the vehicle-type shares in the sample should not be read as population proportions.

Instrument and variables

The interview schedule contained four sections: (a) demographic profile; (b) work profile, including platform, hours, days and distance; (c) monthly income and cost items (gross earnings, energy, maintenance, lease or rent, loan instalments); and (d) perception statements on opportunities and challenges measured on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). Net monthly earnings were computed as gross earnings minus energy, maintenance, lease or rent and loan instalment costs. Satisfaction with vehicle-based earnings was measured on a five-point scale.

Tools of analysis

Data were analysed using frequency and percentage analysis, means and standard deviations, cross-tabulation, Welch's independent-samples t-test (H1, H2), chi-square test of independence (H3), one-way ANOVA (H4) and Pearson's correlation coefficient. Figures and tables were generated using Python (pandas, SciPy and Matplotlib). The significance level was set at 5%. Participation was voluntary, informed consent was obtained, and responses were anonymised.

Data Analysis and Interpretation

Socio-economic profile of respondents

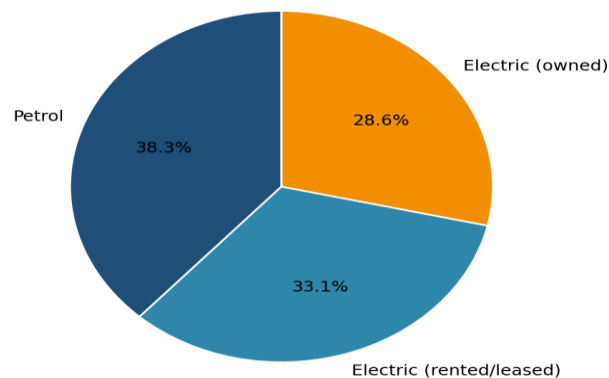
Table 2. Socio-economic profile of respondents (n = 350)

Characteristic	Category	Frequency	Percentage
Age (years)	18–24	79	22.6
	25–34	175	50.0
	35–44	72	20.6
	45 and above	24	6.9

Characteristic	Category	Frequency	Percentage
Gender	Male	331	94.6
	Female	19	5.4
Education	Below SSLC	39	11.1
	SSLC / PUC	130	37.1
	Diploma / ITI	82	23.4
	Graduate	99	28.3
Platform	Zomato	114	32.6
	Swiggy	105	30.0
	Zepto / Blinkit	82	23.4
	Others	49	14.0
Vehicle used	Petrol	134	38.3
	Electric (rented/leased)	116	33.1
	Electric (owned)	100	28.6

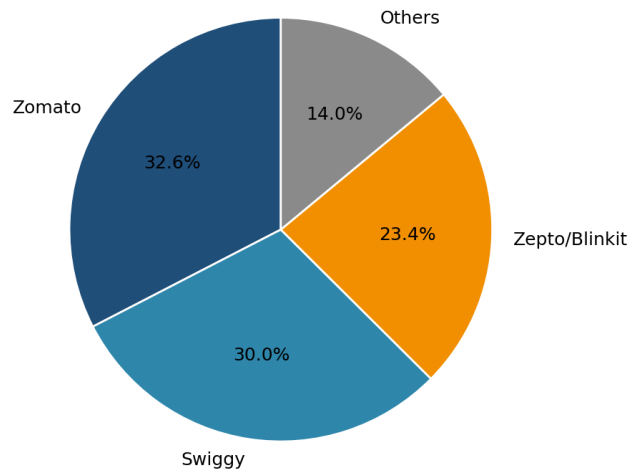
Table 2 shows that riding is a young person's occupation: 72.6 per cent of respondents are below 35 years, and half belong to the 25–34 age group. Male riders dominate (94.6 per cent), in line with the general gender imbalance in delivery work. About 48 per cent have completed SSLC/PUC or lower, while 28.3 per cent are graduates, which suggests that a sizeable group of educated youth are working as riders. Zomato and Swiggy together account for 62.6 per cent of respondents, and quick-commerce platforms (Zepto/Blinkit) account for 23.4 per cent. Overall, 61.7 per cent of respondents use an EV (28.6 per cent owned, 33.1 per cent leased or rented) and 38.3 per cent use petrol vehicles, which reflects the quota design.

