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Keeping up with the *Patels*: Conspicuous consumption drives the adoption of cars and appliances in India

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ABSTRACT

End-users base their consumption decisions not only on available budget and direct use value, but also on their social environment. The underlying social dynamics are particularly important in the case of consumer goods that implicate high future energy demand and are, hence, also key for climate mitigation. This paper investigates the impact of social factors, with a focus on 'status perceptions', on car and appliance ownerships by urban India households. Using two rounds of the household-level data from the India Human Development Survey (IHDS, 2005 and 2012), we test for the impact of social factors in addition to economic, demographic, locational, and housing on ownership levels. Starting with factor analysis to categorise appliances by their latent characteristics, we then apply the bivariate ordered probit model to identify drivers of consumption among the urban households. We find that while income and household demographics are predominant drivers of car and appliance uptake, the household's perception of status, instrumented by a variable measuring expenditure on conspicuous consumption, emerges as a key social dimension influencing the uptake. The results indicate how households identify themselves in society influences their corresponding car and appliance consumption. A deeper understanding of status-based consumption is, therefore, essential to designing better demand-side solutions to low-carbon consumption.

1. Introduction

"Keeping up with the Joneses" shorthands conspicuous consumption intended to convey social status and relative positional good [1–3]. It highlights the zero-sum game involved in buying a bigger car or a larger house just to keep equal social status with neighbors and colleagues. Far from being an US-focussed phenomena, similar dynamics are playing out globally. An understanding of those dynamics becomes also increasingly relevant, as the increasing externalities of consumption, in particular their direct and induced greenhouse gas emissions, shift these social interaction from a zero-sum game to a negative-sum game.

India as the world's second most populated country, with car ownership expected to grow 9-fold from 2014 to 2040, with appliance ownership and electricity demand increasing by 5–7.8 percent annually between 2015 and 2030, deserves to be at the center of analysis. Yet, India's current (c.2018) per capita energy consumption at 23.35 Gigajoules (GJ) [4] is well below the world average of 76 GJ [5]. This low level offers high potential to shape consumption behaviour to facilitate sustainable, low-carbon and where possible, consumption-reducing energy choices that are consistent with high wellbeing. In fact, demand-side solutions that achieve wellbeing for all, while maintaining induced energy and resource demand within limits are possible but remain underexplored [6–8]. An increased focus on end-user preferences, habits, social norms and structural factors that shape energy demand is warranted – keeping up with the *Patels*.[1]

Income has been studied as a predominant driver of energy consumption alongside other socio-economic factors. Literature on household energy consumption patterns in India so far has explored (but not restricted to) the determinants and drivers for cooking and lighting fuel use [9–12], fuel switching [13–15] and transitions [16], emissions from private transport choices [17], commuting patterns [18], and

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[1] Patel is one of most commonly occurring surnames, and the Indian family names correlated with the highest amount of purchases of gadgets (even if only in the UK) (https://www.thefreelibrary.com/Keeping+up+with+the+Patels%3B+THEY+SPEND+pounds+2%2C300+ON+GADGETS.-a0179894928). While a Hindu family name, Muslims, Christians and other religions are equally considered in this manuscript.

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residential electricity use [19] across rural and urban demographics. These studies vary by methodologies and context; yet they confirm the relevance of income, socio-economic, demographic and locational factors among others in affecting household energy choices.

At the same time, the level of energy consumption is increasingly seen as a key indicator of the standard of living for households. Literature on determinants of well-being for developing countries points towards a certain threshold of income below which households are immune to social comparisons and instead fully focuses on improving the absolute rather than relative income levels [20,21]. Above this threshold, with the increasing affordability of a wider range of goods, households define themselves by their purchases and experiences that signal their relative standing in a group or meet the average consumption standards of their community [22]. The social value that households seek through their behaviour and consumption patterns then translates into "status" [23]. This dimension of status remains however underexplored in the investigation of household consumption decisions.

Here, we investigate consumption choices of households focusing on status consumption in urban India. Using microdata for urban households in India, we validate this growing relationship for car and appliance uptake by applying panel regression methods and an instrumental variable (IV) approach. We begin with the understanding that car and appliance ownership would be higher among urban households primarily on account of the higher purchasing power they hold [18]. We focus on the urban household energy consumption dynamics in Indian cities and demand-side factors that have the potential to influence the overall urbanization trajectory towards low-carbon consumption. More specifically, two end-use energy sectors including transport and buildings are selected to inspect the role of "status" perception of urban Indian households. The paper aims to (a) identify factors, beyond income, which drive the choice of owning a car and household appliances in urban Indian households; and (b) explain the role of household's status in the ownership of car and electric appliances. This study also comments on the limitation of existing data sources for a detailed evaluation of demand-side factors that drive consumption to meet car and appliance needs.

Our research question focuses on the role of perceived socio-economic status in driving consumption. This question is of broader concern for the social sciences at large, and specifically, those investigating the role of energy, involving, for example, the econometricians view in discerning not only the correlated but also tentatively causal effects, and involving a sociological perspective on the societal transition from needs-satisfaction towards a status-driven consumption.

This paper is organized as follows: Section 2 brings attention to status-driven consumption for energy services in middle- and high-income households, Section 3 presents the data and methodology to estimate the relationship between the status perceptions and car and appliance choices, section 4 discusses the results in varying contexts, and the final section presents conclusion and future research areas.

2. Consumption and status

The pursuit of higher status and social distinction leads to conspicuous household consumption [24] and an attachment to lifestyle-based status performances. Using consumption in the development, displacement and maintenance of social position was also suggested through positional goods [25] and through forms of capital and social exclusion [26]. However, conspicuous consumption alone says little about the state of wellbeing [27]. Linssen et al. [28] find a negative relationship between conspicuous consumption and subjective well-being for low income rural Indian households, while Jaikumar et al. [29] observe a positive relation, with a higher effect for below poverty line (BPL) Indian households. A similar assessment of Russian households reveals an increase in individual happiness with increased consumption of an observable good – clothes, while the same was insignificant for the unobservable good – food [30].

Social stratification in India based on caste and gender lends heterogeneity to consumption patterns and behaviours in nutrition, education, mobility and energy. This is further accentuated by western consumption standards that reinforce norms around aspirational lifestyles. The Lok Survey from 2014 [31], found self-identified middle-class households to have a highly optimistic view of their status in life as well as their economic futures. Consequences of this optimism could be seen in choice of purchases made to meet the idea of a middle-class lifestyle of say owning a house, a car or adopting modern food habits. Marjit et al. [32] test the existence of status-seeking behaviour for poor households in India to find that need for social status prompts poor individuals to spend less on food and more on status goods (non-food items). In associating gender roles to cooking energy use in urban India, Kishore & Spears [33] establish a causal effect between male first child and use of clean cooking fuels in the household. While we may find status prevalent in daily consumption practices, not enough is understood about its extent and direction of influence on energy services in India. Status from energy consumption levels can be signalled through the kinds of domestic energy practices and the modes of meeting end-use energy services. For instance, installing energy-efficient lights in the house may be viewed differently to taking the bus to work daily. Lutzenheiser [34] suggests basing the discourse on energy and lifestyles on empirical investigations, rather than recognizable and intuitively satisfying stereotypes.

