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Why do you Self-Drive? Insights from Car-Owning Households in India

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Abstract

This study examines a largely overlooked question in car-use research: who chooses to self-drive and why? While existing literature in India and other Global South contexts has primarily focused on car ownership and overall car use. It explains *who owns cars*, *how many cars are owned*, and *why cars are chosen over other modes*. The present research departs from this tradition by reframing the central inquiry. Instead of asking why households own or use cars, it asks: *Who chooses to self-drive, and why?* Drawing on semi-structured interviews with car owners, this paper analyses the motivations of those who deliberately opt to self-drive. Using cluster analysis, hypergeometric over-representation tests, and in-depth qualitative interpretation, two behavioural archetypes are identified: the Self-reliant Affluent and the Frugal Driver-sceptic. The findings demonstrate that self-driving is shaped not merely by income or convenience, but by attitudes toward autonomy, control, trust, and the organisation of everyday travel. While these themes have appeared in prior car-use research. This study approaches them differently—by positioning self-driving itself as the primary object of inquiry. Rather than treating driving as an assumed consequence of ownership, it examines it as a deliberate behavioural stance within car-owning households. In doing so, the study reframes familiar determinants through a new empirical lens, offering a distinct contribution to car-use literature in India.

1. Introduction

Research on car ownership and use in developing countries and the broader Global South has been overwhelmingly structured around discrete choice modelling frameworks derived from random utility maximisation. These studies primarily examine whether households own a car, how many cars they own, or which mode they choose for a given trip. While such models have advanced understanding of motorisation trends, they implicitly assume that “car use” equates to “self-driving,” leaving unexplored the crucial behavioural distinction between households that self-drive and those that rely on driver assistance especially in Indian context (Chowdhury, Mazumder and Gupta, 2024). The contemporary literature has focussed more toward disaggregate, household-level modelling approaches that aim to explain the determinants of car ownership and use. These approaches are grounded in random utility maximisation (RUT) theory and operationalised through discrete choice models such as multinomial logit (MNL), nested logit (NL), ordered probit (OP), multinomial probit (MNP), and multiple discrete-continuous extreme value (MDCEV) models compared to aggregate-level associations between gross domestic product (GDP) and motorisation rates in the previous years.

1.1 Car Ownership and Use in the Global South

Across Global South cities, income consistently emerges as the most influential determinant of car ownership. Studies in Indonesia, Thailand, China, and other rapidly motorising contexts show that rising household income significantly increases the probability of owning one or more cars (Belgiawan *et al.*, 2017; Moody and Zhao, 2019; Zhao and Zhao, 2020). These studies typically employ multinomial logit (MNL), ordered probit (OP), or nested logit (NL) models to estimate ownership probabilities and modal

choices. Household size, number of employed members, education level, and presence of children are also frequently included as explanatory variables. In Southeast Asian contexts, (Belgiawan and Schmocker, 2016) demonstrate that income and pro-car attitudes significantly predict vehicle acquisition. Similarly, (Moody and Zhao, 2019), using a structural equation modelling approach, highlight the mediating role of attitudes and perceived behavioural control in shaping car ownership intentions in China. (Zhao and Zhao, 2020) further extend this approach by incorporating latent attitudinal constructs into econometric models, arguing that subjective factors improve predictive power beyond purely objective socioeconomic variables. Indian literature mirrors these methodological approaches. (Srinivasan *et al.*, 2007) applied a multivariate ordered probit model to examine car ownership decisions in Chennai, identifying income, household structure, and employment characteristics as dominant determinants. (Verma, 2015) and (Verma, Manoj and Verma, 2016, 2017) similarly employ discrete choice frameworks to investigate ownership levels and modal shifts in urban India.(Kumar and Rao, 2007), through a stated preference study in the Mumbai Metropolitan Region, show that higher-income households are more likely to choose cars for recreational and shopping trips. Meena et al. (2021) further emphasise socioeconomic status and built environment characteristics as key predictors of private vehicle use in Indian cities. These studies collectively reinforce three central explanatory domains: (1) socioeconomic and demographic characteristics, (2) built environment attributes, and (3) attitudinal or psychological factors. The built environment literature in the Global South demonstrates that residential density, distance to central business districts, and access to public transport significantly influence car use intensity (Zegras, 2010). In Indian contexts, similar relationships have been observed, where peripheral residential locations and weak public transport systems increase dependency on private vehicles (Verma, Manoj and Verma, 2016). A parallel stream of research has incorporated psychological theories such as the Theory of Planned Behaviour (Ajzen, 1991) to account for attitudes, subjective norms, and perceived behavioural control. (Potoglou *et al.*, 2020) highlight that attitudinal profiles are crucial for predicting future acceptance of autonomous vehicles in India, indicating that subjective dimensions of mobility are increasingly recognised as important. (Martins *et al.*, 2020) through meta-analysis, classify motivations behind car use as habitual, reason-based, and cognitive-based, underscoring the multidimensionality of transport behaviour.

Despite these methodological refinements, the dependent variable in most Global South and Indian studies remains limited to *car ownership*, *number of cars owned*, or *mode choice relative to other transport options*. Even when scholars refer to “car use,” they operationalise it as frequency of trips made by car or likelihood of choosing the car over public transport, walking, or intermediate public transport (IPT). The car is treated as a homogeneous mobility tool whose utility is realised through use, without specifying who performs the act of driving. This implicit assumption becomes particularly significant in the Indian context. In Western transport research, self-driving is the normative and dominant practice; hence, asking why individuals drive their cars may appear redundant and useless. However, in India and several Global South cities, employing a professional driver for household car use is a widespread and culturally embedded practice (Chowdhury, Mazumder and Gupta, 2024). For instance, while (Srinivasan *et al.*, 2007) examine determinants of vehicle ownership in Chennai, the model does not differentiate

between households that self-drive and those that rely on drivers. (Verma, Manoj and Verma, 2016) analyse modal choice behaviour but do not ask respondents whether they personally drive the car. Similarly, (Meena, Singh and Jodha, 2021) investigate determinants of private vehicle use but do not disaggregate users by driving responsibility. The survey instruments in these studies capture trip purpose, income, education, and vehicle ownership, but not the behavioural nuance of whether mobility is mediated through a paid chauffeur.

Even studies that integrate attitudinal and lifestyle variables focus on motivations for owning or preferring cars—such as status symbolism, convenience, comfort, or independence—without distinguishing whether these perceived benefits are derived from self-driving or from being driven. In effect, the literature conflates *car use* with *self-driving*, overlooking a critical behavioural distinction. This omission has conceptual implications. The act of self-driving may carry different symbolic meanings compared to being chauffeured. For some households, self-driving may signify autonomy and control; for others, delegating driving may represent success, convenience, or adherence to established norms.

Notably, bibliometric mapping of Global South transport literature reveals the absence of keywords such as “driver-assisted,” “chauffeur-driven,” or “self-drive choice.” The analytical focus remains fixed on ownership levels and modal substitution. The respondent is typically asked: Why do you own a car? Why do you use a car for commuting? Why do you prefer car over bus? The question *Why do you self-drive your car?* is rarely, if ever, posed. Consequently, econometric models treat all car trips as equivalent, masking heterogeneity in driving practices. Therefore, while the Global South and Indian literature on car use is extensive and methodologically rigorous, it remains incomplete. It explains *who owns cars*, *how many cars are owned*, and *why cars are chosen over other modes*. It integrates socioeconomic, built environment, and psychological variables to improve explanatory depth. However, it does not distinguish between self-driving and driver-assisted automobility.

The present research departs from this tradition by reframing the central inquiry. Instead of asking why households own or use cars, it asks: *Who chooses to self-drive, and why?* This shift recognises that in the Indian context, self-driving is not the default or universal practice. By foregrounding this behavioural distinction, the study addresses a critical blind spot in Global South automobility research and contributes a new analytical lens to understand car use behaviour in India. Following are the research questions.