Figure 2. Vehicle type used by respondents (n = 350)



Source: Primary data.

Figure 3. Platform-wise distribution of respondents (n = 350)



Source: Primary data.

Work profile

Table 3. Work and earnings profile of respondents (n = 350)

Variable	Mean	Std. deviation
Experience as delivery rider (years)	2.1	1.4
Working hours per day	9.2	1.7
Working days per month	26.0	2.1
Distance covered per day (km)	98.9	19.7
Gross monthly earnings (₹)	28,714	5,538
Energy (fuel/charging) cost per month (₹)	3,726	3,189
Maintenance cost per month (₹)	935	679
Net monthly earnings (₹)	21,029	6,376

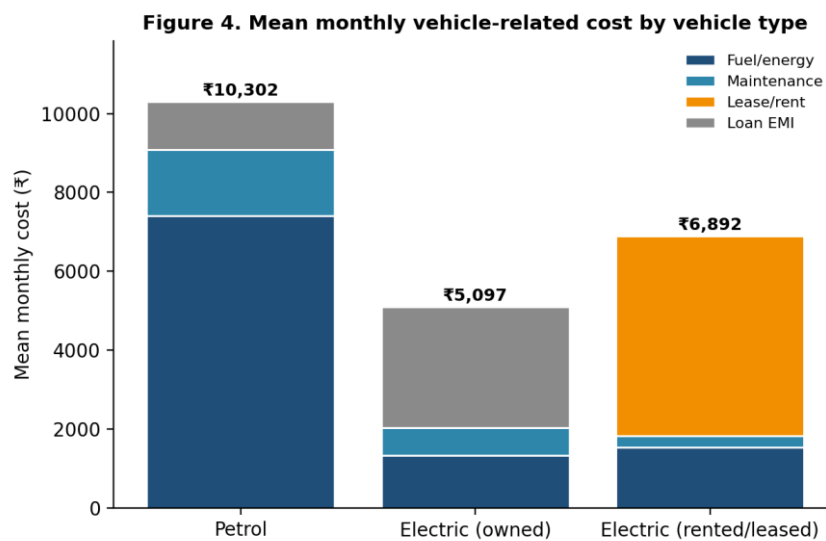
Riders work an average of 9.2 hours a day for about 26 days a month and cover close to 99 km daily. Gross monthly earnings average ₹28,714, but after deducting vehicle-related costs the average net figure falls to ₹21,029, showing that more than a quarter of gross income (about 27 per cent) is absorbed by the vehicle. The Pearson correlation between working hours and net earnings is positive and moderate ($r = 0.44$, $p < .001$), confirming that income depends strongly on long hours.

Cost structure and earnings by vehicle type

Table 4. Mean monthly cost and earnings by vehicle type (₹)

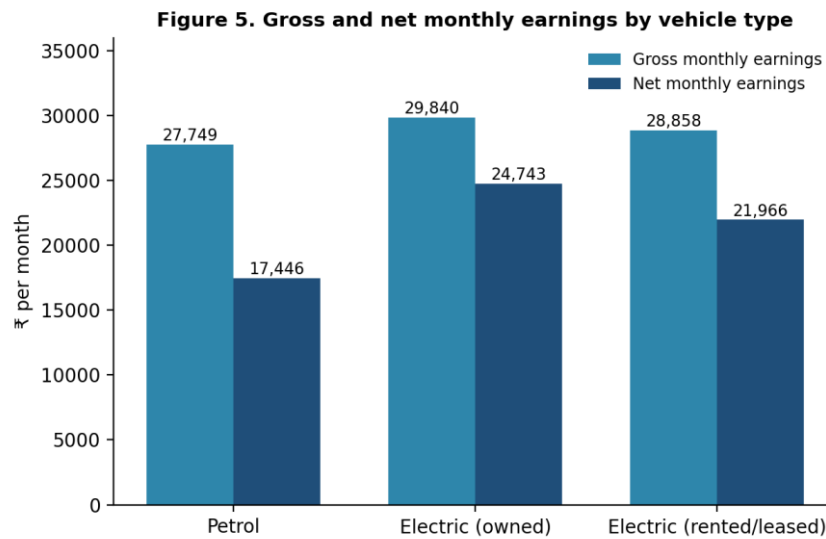
Item	Petrol (n=134)	EV owned (n=100)	EV leased (n=116)
Gross earnings	27,749	29,840	28,858