We therefore empirically test the hypothesis that, the probability of a household owning a car and electric appliances increases with a higher perceived status by the household.

3. Data and methods

3.1. Data

We use data from the India Human Development Survey (IHDS) conducted by the University of Maryland and the National Council of Applied Economic Research [35,36]. The survey uses two-stage stratification and is available as a panel dataset with two rounds of data for 2004–05 and 2011–12. In the second round of survey, around 83 percent of the households were re-interviewed as well as split households (if located within the same village or town) were added to the sample. The panel dataset comprises of over 40,000 rural and urban households. In addition, we combine the two period household data with the data on Eligible Women's Profile from 2011 to 12. The data on Eligible Women's Profile provides data to develop instrument variables. For this study, we restrict our sample to urban households that total around 14,000 households.

The data from the IHDS was preferred over the Indian National Sample Survey (NSS) largely as it captures the key dimension of status through the question asked in round II − 2012: 'According to you, is your household poor/middle-class/comfortable?'. The responses are coded as Poor – 1, Middle Class – 2 and Comfortable – 3. The survey also carries data needed for constructing the instrument variables i.e. economic status of husband's family for women married into the household (detailed in Section 3.2), that is not found in other datasets. Furthermore, the unsuitability of the latest NSS data[2] (round 75th, 2017–18), which is the Household Consumer Expenditure Survey, supports the use of IHDS. Thus, despite the age of the dataset, it proves as the best and only source of data for the current analysis. Moreover, recent publications have emerged with the use of the IHDS data, given their unique features in the Indian context [37–40].

The dependent variables for the study are the ownership of car and

[2] Data withheld due to data quality concerns of the survey (https://www.business-standard.com/article/news-ani/consumer-expenditure-survey-not-to-be-released-due-to-data-quality-issues-govt-119111501572_1.html).

appliances by the households. While the variable for car ownership is adapted directly from the questionnaire in its binary form (0 = does not own a car, 1 = own a car), the variable for appliance(s) ownership is modified using factor analysis (detailed in Section 3.2). It must be noted that data on the frequency of use in terms of the kilometres travelled, hourly kilowatts, or the number of cars or appliances owned by the households is not available. The subjective nature of the response to the question capturing status, allows us to view status as self-perceived. This perception maybe based on the household's relative standing in the society, or their idea of what/who constitutes these categories. While the term 'comfortable' has been identified to imply a status higher than 'middle class' in the paper, 'comfortable' is less commonly used in India to convey socio-economic status positions. It is rather used colloquially to indicate a higher/better standard of living or lifestyle. For this reason, many households belonging to higher-income quintiles may not officially state themselves as being a 'comfortable' household. As this question was asked only in the second round of the survey, any possible change in the perception of the household of their status over time is not possible to assess. The set of exogenous regressors selected for this study include economic factors – income (monthly), occupation and dwelling quality and home ownership status, demographic factors – years of education (highest education attainment by any adult member in the household) and number of members, social factors – membership to a social group (caste associations, political party, panchayats, *mahila mandal*, religious groups, NGOs, rotary clubs etc), caste, religion and structural factors – location (living in metropolitan or metro city[3]). Occupation, a categorical variable, is constructed using the main occupation of the father or husband of the head of the household. The 6 categories adopted from Iversen et al. [41] is created using the two-digit occupation codes from IHDS II and detailed in the Supplementary Data Information (SI, Table S1). The variable of dwelling quality, an indication of wealth, is borrowed from Rao & Ummel [37] and is constructed using five housing-related variables: roof material, wall material, floor material, toilet type, and water source. Each of these dwelling characteristics is categorised as 1-modern or 0-traditional, and index for dwelling quality is the average of all binary variable multiplied by five. A completely modern dwelling is indicated by an index value of five. A key standout of the IHDS panel dataset is the detailed information on income captured from various sources (farming, agricultural/non-ag, business, labour, salary, remittances, government benefits[4]), in contrast to surveys such as the National Sample Survey (NSS) that use consumption expenditure or household assets to measure the income or economic level of the household. A detailed description of each variable and the corresponding categories is provided in the SI (Table S3). Table 1 presents the summary statistics of key household demographics.

Table 1
Summary statistics for key demographics in urban India, 2005 and 2012.

Variable	IHDS - I (2005)		IHDS - II (2012)	
	Mean	Std. Dev	Mean	Std. Dev
Income (Annual) (Rs)	75,374	95,906.49	1,78,699	2,56,705.5
Monthly Consumption Expenditure (Rs)	5618	4,798.13	12,612	11,707.39
HH Size	5.5	2.65	5.04	2.42
Age (Female), in years	Na	na	45.5	12.3
Age (Male), in years	Na	na	50	12.6
Education level, no. of schooling years	9.5	4.65	10.5	4.62
Monthly Expenditure on electricity (Rs)	229	293.78	425	535.72
Electricity Access (hrs/day)	17	7.67	18	6.34
Monthly Expenditure on Transport (Rs)	292	564.84	1010	1870.9
Dwelling Quality	3.65	1.4	3.45	1.1

Note: sample size ~14,000.
Source: Authors' analysis based on IHDS (2004–05 and 2011–12).

3.2. Methods

The paper employs multiple regression analysis to explore the role of status as a demand-side dimension in household energy consumption. The variable for car ownership is taken directly as a binary categorical variable from the survey, whereas we conduct factor analysis to group appliance ownerships with common latent characteristics into three categories. A simple linear combination of all appliances owned suggested insufficiency in capturing any underlying latent characteristics that may correlate with the appliances. Factor analysis instead, allows to explore this multidimensionality of the appliances variables by identifying the underlying inter-relationships between them and classify as per common, unobserved factors. Round I (2004–05) of the IHDS survey captured 8 appliances that included Electric Fan, Colour Television (TV), Mixer/Grinder, Refrigerator, Air Cooler, Washing Machine, Computer and Air Conditioner, and Round II (2011–12) has two additional appliances – Laptop and Microwave, to the list. Each of these variables bear multiple latent features that cannot be captured in their entirety. But if n-1 features of these 10 variables are equally pronounced and if only one feature has opposing characteristics, then it is possible, by comparing the meanings of the variables, to attribute a conspicuous difference between the variables to the contrasting feature only [42]. The units of the variables are the same and the correlation matrix is used to obtain the eigenvalues of the factors. A preliminary exploratory analysis was conducted using iterated principal factors that retained three factors. Varimax orthogonal rotation is then used to facilitate the interpretation of factor loadings, that represent how the variables are weighted for each factor and the correlation between the variables and the factor [43]. The coefficients are used to obtain the factors scores for the retained factors using the *regression method*.