1. What are the reasons car-owning households choose to self-drive?
2. What are the socioeconomic characteristics of car-owning households who self-drive?
3. What lived-reality profiles emerge from self-driving households?

The paper is organised as follows. In Section 2, a literature review on car ownership and use. In the next section, the data collection and questions asked. Section 4 presents the analysis approach and the discussion on the result. Lastly, Section 5 provides the conclusion and the future scope of the work.

2. Data

2.1 Data collection

A field study was undertaken in Patna, India using semi-structured interviews with car-owning households in urban India. The broader study included both self-driving car owners and those who employ personal chauffeurs; however, the present paper analyses only the self-drive subsample. The objective was to understand the underlying decision logics that lead individuals to personally drive their cars, rather than delegating the task. The interview schedule comprised two sections. The first documented the socioeconomic profile of respondents, including age, gender, occupation, household composition, income bracket, and number of vehicles owned. This section enabled the situating of self-driving behaviour within broader structural characteristics. The second section focused specifically on motivations, perceptions, and reflections related to self-driving practices. Importantly, the inquiry into self-driving was framed indirectly. Rather than asking respondents directly, “Why do you self-drive?”, they were asked: *“What are your reasons for not keeping a personal chauffeur to drive your car, and why do you choose to drive yourself?”* This deviation-based framing was adopted deliberately to avoid socially desirable or habitual responses. In many contexts, directly asking why one drives may elicit normative answers such as independence, enjoyment of driving, control, or flexibility—responses commonly reported in existing literature on car use. By contrast, the deviation-based formulation positioned self-driving as an outcome of conscious evaluation. It encouraged respondents to articulate their reasoning in relation to an alternative that is socially visible and often economically considered in Indian cities. This approach required participants to reflect more carefully on their mobility choices, prompting them to revisit earlier stages of decision-making—particularly the period when the household was planning to purchase a car.

The indirect framing also reduced the likelihood of symbolic or performative responses. Direct questions about driving can evoke narratives of masculinity, independence, or status. By situating the discussion within a broader decision context, respondents were more likely to describe pragmatic reasoning and contextual factors shaping their choice. This approach therefore facilitated deeper probing into how self-driving is embedded within everyday routines. Interviews were audio-recorded with consent, transcribed verbatim, and thematically analysed. By foregrounding the reasons for self-driving through a deviation-based lens, the data collection strategy enabled the study to move beyond generic motivations associated with car use. It allowed self-driving to be examined as a deliberate behavioural choice shaped by economic reasoning, habit formation, perceived competence, and normative expectations. This methodological design thus aligns with the central objective of the paper: to understand who chooses to self-drive and how this choice is rationalised within the Indian urban context.

3. Analysis and discussion

3.1 Data analysis approach

The study adopts a sequential and integrative research design to systematically construct household archetypes centred on the choice to self-drive. Rather than beginning with predefined categories, the

approach allows typologies to emerge inductively from respondents' stated motivations and then subjects these emergent groupings to quantitative validation. This combination of interpretive depth and statistical rigour strengthens both internal coherence and analytical transparency.

In the first stage, households were segmented based on their articulated reasons for self-driving. Motivations derived from the semi-structured interviews were coded into analytically comparable categories, enabling systematic clustering. A hierarchical clustering procedure was then employed, producing dendrograms that visually represent how households group together based on similarity in motivational structures (Wagschal, 2016; Engle *et al.*, 2017). The dendrogram serves not merely as a technical output but as a conceptual map: it reveals patterns of convergence and divergence in decision logics, allowing clusters to emerge organically from the data rather than being imposed a priori.

Prior to clustering, households were coded according to life stage and household composition. This preparatory coding was critical for two reasons. First, it provided structural anchors—such as age cohort, presence of children, dual-earner status, or retirement stage—through which motivational clusters could later be interpreted. Second, it ensured that the clustering process did not operate in isolation from demographic context. By integrating life-stage variables into the interpretive phase, the analysis moves beyond surface-level grouping to uncover how motivations are embedded within broader household trajectories. This step significantly enhances explanatory depth, transforming clusters from abstract statistical groupings into socially meaningful archetypes. Once clusters were identified, chi-square tests were conducted to examine whether differences between clusters were statistically significant. This stage performs an important validation function. Qualitative clustering alone may risk subjective interpretation; by testing for statistically meaningful differences in categorical variables across clusters, the study ensures that the identified groupings are not artefacts of coding decisions. This validation step also enables the calculation of hypergeometric p-values. To further characterise cluster composition, hypergeometric p-values (Karp *et al.*, 2021) were estimated to identify socioeconomic attributes that were significantly overrepresented within specific clusters. Unlike simple cross-tabulation, hypergeometric testing allows the identification of attributes whose concentration within a cluster exceeds what would be expected by random distribution. This provides a probabilistic assessment of overrepresentation, strengthening claims about distinctive cluster identities. For instance, if a particular life stage, income bracket, or occupational category appears disproportionately within a cluster, the hypergeometric p-value confirms whether that concentration is statistically meaningful.

The integration of hierarchical clustering, chi-square validation, and hypergeometric testing creates a multi-layered analytical framework. Hierarchical clustering uncovers motivational similarity; chi-square testing confirms statistical differentiation; hypergeometric analysis identifies defining socioeconomic features. Together, these techniques bridge qualitative reasoning and quantitative robustness. Rather than treating interview data as purely narrative, the method operationalises motivations in a structured manner, enabling reproducibility and systematic comparison. This sequential approach is particularly well suited to the study of self-driving behaviour in India because it accommodates complexity. Decisions surrounding self-driving are embedded in life-stage transitions, cost evaluations, time-use

strategies, competence perceptions, and lifestyle aspirations. A purely quantitative model may obscure this richness, while purely qualitative analysis may limit generalisability. The present design overcomes this trade-off by using qualitative interviews to generate motivation categories and then applying quantitative clustering to detect patterned regularities across households.

Importantly, this methodology possesses strong scalability potential. Although applied here to a field-based interview sample, the framework can be extended to large-scale survey datasets. Once motivational categories are standardised into survey instruments, hierarchical clustering and hypergeometric analysis can be applied to thousands of observations. The deviation-based framing of self-driving motivations can be operationalised into structured response options, allowing archetypes to be reproduced and tested across metropolitan regions. Because the statistical procedures employed—hierarchical clustering, chi-square testing, and hypergeometric estimation—are computationally efficient and widely used in large datasets, the design is adaptable to national travel surveys or longitudinal mobility panels.

3.2 Reasons behind why car owners choose to self-drive

There were eight reasons for self-driving (Table 1) their personal car over the common norm of employing a driver in Indian households. Rather than treating self-driving merely as a default or residual category, the study interprets it as an active choice articulated through resistance to employing a personal chauffeur. The reasons articulated by households—such as limited and uncomplicated travel needs, confidence in their own driving skills, and the absence of frequent long-distance or multi-stop trips—suggest that the functional utility of a driver is perceived as low and self—driving a practical choice [R1, R2]. Beyond instrumental considerations, strong normative and affective dimensions emerge [R4 and R5]. Concerns related to privacy intrusion within both the vehicle and the household, mistrust regarding drivers' honesty and reliability, and a pronounced preference for autonomy and independence actively discourage chauffeur adoption [R8]. Additionally, for some respondents, driving itself is a source of enjoyment, control, and personal satisfaction, rendering delegated driving not only redundant but undesirable. In multi-car households, the availability of alternative vehicles further weakens the perceived need to share a primary car with a dedicated driver. Understanding this choice through the *opposition of an alternative* allows the study to more clearly delineate the households for whom self-driving represents a deliberate and meaningful mobility strategy rather than a constrained or second-best option.