Item	Petrol (n=134)	EV owned (n=100)	EV leased (n=116)
Fuel / charging cost	7,415	1,337	1,525
Maintenance	1,665	692	301
Lease / rent	0	0	5,066
Loan EMI	1,223	3,069	0
Total vehicle-related outgo	10,303	5,098	6,892
Net earnings	17,446	24,743	21,966



Source: Primary data.

Table 4 and Figure 4 reveal the central economic result. Energy and maintenance for a petrol rider average ₹9,080 per month, against ₹2,029 for an owned-EV rider and ₹1,826 for a leased-EV rider. Owned-EV riders, however, carry higher loan instalments (₹3,069) because of the higher vehicle price, and leased-EV riders pay ₹5,066 as rent. As a result, net earnings are highest for owned-EV riders (₹24,743), followed by leased-EV riders (₹21,966) and petrol riders (₹17,446). Relative to petrol riders, net earnings are therefore ₹7,297 higher for owned-EV riders but only ₹4,520 higher for leased-EV riders, because rental payments absorb a large part of the running-cost saving. Ownership thus delivers the larger gain but requires access to credit and a sufficient down payment, which many riders lack.



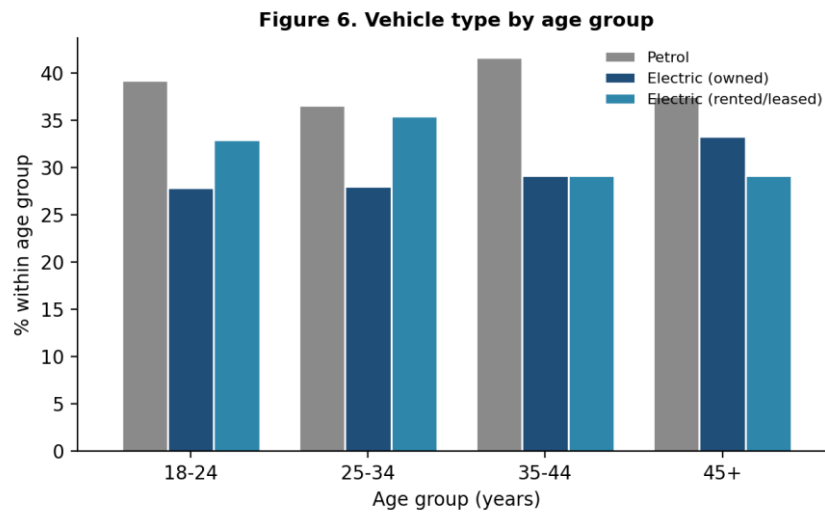
Source: Primary data.

Testing of hypotheses

Table 5. Results of hypothesis tests

Hypothesis	Test	Statistic	p-value	Decision
H1: Net earnings, EV vs petrol (₹23,251 vs ₹17,446)	Welch t-test	$t = 9.17$	$< .001$	Accepted
H2: Running cost, EV vs petrol (₹1,920 vs ₹9,079)	Welch t-test	$t = -38.66$	$< .001$	Accepted
H3: Vehicle type $\times$ platform	Chi-square (df = 6)	$\chi^2 = 9.53$	0.146	Rejected
H4: Satisfaction across vehicle groups	One-way ANOVA	$F = 10.60$	$< .001$	Accepted
Working hours and net earnings	Pearson r	$r = 0.44$	$< .001$	Significant
Net earnings and satisfaction	Pearson r	$r = 0.35$	$< .001$	Significant