Table 2 presents the rotated factor loading based on factor analysis of household appliance ownership using principal component factors. Appliances for which the factor loading is above 0.35 are grouped, such that the minimal level for interpretation of the structure is maintained [44]. Further, the appliance is placed in the group or category where its factor loading is highest, as in the case for Washing Machine. Each factor can be considered to represent the underlying economic progression in the type of appliances that a household owns. Factor 3 groups 'basic appliances' that can be understood to define basic standards of living for the urban Indian household – an electric fan, a TV and a mixer/grinder[5]. Factor 2 groups together 'moderate appliances' that indicate a moderate standard of living for households that own them. Factor 1 symbolizes 'luxurious appliances', which includes appliances that are indicative of a more than adequate lifestyles often characterized by higher energy consumption and economic value. The results of factor analysis are in line with the intuitive categorization of the appliances.

Based on the three appliance groups (basic, moderate, and luxurious), we classify the level of ownership of the number of appliances (nil to maximum), from 0 to 3[6] for basic appliances, 0–2 for moderate appliances, and 0–5 for luxurious appliances. The determinants of ownership are modelled separately for each appliance group, drawing out contextual drivers as per appliance-category type.

[3] Metro cities include: Mumbai, Delhi, Kolkata, Chennai, Bangalore, and Hyderabad.

[4] Detailed income data was based on 50 different income sources queries grouped to create 8 major income types.

[5] Given cooking needs of an Indian household, mixer/grinders are one of the first electrical appliance purchases made.

[6] Increasing in order of the number of basic appliances the household owns.

Table 2
Factor analysis results with factor loadings of household appliances.

Appliances	Factor 1 (Luxurious Appliances)	Factor 2 (Moderate Appliances)	Factor 3 (Basic Appliances)
Mixer/Grinder	0.23	0.32	**0.39**
Colour TV	0.06	0.19	**0.75**
Air Cooler	0.14	**0.42**	0.17
Electric Fan	0.02	0.10	**0.49**
Refrigerator	0.23	**0.74**	0.27
Air Conditioner	**0.54**	0.15	0.04
Washing Machine	**0.54**	0.45	0.10
Computer	**0.50**	0.25	0.09
Laptop	**0.51**	0.11	0.06
Microwave	**0.53**	0.06	0.05

Note: The factor loadings for the variables above 0.35 and considered under the respective factors are marked in bold.
Source: Authors' analysis based on IHDS Data 2011–12.

3.2.1. The model setup

The two-period data allows us to test the effect of socio-economic, demographic and structural variables and for some cases the lagged effect of the drivers on ownership levels. The primary objective of the paper is to jointly study the ownership of car and appliances and the perception of status held by the household. However, given the subjective nature of perceived status, it is likely to be motivated by unobserved characteristics. When we test for the effect of status on the ownership of car and appliances, the case becomes complicated as status being one of the explanatory factors could be endogenous. This might suggest caution in interpreting the correlations as causal relationships. That is, there could be possible reverse causality with asset ownership determining the perception status held by the household, or that the status variable is correlated to the model error, or the effect of status is also explained by an omitted (confounding) variable. To circumvent the problems posed by these possibilities, we instrument the perception of status with theoretically reliable and econometrically valid variables – instrument variables.

Traditional models such as multinomial logit, ordered logit, or nested logit models would provide inconsistent estimates in this case. Therefore, to simultaneously model the household car/appliance ownership levels and status perception, a bivariate ordered probit (BOP) model is appropriately used.

As the dependent (car, appliance ownership) and endogenous (household perception of status) variables take the form of ordered categorical data, we apply the two-equation BOP model [45] using the following functions:

$$Y_{1i} = \beta_1 x_{1i}^{'} + \beta_2 z_i + \varepsilon_{1i} \quad (1)$$

$$Y_{2i} = \beta_1 x_{1i}^{'} + \gamma Y_{1i} + \varepsilon_{2i} \quad (2)$$

where $x^{'}$ is the vector of explanatory (exogenous) variables that include demographic, socio-economic and structural characteristics, β is the vector of unknown parameters, Y_1 is the ordered variable for status perception taking value from 1 to 3 and Y_2 is the ordered variable for car ownership (binary value of 0 and 1) and for appliance ownership (value from 0 to 3 for basic appliances, 0–2 for moderate appliances, and 0–5 for luxurious appliances), ε_1 and ε_2 are normally distributed error terms, and subscript i denotes an individual observation. γ it the scalar coefficient that estimates the effect that status perception has on ownership of car or appliance.

The endogeneity of Y_1, the perception of status, implies that it could depends on explanatory factor(s) in addition to those included in $x^{'}$. This endogeneity results in the correlation among the error terms in Eq. (1) – the outcome equation, and Eq. (2) – the endogenous regression. This endogeneity of status perception is tested using the Durbin–Wu–-Hausman test [46–48], which rejects the null hypothesis that the household's perception of status is exogenous. The likelihood ratio tests across the two models show a simultaneous relationship between status and ownership levels, where status is endogenous to the ownership of car or appliances at 1% level of significance. The significant test scores that suggested endogeneity of Y_1 justify the model specifications. This estimation process allows us to test for a causal relationship between perceived status and car/appliance ownership levels.

To address the issue of endogeneity and improve the identification properties of the model, we make use of instrument variable (IV) estimation approach. A valid and reliable IV must satisfy two essential criteria [49]. First, the relevance criterion requires the instrument to be theoretically justified and statistically correlated (after controlling for all other exogenous variables) with the endogenous variable. Second, the exogeneity criterion requires that the instrument must be uncorrelated with the error terms. This criterion relies on strong theoretical argumentation that eliminate a direct effect of the IV on the dependent variable, or a reverse effect of the dependent variable on the instruments. We begin by constructing two instruments (z_i, in Eq. (1)) namely the share of monthly expenditure on conspicuous consumption (continuous variable) from the Household Data and the economic status of husband's family[7] (relative to natal family) for women married into the household (categorical variable) from the Eligible Women's Profile (further details of IV creation in SI, Table S4).

Conspicuous consumption and status were first described by Veblen [24]. Further studies for high-income [50,51] and low to middle-income countries [52,53] have examined the expenditure on conspicuous consumption and the associated consumption patterns to describe status signalling across sub-populations (rural–urban, religion, race and ethnicities etc.). The IV created for this analysis does not include expenditure made on public or private transport or household appliances by the household, thereby lending no direct effect on the ownership of cars or appliances. The IV of economic status of the husband's family derives significance from the traditional arranged marriages (largely prevalent in India) and the focus on family systems. The purpose of marriages is to further the family's economic and social position. Given the dominantly patriarchal structure of the society, the economic status of the husband's family at the time of the wedding, strongly reflects the overall perceived status of the household the woman is married into.

The absent relation between the IV and dependent variable (car or appliance ownership) is confirmed by a low (< 10%) Pearson's correlation coefficient.