Table 1
Reasons for choosing to self-drive a personal driver in India

	Reasons	Percentage of households reports the reasons
R1	Households reported relatively simple and infrequent travel patterns, characterised by limited trip-making, minimal long-distance travel, and low levels of trip chaining. Under such conditions, self-driving was considered sufficient and functionally appropriate.	81.1%
R2	Respondents perceived their own driving skills as fully adequate and were confident in independently managing urban traffic conditions.	95.2%
R3	The perceived cost of employing a personal chauffeur outweighed its expected benefits, rendering it an unnecessary expense.	49.4%
R4	A strong preference for personal independence and control over daily mobility reinforced the decision to self-drive.	48.2%
R5	Driving was described as an enjoyable, engaging, and intrinsically rewarding activity, making self-driving both desirable and fulfilling.	29.4%
R6	The presence of two or more cars within the household enhanced flexibility and reduced the need for centralised driving arrangements, thereby reinforcing self-driving practices.	16.4%
R7	Concerns regarding reliability and trust in external drivers influenced the preference for personally undertaking driving responsibilities.	12.9%
R8	Self-driving was perceived as better preserving privacy, both within the vehicle and in relation to household routines.	7.0%

3.3 Socioeconomic characteristics of the car owners who self-drive

Eighty-five complete interviews formed part of the final analytical sample. Observations with missing or insufficient information were excluded from the analysis. According to the samples, most households (55%) consist of three to four members, while 31% have more than five members. A significant proportion of households (64%) include elderly male members above 55 years, while 23% have elderly females. Additionally, 39% of households have economically active elderly members, and 22% have school-going children. A small fraction (3%) includes immobile members. Economically, the majority of self-drive users belong to the very high-income group (71%), with an additional 27% in the high-income bracket. Households typically have multiple earners, with 38% relying on a single earner, 35% having dual earners, and 27% having multiple earners. Female employment is notable, with 33% of households having female earners. The workforce composition shows that 46% of individuals are self-employed, 38% are salaried employees, and 16% engage in both salaried and self-employed work. In terms of car ownership, nearly all male members (98%) hold a driving license, while female license ownership remains lower at 28%. The majority (67%) of households own a single car, 25% own two cars, and 8% own more than two. Car ownership trends indicate long-term usage, with 35% of vehicles being over 20

years old and only 14% being acquired within the last five years. Most cars (64%) fall within the 5–10 lakh INR price range, and hatchbacks dominate ownership (52%), with 34% of households owning multiple car variants, such as a combination of SUVs and hatchbacks. Regarding travel behaviour, work trips are the primary reason for car usage, with 77% of households using their car for commuting. School trips by car are minimal (6%), and organized leisure trips are even rarer (3%). Additionally, 49% of households do not have school-going children, reducing the necessity for school-related travel. The overall findings suggest that self-drive users primarily rely on their vehicles for professional mobility rather than leisure or family-related travel, reinforcing their preference for self-driving over hiring a driver.

Table 2
Description of car owner who like to self-drive

No.	Household Characteristics	Count (Total N = 85)	Percent
1	Household Size		
	Less than three	11	13%
	Three-four	47	55%
	More than five	27	31%
2	Households with school-going children	18	22%
3	Male elderly above 55 years old	55	64%
4	Female elderly above 55 years old	20	23%
5	Households with elderly above 55 years	55	64%
6	Households with economically active above 55 years	33	39%
7	Household With Immobile Members	4	3%
8	Household annual income [1]		
	Medium	2	2%
	High	23	27%
	Very high	60	71%
9	Number of Earning Members		
	Single	32	38%
	Dual	30	35%
	Multiple	23	27%
	Pensioner	0	0%
10	Female earners	29	33%
11	Occupation Type categories:		
	Salaried	32	38%
	Self-employed	39	46%
	Salaried and self-employed both	14	16%
	Pensioner only	0	0%
12	Driving license male	83	98%

No.	Household Characteristics	Count (Total N = 85)	Percent
13	Driving license female	23	28%
14	Number of cars categories:		
	One car	57	67%
	Two car	21	25%
	More than two cars	7	8%
15	Duration of car ownership:		
	Less than 5 years	11	14%
	6 to 10 years	24	28%
	11 to 15 years	15	16%
	16 to 20years	5	6%
	More than 20 years	30	35%
16	Price of car categories:		
	Less than 5 lakhs	10	12%
	5 to 10 lakhs	55	64%
	10 to 15 lakhs	13	15%
	15 to 25 lakhs	6	7%
	Above 25 lakhs	1	1%
17	Car variant categories:		
	Hatchback only	44	52%
	Sedan only	3	3%
	Sports Utility Vehicle (SUV) only	9	11%
	Multi-utility vehicle (MUV) only	0	0
	Luxury only (above 9 million)	0	0
	Multiple variants (two SUV + SUV+ Luxury, SUV + MUV, SUV+ hatchback)	29	34%
18	Distance to school:		
	Less than 5 km	7	5%
	6 to 10 km	9	7%

No.	Household Characteristics	Count (Total N = 85)	Percent
	More than 10 km	3	3%
	Household with no school-going children	65	49%
19	Household with school trips by car	5	6%
20	Household with organized leisure activities by car	3	3%
21	Household with work trips by car	65	77%

A cluster analysis (Wagschal, 2016) was applied to self-driving households to group them according to common motivational determinants described in Table 2. The output of the cluster is shown in Fig. 1. The dendrogram presents the results of hierarchical clustering, revealing three major household clusters (A–C), with Cluster A exhibiting additional internal differentiation into sub-clusters A1 and A2. This hierarchical grouping suggests households in the dataset share varying levels of similarity based on their attributes. Prior to clustering, all 85 households in the sample were assigned descriptive labels based on household composition. Hierarchical cluster analysis was then conducted to group households according to their reported reasons. Based on the cluster analysis, nine distinct household typologies preferring self-driving were identified. These include: (1) newly married young couples; (2) households in their early 30s with non-school-going children (toddlers); (3) households in their mid-30s with school-going children; (4) households in their 40s with teenage children; (5) households in their 40s with adolescent or young adult children in their 20s; (6) households in their 50s co-residing with young adults; (7) pre-retirement elderly households living with young adults; (8) elderly households living alone without young dependents; and (9) multigenerational households comprising three co-residing generations.

The diagram illustrates how individual households, labelled according to their composition, are associated with more than one cluster, is shown in Table 4. This demonstrates the distribution of household typologies across clusters, emphasising that motivational factors, rather than demographics alone, underpin the observed clustering.