The t-tests show that EV riders earn about ₹5,800 more per month than petrol riders after all vehicle costs, and that this difference is statistically significant. The gap in energy and maintenance costs alone is about ₹7,160 per month. The chi-square test finds no significant association between vehicle type and platform ($p = 0.146$), suggesting that EV use is spread across platforms rather than confined to one company in this sample. Mean satisfaction differs significantly across groups (owned EV 3.45, leased EV 3.18, petrol 2.93 on a five-point scale). Satisfaction is positively related to net earnings ($r = 0.35$), which indicates that earnings, and not merely ride comfort, drive rider evaluation.



Source: Primary data.

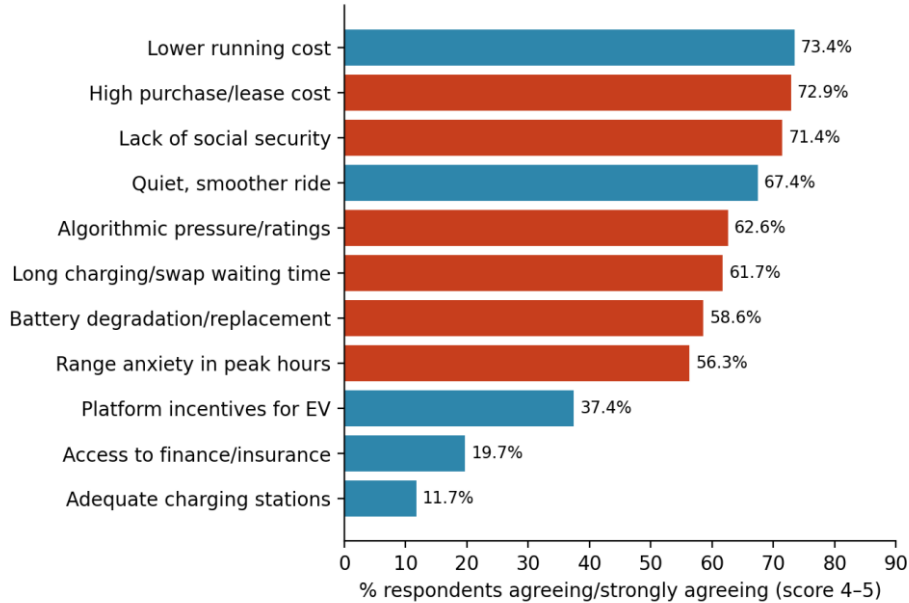
Figure 6 shows that petrol vehicles remain the largest single category in every age group, and that EV use is fairly evenly spread; older riders (45 and above) are slightly more likely to own an EV, which may reflect greater access to savings or credit.

Perceived opportunities and challenges

Table 6. Perception of opportunities and challenges (five-point scale, n = 350)

Statement	Mean	SD	% agree (4–5)
Lower running cost	4.07	0.91	73.4
Quiet, smoother ride	3.84	0.97	67.4
Platform incentives for EV riders	3.13	1.07	37.4
Adequate charging stations	2.41	0.98	11.7
Access to finance/insurance	2.68	1.00	19.7
High purchase / lease cost	4.01	0.92	72.9
Lack of social security	3.97	0.92	71.4
Long charging / swap waiting time	3.74	0.93	61.7
Algorithmic pressure / ratings	3.74	0.99	62.6
Battery degradation / replacement	3.67	0.94	58.6
Range anxiety in peak hours	3.62	0.98	56.3

Figure 7. Perceived opportunities (blue) and challenges (red)



Source: Primary data.

Respondents most strongly endorse lower running cost as an opportunity (73.4 per cent agree), followed by ride quality (67.4 per cent). Only 37.4 per cent feel that platforms offer meaningful incentives for EV use, and just 11.7 per cent consider charging stations adequate. On the challenge side, high purchase or lease cost (72.9 per cent) and the lack of social security (71.4 per cent) are the most widely reported concerns, followed by algorithmic pressure, waiting time, battery risk and range anxiety.