We apply the two constructed instrument variables to address the issue of endogeneity of the status variable. The relevance of the two instruments is tested in the first-stage regression by relying on the two-stage least square estimates. The over-identification (significant Sargan and Basmann chi-sq. test scores) of two IVs led to testing each of the IVs separately. After controlling for all the exogenous regressors, the F – statistic for the IV – share of monthly expenditure on conspicuous consumption is found significant and higher than 10 [49], demonstrating it to be a strong instrument with high correlation to status perception. The F-statistic was lower than 10 and insignificant for the IV – economic status of the husband's family. As a result, we drop the second IV. The outcome model (Eq. (2)) is finally estimated using the share of monthly expenditure on conspicuous consumption as the IV for status perception.

As a robustness check of the chosen IV – share of monthly expenditure on conspicuous consumption, varying versions were tested by altering the categories for conspicuous consumptipn and scale of measure (see SI).

The explanatory variables in the model satisfy the conditions for exogeneity such as $E(x_i, \varepsilon_i) = 0$ and $E(z_i, \varepsilon_i) = 0$.

[7] Variable constructed from Eligible Women's Profile 2011–12 dataset.

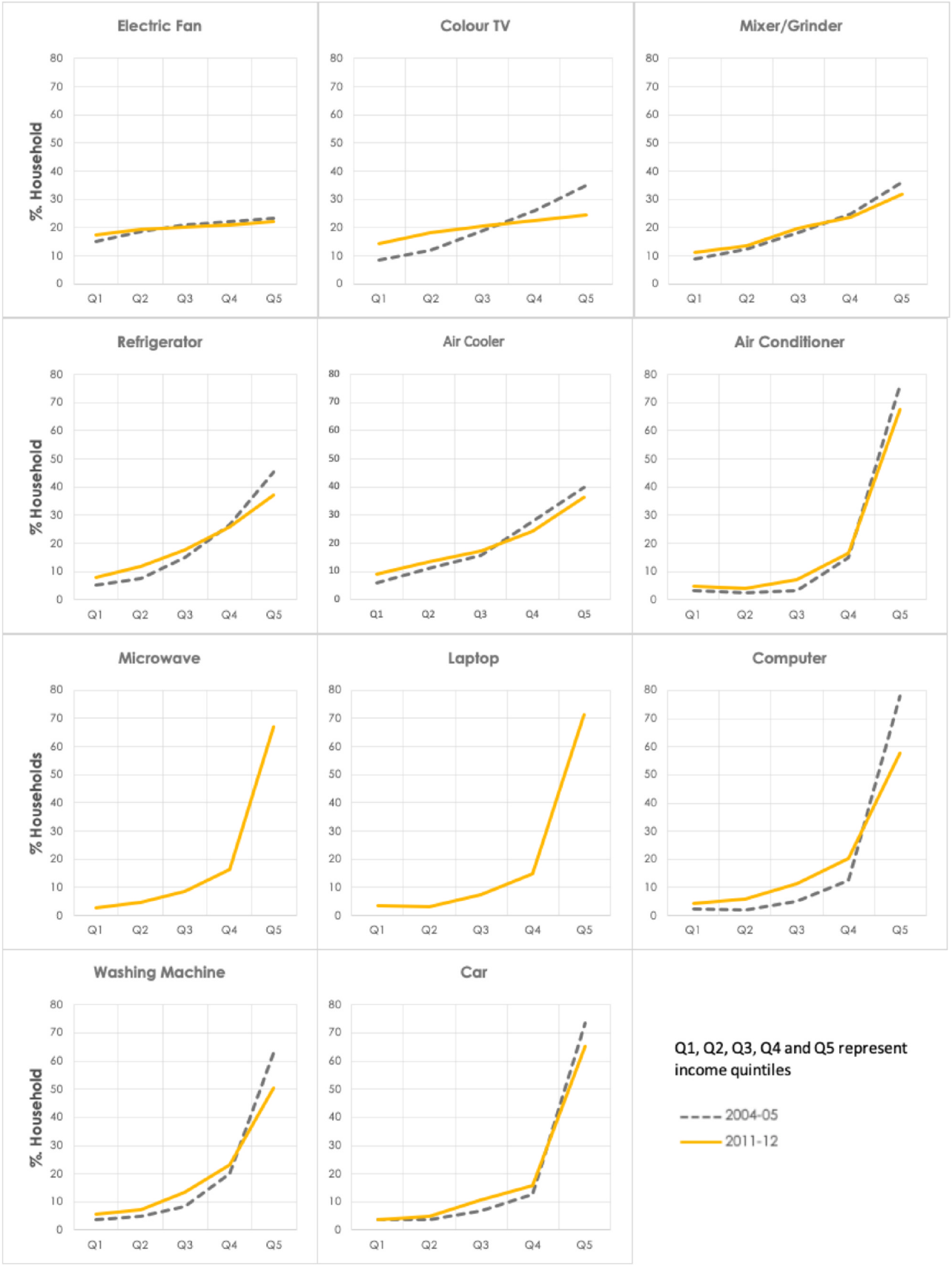

Fig. 1. Appliance and car ownership trends in urban India, 2005 and 2012. The graphs show the relative distribution of appliance and car ownership across income quintiles. The figures show that appliance and car ownership is distributed more equally across income segments in 2012 compared to 2005, even as all income segments obtain more appliances. Note: Data on Laptop and Microwave ownership was captured only in the second round of IHDS. Data Source: IHDS (2005 and 2012).

4. Results and discussion

4.1. Appliance and car ownership variation with income

The evolving nature of the Indian consumer is driven by the rising affluence and urbanization, amongst other factors [54]. The asset acquisition across households for both rounds is illustrated in Fig. 1, which plots the relative ownership level across income quintiles (i.e., the number of households in that quintile owning an asset by the total number of households owning the asset). The income quintiles are estimated for the two rounds. The income in 2004–05 is inflation adjusted to 2011–12 prices, facilitating comparison across two years.

As incomes rise, greater shares of households own assets, conforming to expectations. Of households owning a car 3.56 percent in 2012 were in the lowest quintile, while nearly 65 percent were in the highest income quintile. Similar increasing trends are also observed across all appliances as well, varying by the degree of increase over the income classes. The same year, a rapid increase in the share of households owning appliances while transitioning from the fourth to fifth quintile is seen for 'capital intensive high electricity consuming appliances' such as Air Conditioner, Washing Machine, Computer, Laptop, and Microwave. For these appliances, the income effect is found to be the strongest at the highest income levels and moderate at lower and middle incomes. The trend is not as drastic for Electric Fans and Color TV that present only a marginal increase over income classes, as it can be expected to be commonplace in urban households.