Table 3
Socioeconomic characteristics of households that self-drive

1	Household Characteristics	Cluster A1	Cluster A2	Cluster B	Cluster C
	Household Size				
	Less than three	6%	11%	19%	29%
	Three-four	50%	52%	75	43%
	More than five	44%	37%	6%	29%
2	Households with school-going children	31%	7%	31	43%
3	Male elderly above 55 years old	63%	70%	50	71%
4	Female elderly above 55 years old	25%	22%	25%	29%
5	Households with the elderly above 55 years	63%	70%	50%	71%
6	Households with economically active individuals above 55 years	38%	46%	19%	43%
7	Household With Immobile Members	0%	2%	0%	43%
8	Household annual income[1]				
	Medium		4%	0%	0%
	High	25%	37%	6%	14%
	Very high	75%	59%	94%	86%
9	Number of Earning Members				
	Single	31%	39%	50%	0%
	Dual	19%	22%	44%	71%
	Multiple	50%	39%	6%	29%
	Pensioner	0%	0%	0%	0%
10	Female earners	38%	33%%	13%	43%
11	Occupation Type				
	Salaried	31%	52%	13%	14%
	Self-employed	44%	30%	88%	57%
	Salaried and self-employed both	25%	17%%	0%	29%
	Pensioner	0%	0	0%	0

1	Household Characteristics	Cluster A1	Cluster A2	Cluster B	Cluster C
	Household Size				
12	Driving license holding male mmbers	100%	98%	100%	86%
13	Driving license holding female members	25%	22%	31%	57%
14	Number of cars				
	One	44%	80%	75%	14%
	Two	50%	13%	19%	57%
	More than two	6%	7%	6%	29%
15	Duration of car ownership within the household				
	0 to 5 years	13%	17%	6%	0%
	6 to 10 years	13%	28%%	38%	43%
	11 to 15 years	19%	24%	6%	0
	16to 20years	6%	4%	13%	0%
	More than 20 years	50%	26%	38%	57%
16	Price of the car				
	Less than 5 lakhs	0	13%	25%	0
	5 to 10 lakhs	81%	70%	44%	43%
	10 to 15 lakhs	13%	15%	19%	14%
	15 to 25 lakhs	6%	2%	6%	43%
	Above 25 lakhs	0	0	6	0
17	Car variant				
	Hatchback only	44%	59%	56%%	14%
	Sedan only	0	7%	0	0
	Sports Utility Vehicle (SUV) only	6%	15%	6%	0
	Multi-utility vehicle (MUV) only	0	0	0	0
	Luxury only (above INR 9 million)	0	0	0	0
	Multiple variants (Hatchback + SUV, Two SUVs, SUV + MUV etc)	50%	20%	38%	86%

1	Household Characteristics	Cluster A1	Cluster A2	Cluster B	Cluster C
	Household Size				
18	Distance to school				
	Less than 5 km	6%	4%	19%	14%
	6 to 10 km	19%	2%	6%	14%
	More than 10 km	6%	0	6%	14%
	No school-going children in the hosuehold	69%	93%	69%	57%
19	School trips by car	6%	0	13%	29%
20	Organized leisure activities by car	0	0	100%	29%
21	Work trips by car	81%	74%	69%	100%

[1]. Medium Income = INR 2,73,000 - 8,46,000; High Income= INR 8,46,000 - 15,00,000 ; Very High Income= INR 15,00,000 above.

Table 4
Description of household composition under each cluster

Cluster	Household Composition (Major Groups)	Main Characteristic of the Cluster	Description
A1	38% Multigenerational households; 31% late-50s households with young adult children; 13% couples in mid-30s with non-school-going children	Multigenerational and mature households with established mobility patterns	Households with long-standing car ownership and multiple adults capable of driving, enabling flexible distribution of travel and encouraging self-driving.
A2	41% late-50s households with young adults; 24% older adults with young children; 28% multigenerational households; 9% middle-aged parents with teenagers; 9% elderly living alone	Older households with diverse family structures	A mix of aging parents, young adults, and extended family members leading to varied mobility needs and coordinated household travel arrangements.
B	25% middle-aged parents (40s) with teenagers; 19% multigenerational families; 19% parents (40s) with young adult children; 13% late-50s with married young adults; 6% couples in 30s with young children	Middle-aged family households managing active life stages	Households with school-age or young adult children, balancing work, education, and family responsibilities, creating complex mobility demands.
C	71% multigenerational families; 29% elderly couples living alone	Predominantly multigenerational or aging households	Mobility patterns shaped by long-term family living arrangements and aging household members, often associated with established lifestyle practices and reliance on assistance.

While Table 3 presents the socioeconomic characteristics associated with each cluster, these variables alone do not sufficiently distinguish the groups. Across clusters, households often share similar and different income brackets, comparable levels of car ownership, and overlapping occupational profiles. If interpreted solely through conventional socioeconomic indicators, the clusters may appear structurally similar. However, what emerges more meaningfully is the extension of these characteristics into distinct household typologies. As shown in Table 4, each cluster represents a different life-stage configuration and household composition pattern. These typologies capture variations in generational structure, presence of children, aging members, and intra-household role distribution. Thus, even when income levels and number of vehicles are comparable, the social organisation of the household differs substantially. This distinction is analytically significant. Existing car ownership and car use studies in the Global South and India primarily rely on socioeconomic predictors such as income, employment status, or household size to explain vehicle-related behaviour. While these variables are important, they often treat households as homogeneous economic units.

3.4 Cluster-wise Variation in Reasons for Self-Driving

Cluster A1 is characterised by mature, multigenerational households with established mobility routines. For this group, the dominant motivations are : Confidence in personal driving ability (100%); Preference for independence (81%); Adequacy of limited or predictable travel needs (69%). These households possess multiple capable drivers and structured travel patterns. Independence here reflects functional autonomy within an already settled lifestyle. Self-driving appears normalised and institutionalised within the household's long-standing mobility culture.

Cluster A2 represents late-50s or aging households with diverse family structures. Key motivations include:Confidence in driving ability (100%); Perception of unnecessary expense (70%); Limited or manageable trip patterns (57%); Preference for independence (37%). In contrast to A1, this cluster demonstrates a stronger economic calculus. As households transition into later life stages, self-driving reflects conscious cost-benefit evaluation rather than lifestyle habit. The relatively high emphasis on financial prudence suggests that self-driving here is a decision shaped by recalibration of household priorities. Independence matters, but it is secondary to rational resource allocation.

Cluster B consists primarily of middle-aged households managing work and children. Their motivations show a distinctive p attern: Confidence in driving ability (100%); Enjoyment of driving (100%); Preference for independence (75%); Manageable trip structures (50%). This cluster stands out because self-driving is positively valued. Unlike A2, where rational evaluation dominates, and A1, where routine stability prevails, Cluster B frames driving as intrinsically rewarding. For these active life-stage households, self-driving appears energising and identity-affirming. It aligns with a phase of life characterised by professional engagement, high mobility demands, and personal agency. Driving is not merely functional—it is meaningful.

Cluster C, comprising predominantly multigenerational and elderly households, presents a strikingly different profile: Enjoyment of driving (100%); Privacy concerns (86%); Presence of multiple cars (86%); Trust concerns (57%); Limited trip patterns (57%). This cluster reveals that self-driving persists even within aging or assistance-oriented household contexts, but for different reasons. Privacy and trust concerns are unusually high here, suggesting sensitivity to personal space and relational boundaries. Unlike other clusters, the presence of multiple vehicles plays a significant role, indicating decentralised mobility within complex family arrangements. Most notably, despite structural aging characteristics, enjoyment remains universal (100%). This suggests that for some elderly or multigenerational households, driving is not merely a necessity but an assertion of capability and continuity. Self-driving may function symbolically as resistance to dependency.

The most significant inference is that self-driving is behaviourally stable but motivationally heterogeneous. Households at very different life stages converge on the same behavioural outcome—self-driving—but for structurally distinct reasons. Thus, the clusters demonstrate that identical behaviour can emerge from different causal logics.

3.5 Which socioeconomic characteristics are more prominent in each household cluster of self-drivers?

To identify which socioeconomic attributes are disproportionately associated with each self-driving cluster, hypergeometric p-values were estimated. The hypergeometric test, conceptually similar to Fisher's Exact Test, evaluates whether the observed concentration of a particular household characteristic within a cluster is significantly higher (or lower) than what would be expected under random distribution. Unlike standard cross-tabulation, which merely shows proportional differences, the hypergeometric approach allows identification of statistically meaningful overrepresentation and underrepresentation within clusters.