Discussion in the light of earlier studies

The results support the view of Kalleberg and Dunn (2016) that gig work is neither uniformly good nor uniformly bad: the same delivery job yields very different livelihoods depending on the vehicle and financing arrangement through which the rider participates. The large cost advantage of EVs corresponds to the operating-cost benefits emphasised in the EV adoption literature (Kumar & Alok, 2020; Rajper & Albrecht, 2020), but the present evidence shows that, for commercial users, this advantage can be partly offset by fixed rental or loan obligations. This is consistent with the observation of Surie and Koduganti (2016) that vehicle-related debt is a source of vulnerability for platform drivers in Bengaluru.

The low rating of charging infrastructure and the reported time loss confirm the barriers identified by Goel et al. (2021), and they add a labour dimension: time spent charging is unpaid time, and in an algorithmically managed setting it can translate into lower order allocation (Vallas & Schor, 2020; Woodcock, 2020). The near-absence of social security among respondents echoes the concerns raised by Berg et al. (2018) and NITI Aayog (2022), and it underlines that the Code on Social Security, 2020 will matter only if implemented at scale. Finally, the finding that satisfaction is more closely tied to net earnings than to vehicle novelty suggests that policies should focus on the rider's take-home income, and not only on vehicle sales targets.

From a managerial perspective, the results imply that platforms have a direct financial interest in solving the charging and financing bottlenecks. Riders on EVs who spend less time at a charging point and hold stable incomes are likely to work more reliably, which improves delivery performance. Similarly, leasing

companies that share battery risk with riders can expand their customer base, since the main deterrent identified by respondents is the size of the fixed monthly outgo and not the technology itself.

Challenges Faced by EV Riders

The analysis identifies six clusters of challenges that constrain the economic promise of EVs.

Charging and swapping infrastructure

EV riders in the sample lose an average of about 38 minutes per day to charging or battery swapping and travel an average of 2.6 km to reach a charging or swap point. In a work model where earnings depend on orders completed per hour, this lost time is a hidden cost. Only 11.7 per cent of respondents consider charging infrastructure adequate. This finding is consistent with infrastructure barriers highlighted by Rajper and Albrecht (2020) and Goel et al. (2021).

High upfront and rental costs

The purchase price of an electric two-wheeler and the fixed rent charged by leasing operators are viewed as the biggest financial hurdles (72.9 per cent agree). Owned-EV riders pay about ₹3,069 per month as loan instalments, and leased-EV riders pay about ₹5,066 as rent. These fixed obligations convert a variable-cost occupation into one with committed outgo, increasing income risk during slow months.

Range anxiety and battery-related risk

More than half of respondents report range anxiety during peak hours (56.3 per cent) and concern about battery degradation and replacement (58.6 per cent). Because riders cover close to 100 km per day, batteries are cycled intensively, and uncertainty about warranty coverage and resale value discourages ownership.

Algorithmic pressure

Nearly two-thirds of respondents (62.6 per cent) feel pressure from ratings, delivery-time targets and order-allocation rules. For EV riders this pressure interacts with charging constraints: a rider who must leave the delivery cycle to swap a battery may face reduced order allocation or lower ratings. This echoes the findings of Wood et al. (2019) and Woodcock (2020) on algorithmic control.

Weak financial access and social security

Only 19.7 per cent of riders feel they have adequate access to finance and insurance, and 69.7 per cent report having no social security cover of any kind (Table 7). Only 8.0 per cent benefit from ESI or PF-type coverage through the platform. Without accident and health protection, a battery fire, accident or vehicle failure can wipe out months of savings.

Table 7. Social security coverage of respondents (n = 350)

Coverage	Frequency	Percentage
No cover	244	69.7
Private insurance only	78	22.3
ESI / PF through platform	28	8.0

Uneven distribution of gains

Although EVs raise average net earnings, riders on leased vehicles retain a smaller share of the saving, and riders without savings or credit cannot buy their own vehicles. Among the 134 petrol riders, 44.8 per cent intend to switch to an EV, 31.3 per cent are undecided and 23.9 per cent do not intend to switch, indicating that cost and infrastructure concerns keep a sizeable proportion in an uncertain position.