Comparative analysis is done at two levels of comparisons – first across quintiles for the same year, second between the two years. The data indicates interesting patterns when these household shares are compared over the two survey years. Over 2004–05 to 2011–12, Q1 to Q3 have seen a faster increase in appliance ownership than Q4 and Q5 across nearly all assets. This indicates marginally higher equality (in appliance ownership) across income classes. As a consequence, even as more households in the top two quintiles possess appliance in absolute terms in 2012, their share is now smaller. This trend suggests that the increase in the number of households that owned car and appliances was higher in lower- and middle-income households than in upper middle- and higher-income households. Relative to 2005, where the major share of households owning cars and appliances were in the higher incomes, by 2012 this share is being shared by middle incomes as well. Two movements are likely to be in action here – the movements of households within the same income quintiles and the movements between quintiles (low to middle).

This expansion of the middle-income class, despite varied definitions across emerging studies, has been explored as the shifting of behaviours and spending patterns of the evolving consumer beyond certain income levels from necessities to choice-based ones [54,55] and rise in self-identification as middle class for the aspirational poor [56]. This is also evident in the data with over 60% of urban households in 2012 perceiving themselves as middle class. Across income quintiles (Fig. 2), even at the lowest income quintile, over 40% of the households stated themselves to be middle class. The perception of being poor fell and that of being comfortable increased with higher income quintiles falling in line with the common base of understanding. However, across all income quintiles the perception of being a middle-class household was dominant.

4.2. Changing ownerships rates with status

Plotting the category-wise appliance stock across status levels, we see number of appliances (> 0) being owned under each category increasing with improving status levels. This was the highest in case of Basic appliances, with 100 percent households owning at least one of the appliance. Uptake of Moderate and Luxurious appliances also underwent stark increases, but most households focused on owning 1–2 appliances as the status improved.

Figs. 3 and 4 plot how the car and appliance respectively ownership levels, respectively, change across the status perceptions, described as poor, middle class and comfortable, that was asked in the second round of the survey. The share of households owning a car increases as the status claim change from being poor to middle class to comfortable. A similar trend is seen for appliances.

Examining the three status perception categories independently, it becomes evident that households that perceive themselves as 'Comfortable' own a larger number of appliance or have a car, as compared to those who view themselves as 'Middle Class'. Amongst households that were 'Comfortable', majority owned the Basic (100%), Moderate (90%) and Luxurious (67%) appliances. While it is not a majority, nearly 40% of Comfortable households owned a car. For the 'Middle Class' households, only 30 percent owned Luxurious appliances, though a majority owned Moderate (64%) and Basic (99%) appliances. Only a share of 8% 'Middle Class' household owned a car. Thus, the self-perception of socioeconomic status is positive with the number and the kind of appliance and car one owns.

4.3. Factors explaining car and appliance ownerships

We estimate the BOP model jointly with Eqs. (1) and (2) using the maximum likelihood method to establish a statistically significant correlation between the perception of status held by the households and their probability of ownership of a car or appliances across categories. A positive (negative) value of a coefficient estimate indicates an increase (decrease) in the probability of ownership of a car or appliances (as applicable). Table 3 presents the two-equation BOP model regression results[8] for car ownership, and the appliance categories separately – basic appliances, moderate appliances and luxurious appliances. The table presents the estimated coefficients of the regressors for household status perception, Eq. (1), in the top part and the estimated coefficients for car and appliance category ownership, Eq. (2), in the lower part.

As the key focus of the paper – the effect of status perception and the probability of ownership of car and appliances is revealed by gamma (γ), which is positive and significant across all cases. The results indicate a moderate heterogeneity in the impact of status on ownership levels. The effect is strongest for luxurious appliances (1.02) that include air conditioner, washing machine, microwave, computer and laptop. The increasing ownership of such appliances is indicative that households' desire to live affluent lifestyles marked by comfort and convenience over toil and higher costs, improved service performances[9] as well as a visual testament of economic progress and social conspicuousness. At the same time, the entry of microwaves and washing machines into homes could free women from domestic chores, enabling them to enter the workforce and contributing to the household income. Yet for India, over 70 percent of the households surveyed are yet to own a luxurious appliance. So as households own more of these appliances, they perceive themselves as a more comfortable household relative to a poor or middle-class household. A gamma value of 0.92 for the impact of status on car ownership reiterates the value of higher status the society accords to owning a car. The similar and significant correlation of status perception with owning basic and moderate appliances (0.87 and 0.82 respectively), suggests that while some of these appliances are needed for meeting primary living standards, households owning more (than one) or all appliances in the categories are perceived better-off than those who own lesser.

Analysing the regression estimates for household perception of

[8] The magnitude of the coefficients cannot be interpreted as they differ by scale factor.

[9] Microwaves allow food to be reheated, saving cooking time; Washing Machines automate clothes washing tasks enabling time saving benefits and transforming the washing experience; Air conditioners provide better cooling than Air coolers in humid areas.

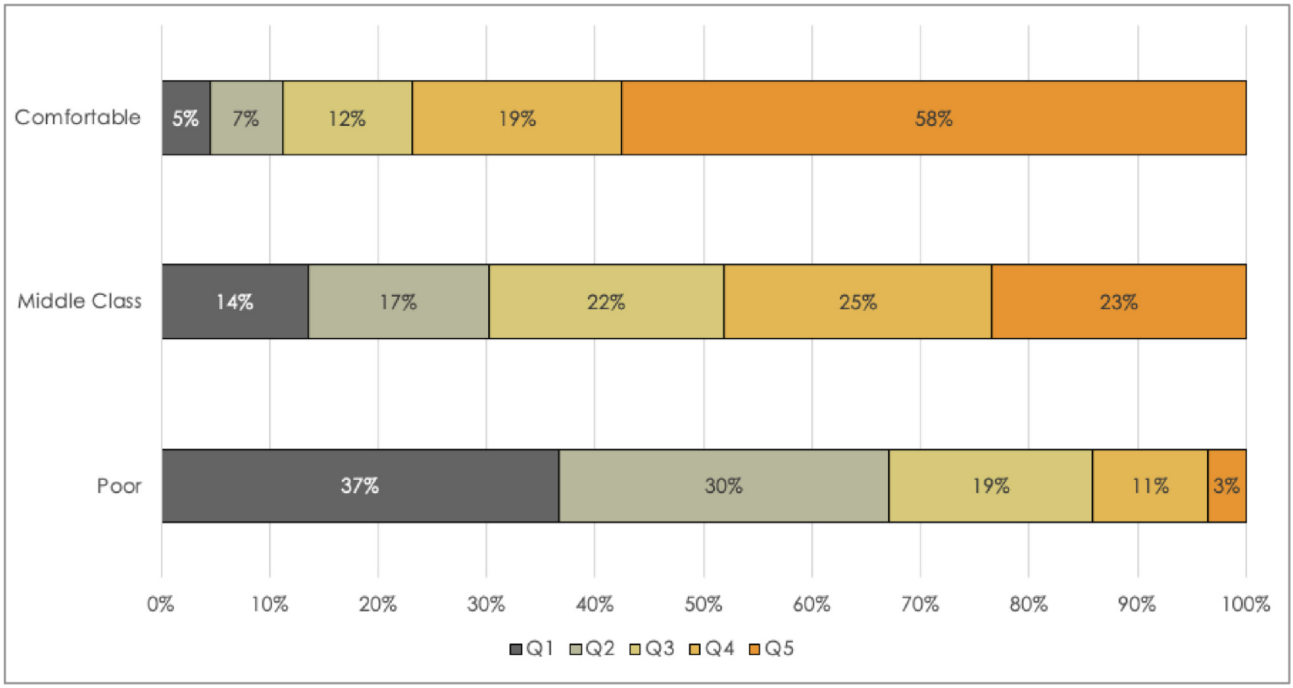

Fig. 2. Perceived status by income quintiles in urban India, 2012. Data source: IHDS (2005 and 2012).