Table 5 Hypergeometric p-value for distinct household characteristics for each cluster

S. No.	Household characteristics	Cluster A1	Cluster A2	Cluster B	Cluster C
1	Households with school-going children		0.0002		
2	Household With Immobile Members		0.040		0.001
3	Annual income: Medium				
	Annual income: High		0.022	0.003	
	Annual income: Very high		0.001	0.018	
4	Dual-earning members		0.027		
	Multiple earning members			0.0005	0.021
5	Occupation type: salaried		0.002		0.031
	Occupation type: self-employed			0.0002	
6	Number of cars: Two	0.014	0.001		0.050
	Number of cars: More than two				
					Red colour indicates over-represented p-values.
					Blue colour indicates under-represented p-values.

According to the over-representation analysis for Cluster A1, the likelihood of households owning two cars is significantly higher than expected by chance. As described earlier in Fig. 2, Cluster A1 is predominantly composed of multigenerational households (38%) and households in their late 50s living with young adult children (31%). The over-representation analysis for Cluster A2 indicates a low likelihood of households belonging to the very high–income category. This cluster is characterised predominantly by single-earner households, as dual earners are significantly under-represented ($p = 0.027$), which means the income is not so high. Salaried employment is strongly over-represented ($p = 0.002$), and car ownership is limited to a single vehicle, with only 9% of households reporting ownership of two cars based on descriptive statistics. Cluster B is characterised by a strong over-representation of very high-income households ($p = 0.018$). In terms of occupation, self-employed households are strongly over-represented ($p = 0.0002$), distinguishing this cluster from those dominated by salaried employment. In Cluster C, the over-representation of multiple earning members and multi-car ownership is closely linked to the predominance of multigenerational households (71%), where the presence of several economically active members drives both higher income pooling and greater vehicle ownership.

3.6 Household archetypes

Archetypes were constructed by integrating household cluster analysis and hypergeometric over-representation results with in-depth qualitative data, providing a layered and contextually grounded understanding of self-driving behaviour. While statistical clustering identifies patterned similarities and

hypergeometric testing validates the distinctiveness of certain socioeconomic features, these techniques alone cannot fully explain how and why households organise mobility in particular ways. Archetype construction bridges this gap. Relying solely on socioeconomic characteristics—such as income, occupation, or number of cars—produces a fragmented and reductionist picture of self-driving households in India. These variables indicate structural capacity but do not capture the lived logic through which decisions are made. Two households may share similar income levels and vehicle ownership yet interpret and organise their mobility differently depending on life stage, familyd structure, caregiving responsibilities, and habitual practices. Statistical associations can reveal correlation, but they do not illuminate the internal coherence of household decision-making. The creation of archetypes addresses this limitation by synthesising quantitative patterns with qualitative depth. An archetype is not merely a cluster label; it is a theoretically meaningful profile that integrates structural characteristics, motivational themes, and life-stage positioning into a coherent explanatory narrative. In doing so, archetypes allow mobility behaviour to be understood as embedded within household realities rather than isolated variables.

3.6.1 Archetype 1: Self-reliant, affluent (Prominence of cluster A1 and C)

The archetypes are predominantly composed of multigenerational households with long-standing car ownership. Extended experience with private vehicles has resulted in multiple household members, including females, holding driver's licenses and possessing high familiarity with car driving, ensuring relatively equitable access to car use within the household. These households primarily belong to the very high–income segment. High disposable income enables these households to own multiple vehicles, allowing individual members to meet their specific mobility needs. Car usage is deeply embedded, reducing reliance on public or intermediate transport modes, and supporting a household strategy of multiple-car ownership to satisfy the travel demands of all members. With widespread possession of driver's licenses and equitable access to vehicles, intra-household travel conflicts are minimised, and trips are distributed across cars. This encourages them to self-drive, and the need to delegate the task to a personal chauffeur reduces significantly.

This dual-earner archetype often includes economically active older parents alongside their young adult children. Household members associate car driving with affective and symbolic values, including thrill, excitement, pride, power, and independence. Self-driving allows them to retain control over their mobility, avoiding reliance on chauffeurs who might disrupt travel plans. These households not only possess substantial economic capital but also significant cultural capital, including extensive knowledge of cars and driving. While some households have briefly employed full-time chauffeurs—for example, during periods of intense work-related travel or when managing a newly purchased car—these instances were temporary, and most members express a clear preference for self-driving. The evidence suggests that reliance on a personal chauffeur is generally viewed as unnecessary, with autonomy and control reinforcing their commitment to driving themselves.

I117: a 48-year-old businesswoman who has been a car user for almost three decades describes;

My husband and I both drive to our work every day… We both are second-generation car owners…Driving is not a tedious task for us. In fact, I have dropped my younger daughter at school every single day on the way to work. Driving a car makes things easier. You can easily plan a social meeting, go shopping, and do out-of-home chores. Things are in my hand... There is no point in employing a driver since we all can drive, including my elder daughter now…I was very particular about it when she became eligible for getting a driving license… It makes you independent. Being able to go anywhere safely without putting the burden on others is ensuring everyone's well-being… I don't feel any headaches from taking my car for servicing, repairs, etc. I am very much used to doing it all, and so is my husband. I love my car, and driving is the exciting part of the day…

3.6.2 Archetype 2: Frugal and driver-sceptic(A2 and B)

This archetype comprises households that perceive employing a personal driver as an unnecessary recurring expense. They explicitly consider the opportunity cost of hiring a chauffeur, evaluating how the same resources could be allocated to savings, investments, or other lifestyle priorities. By personally driving their cars, these households maximize the utility of their vehicles while avoiding external costs, reinforcing a preference for self-reliance and autonomy over delegated driving.

This archetype is primarily composed of first-time car buyers, such as young couples in their 30s, middle-aged parents with teenage children, or elderly individuals living alone. According to the interviews, car use is limited and unevenly distributed, typically restricted to a single economically active male member, while other household members rely on two-wheelers or public transport for their trips. The limited access reduces intra-household travel complexity but reinforces the perception that employing a personal chauffeur is neither necessary nor cost-effective. Households in this group also express heightened concerns about security and asset management: drivers are perceived as potentially misusing the vehicle, causing undue wear and tear, or being dishonest about fuel consumption and travel distances. Semi-structured interviews further revealed that chauffeurs may intrude on privacy, overhear personal conversations, or gain knowledge of sensitive schedules, contributing to owners' unease. These economic, operational, and security considerations collectively reinforce a strong preference for self-driving over hiring a personal chauffeur. Households in this archetype prioritize direct control over their car and travel schedule. They value autonomy in managing the driving experience, including vehicle handling and maintenance, and often believe they can optimize routes, fuel efficiency, and travel time more effectively than a hired driver. Cost-conscious and risk-aware, these users adopt cautious driving practices to minimize potential expenses from accidents, traffic fines, or additional maintenance, further reinforcing their preference for self-driving over employing a personal chauffeur.

[Interviewee 9]: A 25-year-old describes;

"*We have been using cars for more than a decade now… We are a family of four, and we can all drive. Self driving gives us a control over our routine. My father uses the car occasionally for his work trips;*

otherwise, we use it mostly for social trips. We never felt the need for a driver as we all can drive... a two-wheeler is more convenient and cheaper... Once you start driving yourself, you will never like someone else driving your car and certainly not a driver… They are highly careless in handling other's car… cannot be easily trusted…They deceive you with fake receipts for car servicing and related matters… Also, your privacy is affected. One cannot speak freely inside the car in their presence…".