Major Findings

- ✓ The rider workforce is young (72.6 per cent below 35 years), overwhelmingly male (94.6 per cent) and works long hours (about 9.2 hours a day, 26 days a month).
- ✓ Vehicle costs absorb a substantial share of income: gross earnings average ₹28,714 while net earnings average ₹21,029.
- ✓ EV riders spend about ₹7,160 less per month on energy and maintenance than petrol riders, and the difference is statistically significant (H2 accepted).
- ✓ EV riders earn significantly higher net income (₹23,251) than petrol riders (₹17,446) (H1 accepted). Owned-EV riders benefit most (₹24,743) while leased-EV riders earn ₹21,966 because rental payments absorb part of the saving.
- ✓ Vehicle type is not significantly associated with platform ($p = 0.146$; H3 rejected), so EV use in the sample is not confined to a single platform.
- ✓ Satisfaction is highest among owned-EV riders and lowest among petrol riders (H4 accepted), and satisfaction rises with net earnings.
- ✓ The most cited opportunities are lower running cost and smoother ride; the most cited challenges are high purchase or lease cost, lack of social security, algorithmic pressure, waiting time and range anxiety.
- ✓ Only 11.7 per cent consider charging infrastructure adequate, and EV riders lose about 38 minutes a day to charging or swapping.
- ✓ Platform incentives for EV riders are seen as modest (37.4 per cent agree), and 69.7 per cent of riders have no social security cover.

Suggestions**For the government**

- Expand public and semi-public fast-charging and battery-swapping points near delivery hotspots such as restaurant clusters, dark stores and residential hubs, with open, interoperable access.
- Extend purchase and financing incentives to individual commercial riders and to leasing operators serving riders, so that benefits reach workers who rent.
- Operationalise the social security provisions for gig workers, including accident, health and vehicle-fire insurance linked to EV use (Government of India, 2020).
- Publish periodic rider-level data on EV use and earnings to support evidence-based policy.

For platforms

- Introduce EV-specific incentives such as per-kilometre bonuses, charging credits and priority order allocation, and exempt charging or swapping time from rating and performance penalties.
- Co-invest in charging hubs at pickup points and negotiate lower lease rates and battery warranties with vehicle suppliers.

- Make algorithmic rules and deactivation criteria transparent and provide a grievance mechanism.

For financial institutions and leasing firms

- Design low-down-payment loans and rent-to-own schemes that use earnings history on the platform as a credit signal.
- Offer transparent lease contracts that allow riders to accumulate equity and that share battery-degradation risk.

For riders and rider associations

- Use collective bargaining and cooperative models for bulk purchase, group insurance and shared charging facilities.
- Build financial literacy on total cost of ownership so that riders can compare owning, leasing and petrol options.

3. Conclusion:

This study examined the economic opportunities and challenges that electric vehicles create for delivery riders in Bengaluru Urban District using primary data from 350 riders. The results show that EVs can substantially reduce running cost and raise net earnings, and that riders appreciate their smoothness and low operating expense. However, the gain is neither automatic nor uniformly shared. It depends on whether the rider owns or leases the vehicle, can afford the upfront or rental cost, has access to reliable charging or swapping, and is protected from algorithmic penalties and financial shocks. In the absence of social security and affordable finance, riders bear a large share of the transition risk.

For electrification to be a genuine livelihood opportunity and not merely an environmental or industrial goal, it must be accompanied by charging infrastructure near work zones, worker-focused financing, fair platform practices and social protection. Bengaluru, as an early adopter of both platform work and EV policy, is well positioned to pilot such an integrated approach.

4. Limitations and scope for further research

The study is cross-sectional and based on quota-based purposive sampling in one district, so the results cannot be generalised to all riders or cities. Earnings and cost data are self-reported and may contain recall error. Future research could use longitudinal or platform-administrative data, examine women riders and three-wheeler operators, compare Indian cities, and evaluate the effect of specific incentive schemes on rider incomes.

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