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The hedonic treadmill: Electricity access in India has increased, but so have expectations

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ABSTRACT

As household electrification rates continue to increase globally, the focus in energy access planning is increasingly shifting towards quality of service. To inform this planning, we explore changes in household electricity and people's use and satisfaction with their service over time in rural India. Fielded in 2015, the ACCESS survey collected data on energy access from more than 8,500 households living across six Indian states. In 2018, the same households were re-surveyed. Using this longitudinal dataset, we sketch the changes in electricity access that took place during these three years. We find that access and the quality of supply have both improved substantially, with a 17 percentage points increase in electrification rates (95% CI: [15,19]). However, a large minority (about one fifth) remains unsatisfied with its electricity access. People's satisfaction levels were more sensitive to the quality of supply in 2018 compared to 2015. We propose that this change is a result of evolving expectations of electricity services that are offered. As households climb electricity access tiers and acquire more and larger electric appliances (such as fans or TVs), their demands increasingly shift from focusing on the extensive margin of supply to its intensive margin.

1. Introduction

Over the last two decades, electrification rates have grown substantially across the emerging world (IEA, 2018; Aklin et al., 2018). India, in particular, has been at the forefront of a rapid expansion of electricity access, connecting millions of households to the grid. The Government of India's announcement in 2018 that all villages had been electrified crowned years of proactive energy policy (Mehra and Bhattacharya, 2019). While in practice a number of households remain without electricity, a new set of public programs has been undertaken to meet the objective of universal electrification.[1]

While the *extensive margin* of the electricity access problem has been largely solved, the *intensive margin* remains a challenge. By intensive margin, we are referring to various characteristics of electricity supply that pertain to its quality. This includes how many hours per day households receive electricity, the number of blackouts per month, and problems related to voltage fluctuations. Concerns over quality of electricity are believed to be widespread, but little data has been available to shed light on the degree to which it remains a problem.

This paper makes two primary contributions. First, it uses new data to understand how access to electricity in India changed between 2015 and 2018. Using a framework that focuses on the multidimensional nature of electricity access helps us provide a richer account of the dramatic changes experienced in parts of India. Second, it introduces a new theory on dynamic changes in people's satisfaction levels with electricity.

For the first contribution, we use a new panel dataset of rural households living across six Indian states (Jain et al., 2018). The data were collected in 2015 and again in 2018, offering one of the few longitudinal resources to study electricity access. Using this dataset, our

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[1] "Modi Announces '100% Village Electrification', But 31 Million Indian Homes Are Still In The Dark" *Forbes*, May 7, 2018 https://www.forbes.com/sites/suparnadutt/2018/05/07/modi-announces-100-village-electrification-but-31-million-homes-are-still-in-the-dark/#51e4568e63ba.

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study offers three insights. First, we sketch the evolution of electricity access both from an objective and a subjective standpoint. We examine the degree to which (subjective) satisfaction levels regarding households' electricity situations have risen with improved electricity services. Despite improvements, the share of households that are unsatisfied has remained stable (about one fifth of the sample). Second, building on Aklin et al. (2016), we explore whether the quality of supply – mainly: duration, voltage fluctuations, and reliability – continue to shape people's satisfaction with electricity. Our interest in these dimensions stems from their importance in understanding other aspects of electricity access. SE4ALL (2017) flags them as particularly important for studying and reducing energy poverty. We replicate the main findings of Aklin et al. (2016) but we also find that many households have become more sensitive to the quality of supply than before.

The second contribution is theoretical in nature. In the last part of the paper, we reconcile the large remaining set of unsatisfied people and the increasing importance of supply quality. We move away from static models and argue that preferences adapt and evolve as the quality of supply improves. We present a theory that posits the existence of a hierarchy of electricity needs. As households climb the ladder of better electric supply, their needs and desires evolve accordingly. People's expectations increase with better access. Thus, the 'hedonic treadmill,' whereby a positive shock does not necessarily lead to permanent increases in happiness, may also be applicable for energy access (Diener et al., 2009). Further, as argued by Kano et al. (1984) in their customer satisfaction theory, the relationship between service improvement and customer satisfaction is not necessarily linear; it is mediated by quality attributes of the service that customers may value differently. This has, as we discuss in the conclusion, several policy implications.