4. Conclusion

4.1 Significance of the study

This study identifies two distinct behavioural archetypes of self-driving households in India: the Self-reliant Affluent and the Frugal and Risk-Conscious. The findings demonstrate that the decision to self-drive is not determined solely by affordability or convenience, but by deeper orientations toward autonomy, control, competence, trust, and perceived risk. The Self-reliant Affluent archetype comprises households for whom driving is both practically manageable and symbolically meaningful. These households possess the economic capacity and structural stability to organise mobility in multiple ways, yet they deliberately retain personal control over driving. For them, self-driving represents autonomy, mastery, and active engagement with everyday mobility. Driving is not experienced as a burden but as an extension of self-sufficiency and confidence. The act of driving reinforces independence and preserves flexibility in daily routines. In contrast, the Frugal and Risk-Conscious archetype is shaped by a different evaluative logic. These households approach mobility decisions through careful cost–benefit reasoning and heightened sensitivity to privacy, reliability, and risk. Self-driving here reflects prudence and caution rather than symbolic affirmation. Financial discipline, concern over vehicle use, and preference for maintaining personal oversight over mobility arrangements guide their decision-making. The emphasis is less on emotional attachment to driving and more on rational management of household resources and responsibilities.

Despite these contrasting motivational foundations, both archetypes converge on the same behavioural outcome: the deliberate choice to self-drive. Importantly, these archetypes cut across conventional socioeconomic boundaries. They include single- and multiple-earning households, as well as both single- and multi-car owners with varying patterns of vehicle sharing. This convergence underscores a central insight of the study: similar mobility behaviour can emerge from distinct life-stage contexts and decision logics. The findings therefore challenge the assumption that self-driving is simply a default consequence of car ownership. Instead, self-driving emerges as an intentional and evaluated practice embedded within broader household strategies. Households consciously assess how mobility fits within their financial priorities, daily rhythms, and personal values. For some, self-driving affirms independence and competence; for others, it reflects vigilance, cost consciousness, and the desire to retain control. Understanding these behavioural archetypes provides a more nuanced explanation of car-use patterns in India. It demonstrates that beneath outwardly similar mobility outcomes lie different evaluative frameworks and lived realities. By foregrounding self-driving as a conscious behavioural choice rather

than an assumed norm, the study contributes a deeper interpretation of how households organise and experience automobility.

The methodological approach adopted in this study—integrating hierarchical cluster analysis, hypergeometric over-representation testing, and rich qualitative interpretation through thick description—constitutes a distinctive contribution to mobility research. Rather than privileging either statistical modelling or narrative explanation, the design deliberately combines structured pattern detection with contextual depth. This allows behavioural regularities to be identified while preserving the lived realities through which those behaviours acquire meaning. Although the dataset is modest in size from a quantitative standpoint, it is analytically robust in qualitative terms. The objective of the study was not population-level estimation, but problem construction and conceptual clarification: to examine whether self-driving could be understood as a differentiated behavioural phenomenon rather than a default outcome of car ownership. In such cases, smaller samples are methodologically appropriate, particularly when the aim is to explore emerging patterns, test the plausibility of a conceptual shift, or generate theoretically meaningful typologies (Robinson, 2014). The emphasis is therefore on depth rather than breadth.

In qualitative research, sample adequacy is guided by the principle of “information power” (Malterud, Siersma and Guassora, 2016). According to this framework, the more specific the research question, the more relevant and information-rich the participants, and the stronger the analytical strategy, the fewer participants are required. The present study satisfies these conditions: the research question is narrowly defined (why households choose to self-drive), participants were purposively selected as car-owning households actively engaged in self-driving, and the analysis employed a structured clustering and validation process. Consequently, the dataset holds substantial explanatory power relative to its size. Moreover, the combination of clustering and over-representation analysis strengthens the credibility of findings derived from a smaller sample. Cluster analysis reveals patterned similarities in motivations, while hypergeometric testing verifies that certain socioeconomic attributes are statistically concentrated within those clusters. Thick description then situates these statistical regularities within everyday household practices. The triangulation of methods reduces the risk of anecdotal inference and enhances analytical transparency.

Replicating this approach across metropolitan, tier-II, and emerging cities could reveal whether self-driving archetypes are stable across contexts or shaped by urban scale and development trajectory. This would refine the understanding of car-user heterogeneity beyond conventional income segmentation models. More broadly, the study demonstrates that conventional large-scale transport surveys may obscure meaningful behavioural distinctions by collapsing diverse motivations into aggregate indicators of “car use.” Ultimately, the strength of this study lies not in sample size but in analytical design. By integrating statistical validation with interpretive richness, it advances a nuanced framework for understanding self-driving as a conscious household strategy. This framework can inform future empirical work.

4.2 Future scope of work

Now that this study has established a clear behavioural distinction between two car-user groups—self-driving households and chauffeur-driven households—it opens an important empirical and policy-oriented research direction. Future research can build upon this segmentation by systematically examining the Vehicle Kilometres Travelled (VKT) associated with each group. Doing so would move the analysis from motivational explanation toward measurable transport system impacts. A comparative VKT assessment would enable researchers to determine whether self-driven and chauffeur-driven cars differ in trip frequency, trip length, peak-hour concentration, idling time, and empty running (e.g., return trips without passengers). Chauffeur-driven vehicles, for instance, may generate additional circulation kilometres related to drop-offs, waiting, repositioning, or parking search behaviour. In contrast, self-driving households may exhibit more consolidated trip chaining but potentially higher peak-hour alignment with work schedules. Without quantifying VKT patterns, these behavioural differences remain speculative. Disaggregating VKT by user group would allow estimation of differentiated congestion contributions. If one category systematically produces higher peak-period traffic loads or greater cruising intensity, transport demand management strategies could be calibrated accordingly. This distinction is particularly relevant in the context of the “polluter pays” principle. In essence, this study provides the conceptual foundation for a next phase of research that links behavioural archetypes to measurable transport impacts. By quantifying the VKT patterns of self-driven and chauffeur-driven households, future studies can move from understanding *why* households organise mobility differently to assessing *how* those differences shape congestion, emissions, and infrastructure demand.

Declarations

This study involved interviews with car owners. Informed consent was obtained from all individual participants prior to their participation. The study was reviewed and approved by my Doctoral Scrutiny Committee (DSC) at the Department of Architecture and Regional Planning, Indian Institute of Technology Kharagpur, India.

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CRediT authorship contribution statement

Purnima Kumari Chowdhury - Writing – review & editing, Writing – original draft, Data curation, Data collection, Software coding, Validation, Methodology, Conceptualization.

Conflict of Interest

The author declares no competing interests. All aspects of the study, including fieldwork, data collection, analysis, and manuscript preparation, were carried out solely by the author.