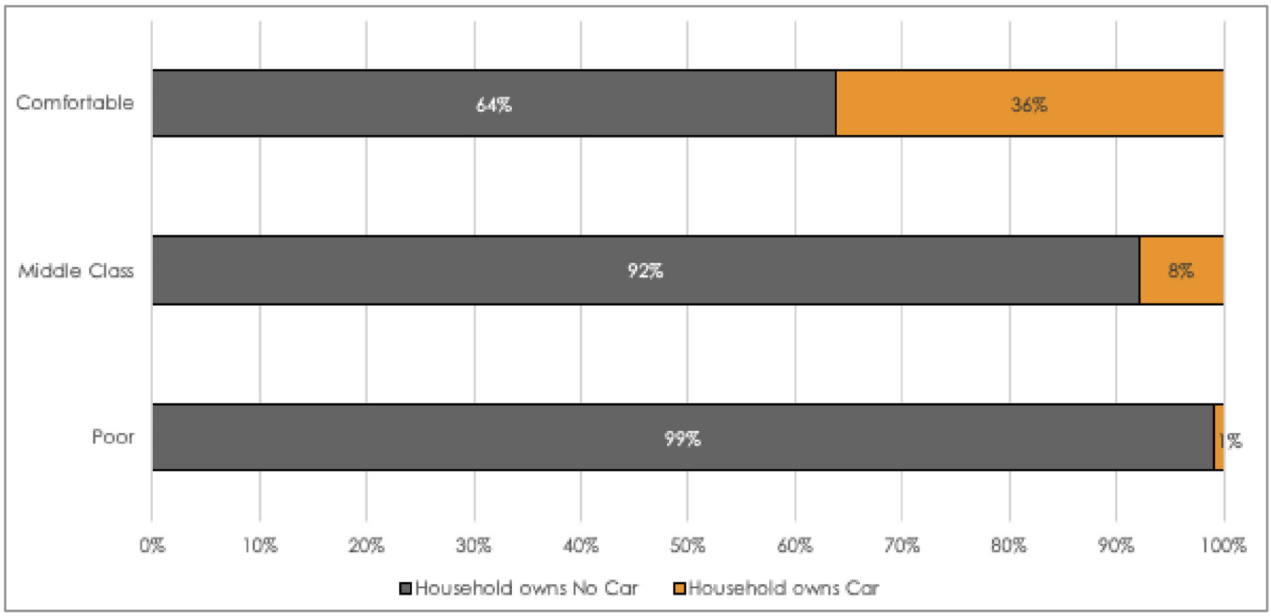

Fig. 3. Car ownership by Status in urban India, 2012. Data Source: IHDS (2012).

status across the models for car and appliances, most variables in consideration have a significant and similar impact. Improvements in economic characteristics of the household – income, occupation status, education, dwelling quality and home ownership – that are also indicative of household wealth, positively affect the perception of status. This is consistent with previous studies that show that an individual or household's material conditions impact their personal and social identities [57,58].

To strengthen the estimated effect of status perception on car and appliance ownership, marginal effects[10] of status and income, the most common cash-based measure of status and class, is presented in Table 4. For a 10% increase in the monthly income of the household, the probabilities of owning a car or upto 4 luxurious appliances are observed to increase by 28.11% and 25.95%, respectively. Likewise, with the household perceiving itself as middle class increases the probability of owning a car by 12.5% as compared to when it perceives itself

[10] In case of income, marginal effects measure the % change in population of car or appliance owners if all households had 10% more income. For status, the

(*footnote continued*)
marginal effects measure the % change in the population of car or appliance owners, if the status perception shifted from being perceived as poor to middle class, and from middle class to being comfortable, established exogenously through a 10% increase in the share of monthly expenditure on conspicuous consumption.

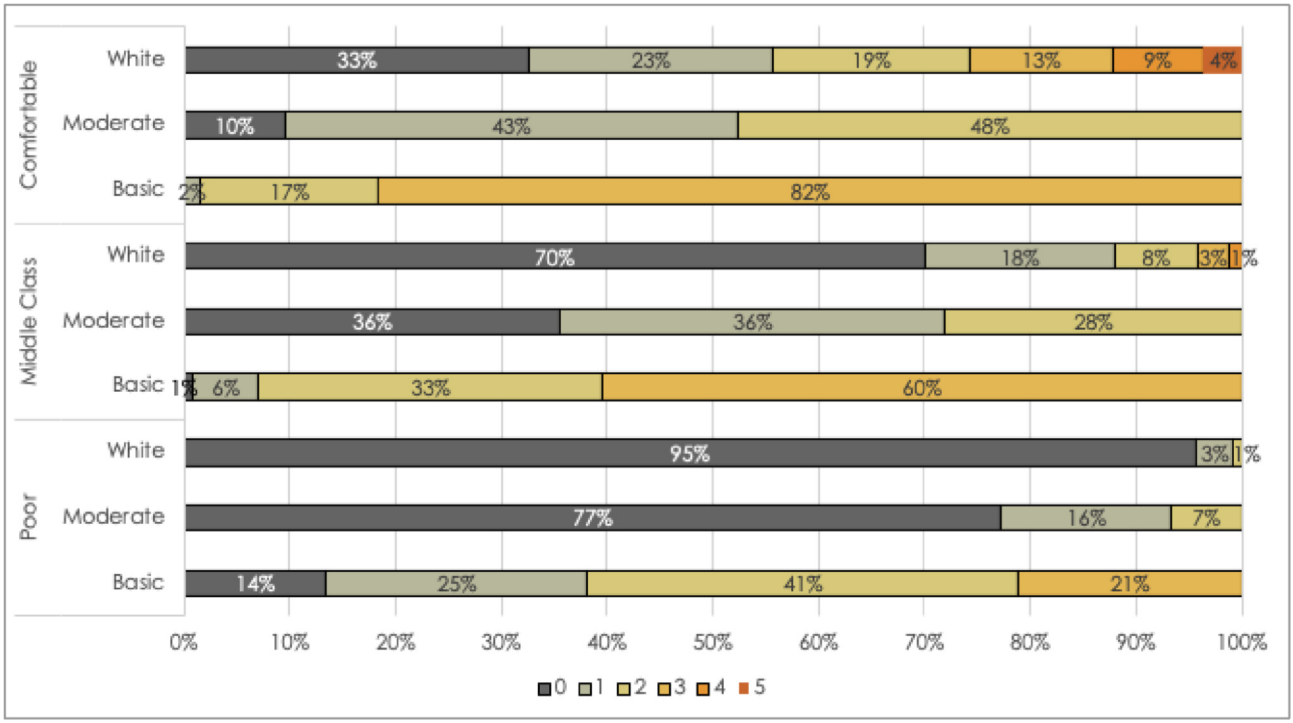

Fig. 4. Number of appliance ownership by status in urban India, 2012. Data Source: IHDS 2012.

comfortable (0.92% only). This likely indicates the middle class aspiration of 'owning' a car, while a comfortable would be more associate with the car brand, quality, count or other features of a car (currently beyond the scope of study).