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Figures

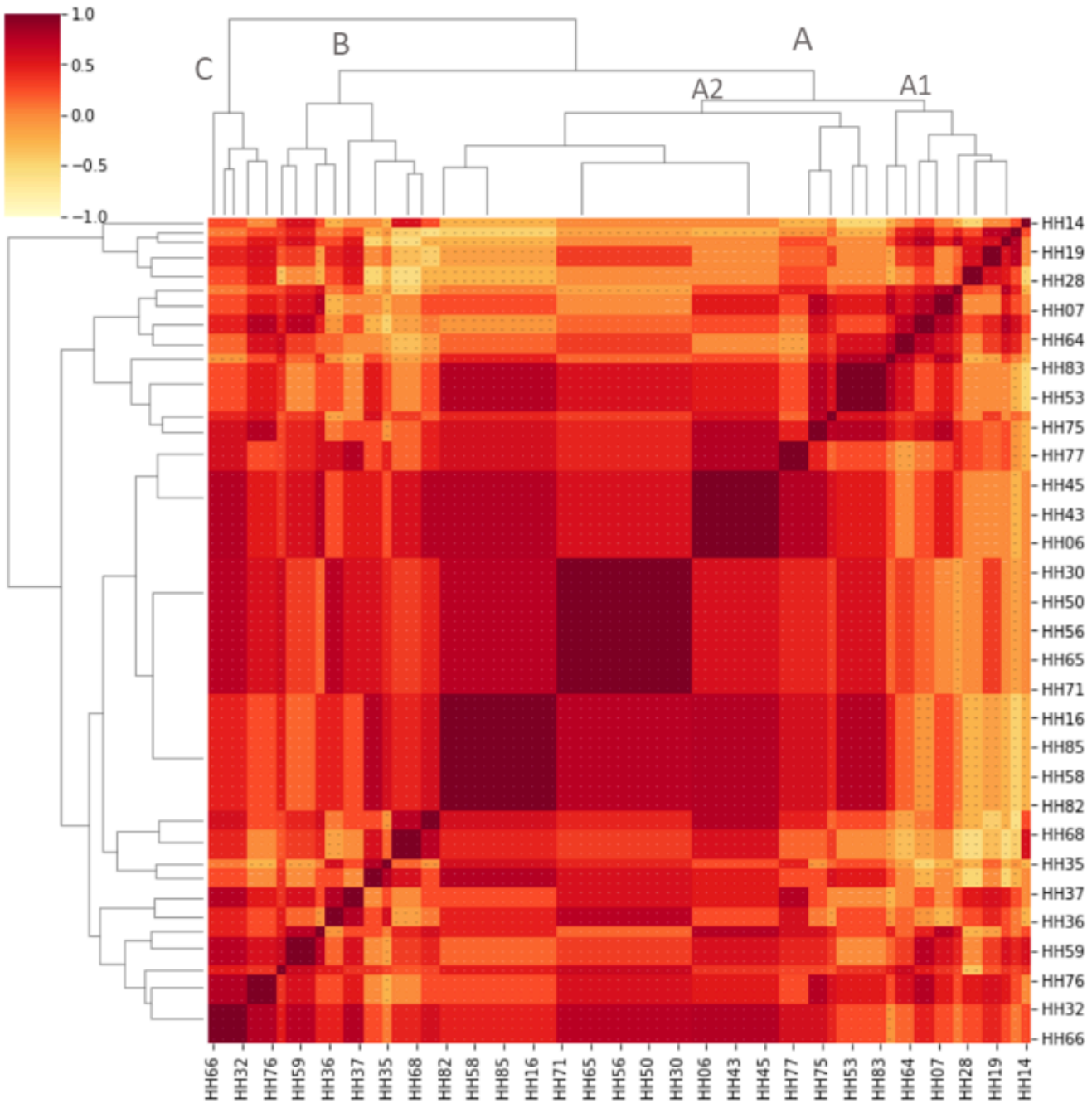


Figure 1

Cluster of households who choose to self-drive (Note: The figure presents a condensed visualization; several household samples are invisble to ensure readability of the axis label.)

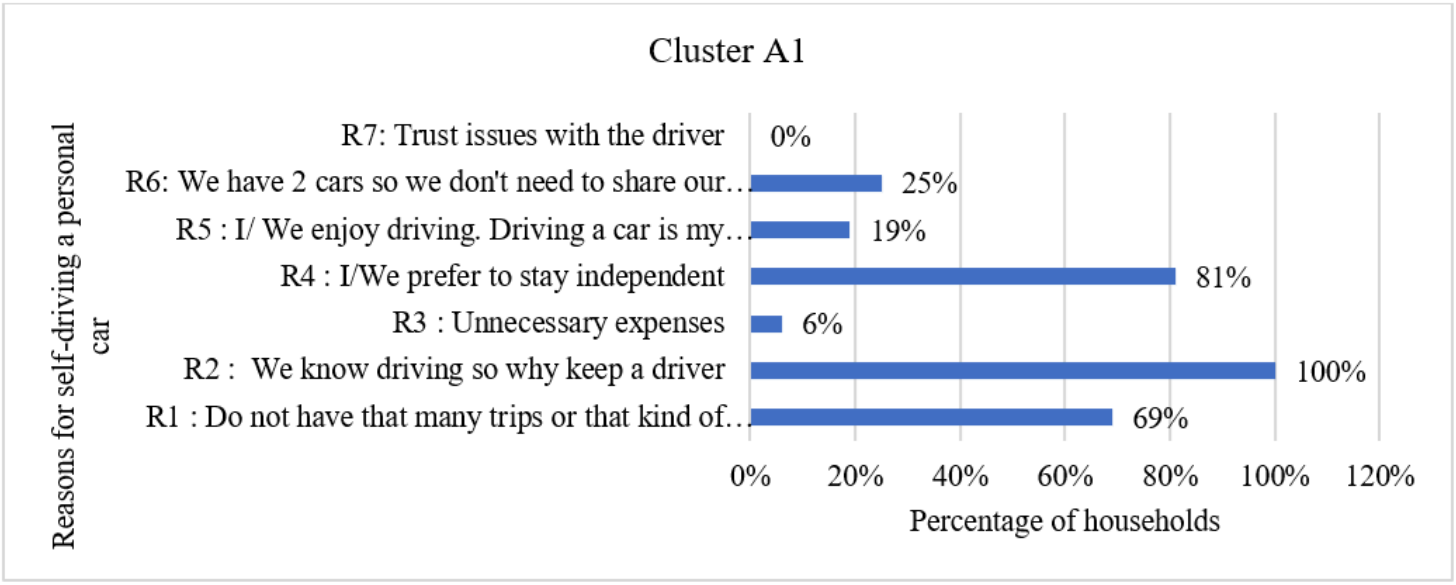


Figure 2

Figure 3 Percentage of reasons for self-driving reported by cluster A1 households

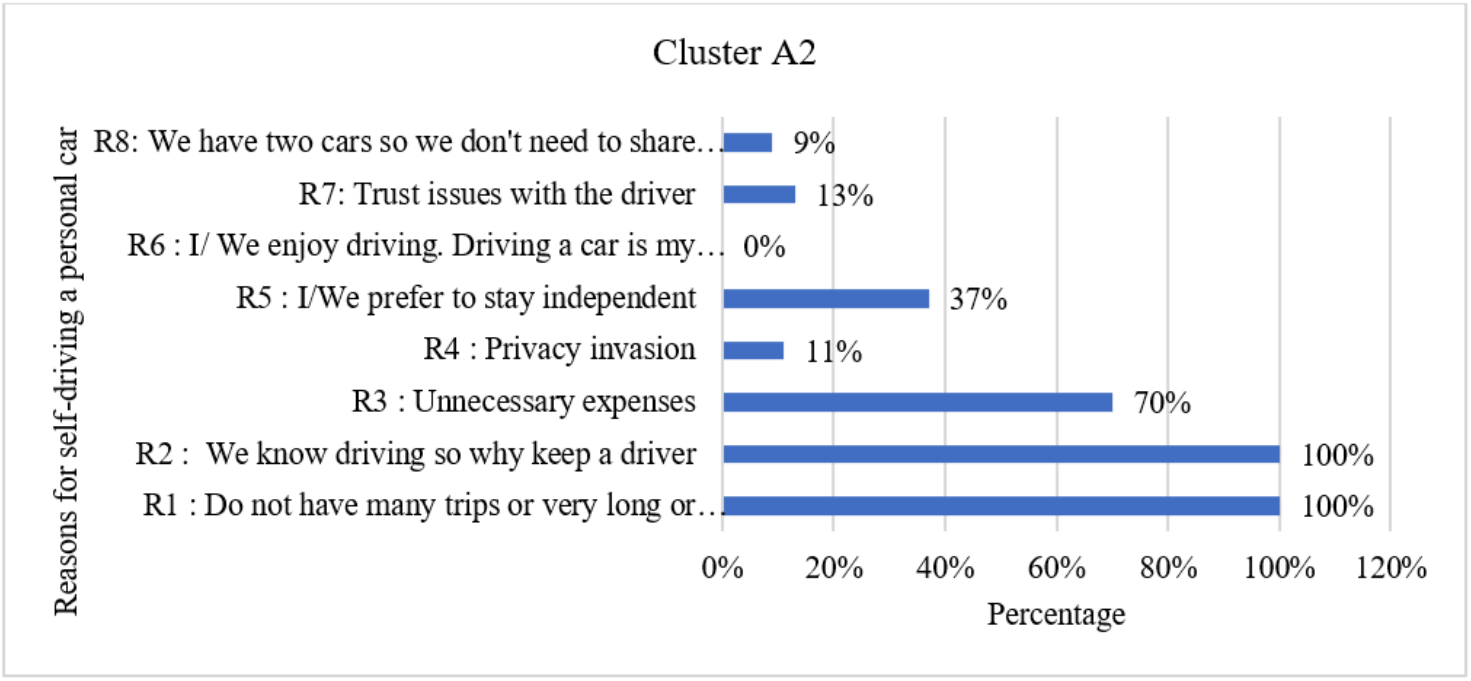


Figure 3

Figure 4 Percentage of reasons for self-driving reported by cluster A2 households