Barring for 1 or 2 basic appliances, the marginal effect of income and status on ownership is positive and significant with increasing number of appliances owned. Interestingly, the marginal effect of status on basic and moderate appliances is higher when a household perceived itself as middle class than comfortable. This effect is reversed in case of luxurious appliances, wherein the marginal effect of a comfortable status is higher for consecutive appliance ownership relative to a middle class perception. This reiterates the strongest status effect on luxurious appliances as also indicated by the gamma coefficient.

In addition to wealth indicators, participation in social groups or organisation has a positive impact, while the caste category has a negative influence on the perception of status. Relative to the Brahmin group (having a high social standing in the society), for households belonging to forward/general categories, or Scheduled Castes, Scheduled Tribes or Other Backward Classes (OBC) groups, the perception of status falls. This impact is reflective of the inherent property of caste that continues to exist in India and extends to the status representation by households [59].

Regression estimates for car ownership reveal income and religion with significant positive effects. While the positive income and car ownership correlation is consistent with previous research and expectations, an increase in the likelihood of car ownership for households as the religious identity of the household changes from Hindu to Muslim, to Christian, Sikh, Buddhist, Jain, Other or No religion, is interesting. A similar correlation is seen between religion and ownership of all appliance categories[11]. The variations in consumption patterns across religious groups was studied by Hirschman[60], concluding that religious affiliation may infact serve as a source of varying consumer behaviour and by extension on purchase decisions. The diverse relationship between private transportation and religion in India was also examined by Ahmad et al. [17,61]. To additionally ascertain why one religious group has a higher likelihood of asset purchases relative to another, the religion–asset ownership dynamics deserves a deeper investigation, currently outside the scope of the paper.

Across appliance categories, income and occupation are significant determinants for basic appliances, however negatively. This could indicate that with increasing incomes and improving occupational status, households do not look to purchase all of the basic appliances (as categorised in this paper), but instead invest elsewhere. An improvement in the quality of dwelling increases the probability of owning moderate appliances, as Rao and Ummel [37] document for refrigerators in India. The negative effect of owning a house on the probability of owning basic appliances can be explained by the fact that when a household purchases a home, they are more likely to already possess the basic appliances such as electric fan and TV, and not purchase more. At the same time, relative to a household in a non-metro, living in a metro city increases the probability of a household owning basic appliances.

The effect of social group membership challenges prior expectations for appliance ownerships. Membership of social groups or organisations negatively influences moderate and luxurious appliances ownership levels while increasing probability of basic appliance ownership. This could mean that elements of social groups – such as which the kind of group or specific features of appliances – brands, technology, features, that may influence the distinctiveness to become essential in investigating the decision path of more expensive and conspicuous appliance purchases. This also demonstrates that as we move from primary to more status-oriented appliances, how social identities shape decisions become complex to comprehend. Subtle shifts in the social context can dramatically change the groups we identify with at any instant [17,61]. The caste of the hosuehold negatively influences the ownership of moderate and luxurious appliances. That is, as caste categories change from Brahmin to Other Backward Classes (OBC) to Scheduled Castes (SC) and Scheduled Tribes (ST), the likelihood of appliance ownerships fall. Caste backgrounds have continued to define opportunities available to indviduals, even in the 21st Century. Despite controlling for economic indicators such as education and income, the

[11] The role of income and education is similar across the caste categories. This effect is tested through an interaction between Caste and Income and Caste and Education(See SI,Table S9)

Table 3
Regression estimates for the (simultaneous) bivariate ordered probit model.

First Stage: Household Perception for Status				
Monthly Income (log) $_{05}$	0.15*** (0.01)	0.15*** (0.01)	0.15*** 0.01)	0.15*** (0.01)
Occupation$_{05}$	0.06*** (0.01)	0.06*** (0.01)	0.06*** (0.01)	0.06*** (0.01)
Education$_{05}$	0.07*** (0.01)	0.07*** (0.01)	0.07*** (0.01)	0.07*** (0.01)
Household Size	0.02*** (0.01)	0.02*** (0.01)	0.02*** (0.01)	0.02*** (0.01)
Religion	0.02 (0.01)	0.02 (0.01)	0.02 (0.01)	0.015 (0.01)
Caste	-0.05*** (0.01)	-0.05*** (0.01)	-0.05*** (0.01)	-0.05*** (0.01)
Dwelling Quality	0.27*** (0.01)	0.28*** (0.01)	0.27*** (0.01)	0.27*** (0.01)
Home - rent or own	0.27*** (0.03)	0.27*** (0.03)	0.27*** (0.03)	0.27*** (0.03)
Location (non-metro/metro city)	-0.02 (0.01)	-0.01 (0.01)	-0.02 (0.01)	-0.02 (0.01)
Member of Social Group	0.09*** (0.02)	0.08*** (0.02)	0.08*** (0.02)	0.08*** (0.02)
Share of monthly expenditure on Conspicuous Consumption (IV)	9.3*** (1.06)	9.32*** (1.06)	9.28*** (1.06)	9.30*** (1.06)
Second Stage: Ownership/Consumption	**Car**	**Basic Appliances**	**Moderate Appliances**	**Luxurious Appliances**
Monthly Income (log) $_{05}$	0.06* (0.04)	-0.05** (0.02)	-0.01 (0.02)	-0.03 (0.02)
Occupation$_{05}$	0.01 (0.02)	-0.04*** (0.01)	-0.01 (0.01)	0.01 (0.01)
Education$_{05}$	0.02 (0.02)	0.01 (0.01)	0.01 (0.01)	0.02 (0.01)
Household Size	0.01 (0.01)	-0.01*** (0.01)	0.03*** (0.01)	-0.01 (0.01)
Religion	0.10*** (0.02)	0.03** (0.02)	0.07*** (0.02)	0.08*** (0.02)
Caste	-0.03 (0.02)	0.02 (0.01)	-0.08*** (0.02)	-0.04** (0.02)
Dwelling Quality	-0.02 (0.05)	0.07 (0.04)	0.11*** (0.05)	-0.03 (0.04)
Home - rent/own	-0.07 (0.06)	-0.10*** (0.04)	0.03 (0.04)	-0.07 (0.04)
Location (non-metro/metro city)	-0.03 (0.02)	0.03*** (0.01)	0.01 (0.01)	0.03** (0.01)
Member of Social Group	0.05 (0.04)	0.26*** (0.04)	-0.21*** (0.02)	-0.05* (0.03)
ρ (correlation coefficient)	-0.47*** (0.17)	-0.55*** (0.13)	-0.54*** (0.12)	-0.77*** (0.13)
Household Perception for Status (Gamma)	0.92*** (0.12)	0.87*** (0.08)	0.82*** (0.07)	1.02*** (0.05)
Likelihood Test	492.04	970.36	770.45	898.06
Observations	11,857	11,855	11,851	11,835

decreasing appliance ownership for castes considered lower order social groups (SC, ST and OBC) and low on wellbeing indicators indicates of the continuing caste disparities and inequalities in opportunities [62]. While the varying association between social factors such as caste and asset ownership requires further exploration into the socio-cultural dynamics in India, these findings demonstrate the importance of non-economic factors.

Since 2000, the electricity consumption in Indian homes has increased threefold. The appliance basket comprising fans, TV, refrigerators, air conditioners, air coolers and water heaters contribute to around 50–60% of the total electricity consumption in India [63]. A survey of low-income houses in Rajkot, Gujarat in 2017 report that fans, TVs and refrigerators form bulk of the appliances used within affordable housing units, while a survey of households in Delhi the same year

Table 4
Marginal effects.

	Owning a Car	Basic Appliances			Moderate Appliances		Luxurious Appliances				
		1	2	3	1	2	1	2	3	4	5
Monthly Income	28.11	−7.47	−3.45	4.60	1.08	11.10	7.21	13.32	19.30	25.92	36.66
Status – Middle class	12.49	−7.39	−3.63	4.65	0.71	7.90	0.40	0.77	1.16	1.61	2.39
Status – Comfortable	0.92	−0.54	−0.27	0.34	0.05	0.58	5.49	10.56	15.77	21.87	32.61

captures rising appliance ownerships with dramatic jumps for refrigerator and air conditioners since 2011 [64]. Furthermore, industry and market studies foresee India to experience exponential growth in the AC market in the next decade [65]. While urban centers serve as sweet spots for car manufacturers to target affluent consumers, the macroeconomic and demographic trends point to shift from two- to four-wheelers. Using the survey data (2015) of residents from Bangalore, Delhi and Kolkata, Bansal et al. [66] predict 72% of the population to own cars by 2030.

Recent studies, focussing on India and other emerging countries, have explored the deep association of ownership of car and home appliances with that of social status, lending support our findings. For instance, Nielsen & Wilhite [67] argue that Tata Nano, a compact city car manufactured and marketed by Tata Motors as inexpensive with a launch price of US$2500 in the year 2008, could not maintain sales volume, primarily because of the inherent tag of a cheap car, thus failing to reflect “status”. Its negative identity connotation, an adverse or incomplete inclusion into the new middle class, was unable to appeal to the masses. In another case, despite bicycle stigmatizing mobility practice in India, the new middle classes of Bangalore opted for high-end bicycles with special gears as it enabled them to maintain their social status in personal and professional circles [68]. Tracing social process in cooking practices, Wang and Bailis [69] find that the shift away from traditional towards modern cookstoves was led by the desire to disassociate with the social stigma of using old and dirty modes of cooking. Drawing on social practice theory, Hansen et al. [70] argued that status plays one of the major roles in the dramatic increase in consumption, for instance, demand for buildings built for air conditioning as air conditioning becomes a social identifier, using India and Vietnam as case studies.

5. Conclusion

The paper examines the patterns of car and appliance ownership across income classes and tests its relationship with status perception using household-level survey data. Using the instrumental variable approach, we establish a causal relationship between car/appliance ownership and perception of status. As the self-perception of status held by the household improves the probability of the household purchasing or owning a car or appliance(s) increases. Specifically, after controlling for income, social aspiration increases consumption of cars and appliances. The results highlight the relevance of urban household’s notion about their relative standing in society when comparing the assets they own. Status emerges as a stronger factor than other non-income factors considered in the analysis.

In line with previous studies, household characteristics such as household demographics, living in metros versus non-metros, household size and housing quality factors influence car and appliance ownerships. Importantly, we find the association with social groups – belonging to a caste, religion and social group membership - to significantly impact the ownership of car, and appliances. Over the seven-year period between the surveys, the strongest increase in ownership of car and luxurious appliances is seen in households from the middle-income quintile (Q3), a section of which (6%) also identifies themselves with being of comfortable status. Acknowledging methodological shortcoming, the notion of ‘comfortable’ households in the Indian context has been elaborated in Section 3.1. A significant share (40–50%) of low-income households (Q1-Q2) identifying themselves as middle class demonstrated that the perception of status preceded the actual income levels. For the emerging middle class that is not defined by the income alone but also by the perception and self-identification, status thus could become a key criteria for energy demand decisions: ownership of cars and appliances seems to allow people to associate themselves with a higher status relative to households with similar socioeconomic characteristics but lacking these goods.

Importantly, the instrument variable approach allowed us to determine a direction of causality in the relationship between car/appliance ownership and the perception of status held by the household. Households that view themselves as middle class relative to being poor, and those that perceive themselves comfortable relative to being middle class, have a higher probability of owning a car and multiple appliances (across all the categories). This could indicate that the aspiration for a more comfortable lifestyle may prompt households to purchase more energy intensive goods. Aspirations often act as motivations that lead households to strive stronger for consumer goods that may not be immediately affordable but would be desirable in the future. This steady aspiration can change spending patterns of the new Indian consumer towards goods that provide a higher status value (conspicuously) but with fewer functional and practical utility. The increasing affordability of aspirational goods may pivot the needs of even value-conscious Indian consumers. Furthermore, the shifting of family structures – joint families giving way to nuclear households – has seen a corresponding shift in basing consumption decisions on lifestyle considerations and the need to ‘keep pace’ [54]. The social nature of consumption stimulated by online shopping and social media exposures add to this pace. While concerns remain on characterising a comfortable lifestyle that is also a low-carbon one, status-based consumption in the emerging country context demand deeper investigation. This calls for a renewed focus on status signalling in consumption research while also enabling future household surveys to capture a higher resolution on facets of social status and its interaction, in particular, with the use of energy services.

Consumption patterns tend to change ahead of incomes [71]. In light of urbanization, social mobility and rising affluence, the self-identified middle-class households with their aspirational standards of living emerge as the potentially largest consumers market. These findings move in the direction of identifying role of social factors in car and appliance uptake and can inform designing demand-side solutions to slowing residential energy demand and lifestyle contributions to climate change mitigation.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

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