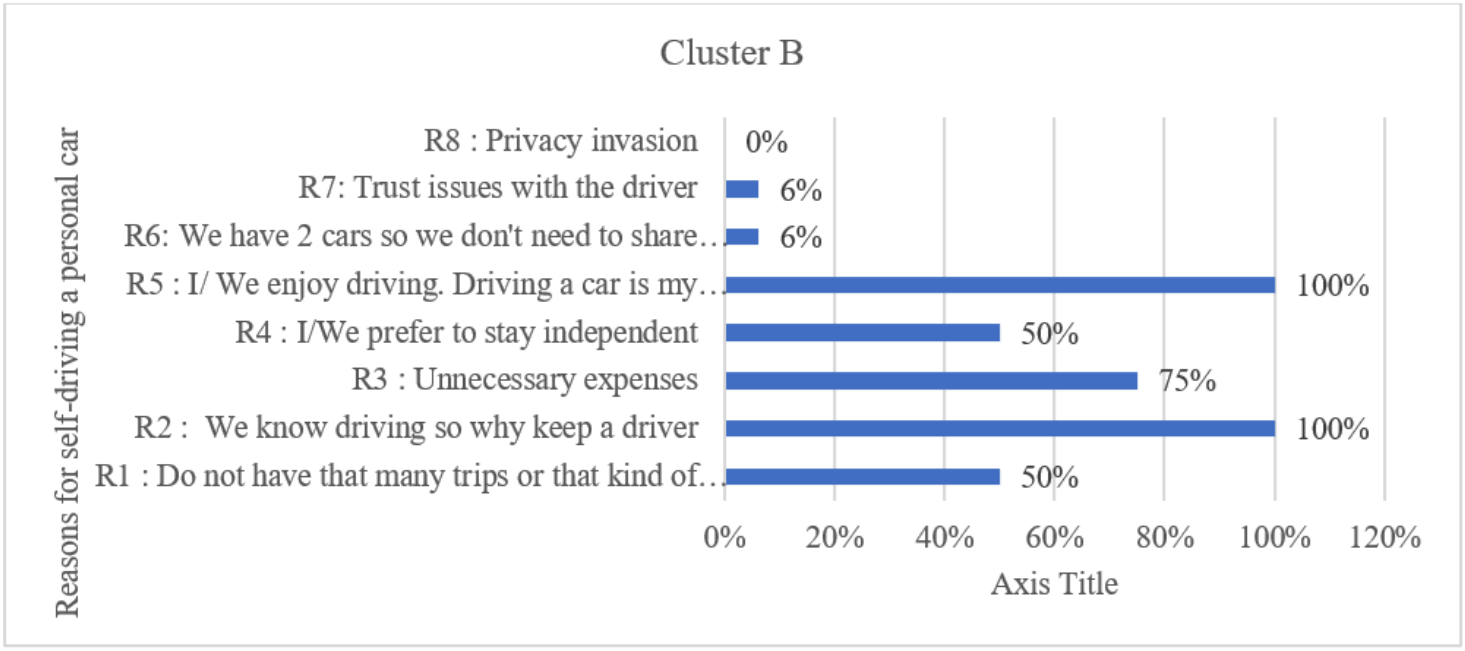


Figure 4

Figure 5 Percentage of reasons for self-driving reported by cluster B households

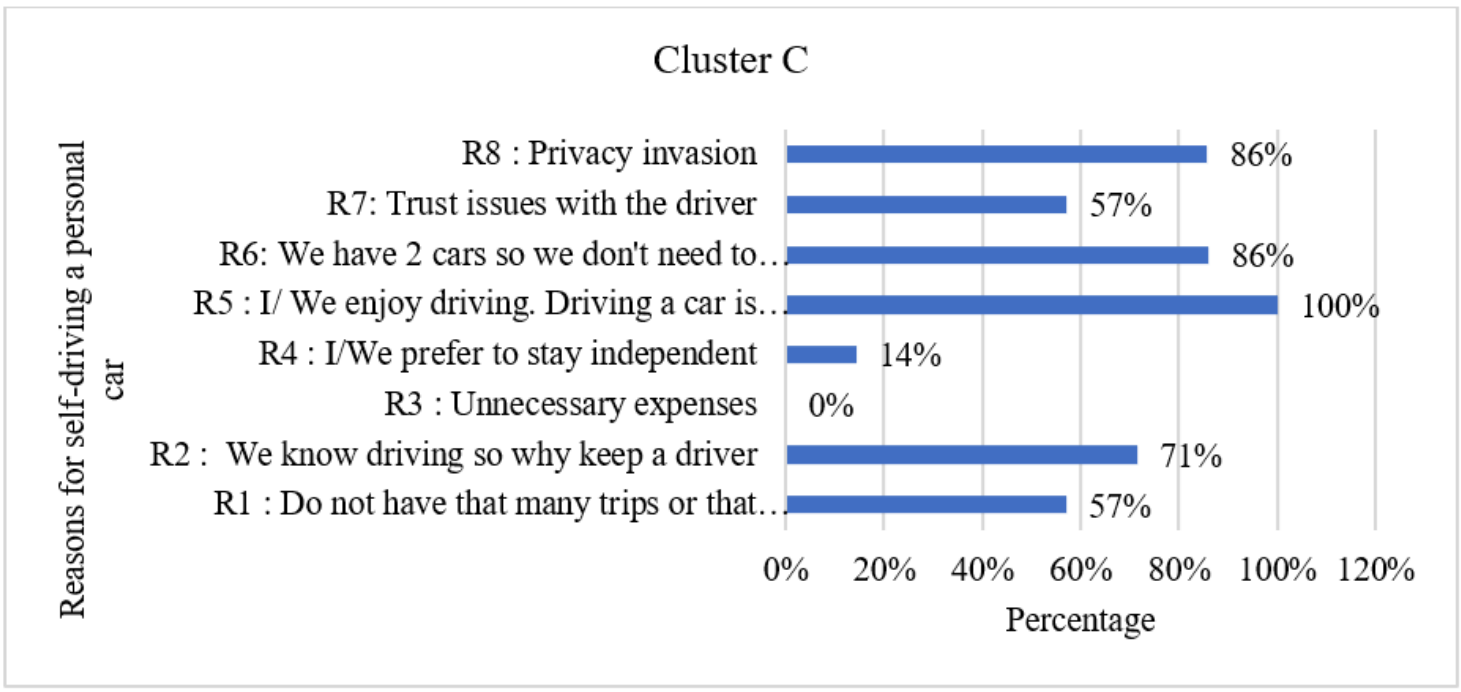


Figure 5

Figure 6 Percentage of reasons for self-driving reported by cluster C households