2. Electrification policy and outcomes in India

We begin with a brief review of key milestones in India's electrification policy history. This section provides background information to contextualize recent developments in electricity access across India and particularly in the northern region.

In the years immediately following independence, rural electrification policies in India primarily focused on electricity as a productive input for the agricultural and micro-enterprise sectors (Bhattacharyya, 2006; Kale, 2014; Palit and Bandyopadhyay, 2017; Pelz et al., 2020). A major policy shift occurred in the Fifth Five Year Plan (1974–79), when domestic electricity was included in the Minimum Needs Programme (Palit and Bandyopadhyay, 2017). Since then there has been a constant push to electrify rural households, starting with the introduction of prominent schemes such as *Kutir Jyoti Yojana* (household lighting program) introduced in 1988 and the *Accelerated Rural Electrification Programme* (AREP) introduced in 2003. In addition, several state-specific programs sought to reduce electricity poverty in response to public demand (Min, 2015; Chindarkar, 2017).

Rural household electrification gained further momentum with the introduction of the *Rajiv Gandhi Grameen Vidyutikaran Yojana* (RGGVY) launched in April 2005 (Government of India, 2014a). The primary objective of RGGVY was to integrate and consolidate various schemes to better achieve rural electrification outcomes as set out in the National Electricity Policy (NEP) of 2003 (Palit and Bandyopadhyay, 2017). All earlier programs, including rural electrification under the *Minimum Needs Programme*, *Kutir Jyoti Yojana*, and AREP, were merged under RGGVY. The program included both the creation of village electricity infrastructure as well as the provision of individual connections to rural households. Below Poverty Line (BPL) households received a free connection but had to pay a minimal tariff for actual consumption.

The rural electrification agenda was furthered by the new national government elected in 2014, whuch emphasized not just expanding access but also improving the quality of rural electricity. With these objectives in mind, the *Deen Dayal Upadhyaya Gram Jyoti Yojana* (DDUGJY) was launched in December 2014, subsuming RGGVY (Government of India, 2014b). DDUGJY is an integrated program that attempts to overcome several gaps in RGGVY by incorporating the separation of domestic and agricultural feeders, strengthening and augmenting of sub-transmission and distribution infrastructure in rural areas, and improving metering (Palit and Bandyopadhyay, 2017). The underlying aim of DDUGJY is to provide 24 $\times$ 7 electricity to all rural households. The pro-poor focus is consistent throughout these efforts, with BPL households continuing to receive free connections.

The most recent program introduced by the government is the *Pradhan Mantri Sahaj Bijli Har Ghar Yojana* or Saubhagya scheme launched in September 2017 (Government of India, 2017). The objective of Saubhagya is to achieve universal electrification through last mile connectivity for un-electrified rural and urban households. To do so, the program provides a full or partial subsidy on the connection cost for poor and other households, respectively (Ganesan et al., 2019; Heynen et al., 2019). For households located in remote and inaccessible areas where grid electricity is not available, the scheme provides electricity through standalone solar photovoltaic systems. Preliminary studies suggest that the program has improved electricity connections (Jain et al., 2018), although voices have expressed concern over the accessibility of the program (Blankenship et al., 2020), the quality of electricity supply (Yadav et al., 2019), and whether its benefits were fairly distributed (Jain et al., 2018).

Taken together, these programs paved the way for a large-scale expansion of electricity access in rural India. By 2000, only about half of rural India was connected to the grid (Aklin et al., 2018). Ten years later, this share had climbed to three-quarters. In 2018, Prime Minster Modi announced that all villages had been connected, and a year later a similar announcement for household electrification was made by the government.[2] While in reality many households remain off the grid for a variety of reasons and some issues persist, the scale of progress has been remarkable.

3. Data and methods

The analysis that follows is based on a new longitudinal survey (Jain et al., 2015, 2018). This survey was fielded in six Indian states: Bihar, Jharkhand, Madhya Pradesh, Odisha, Uttar Pradesh, and West Bengal. The first wave was completed in 2014–2015, and the second one in 2018. We randomly selected 714 villages from 51 districts. Within each village, 12 households were interviewed. The dataset contains 17,635 observations, of which 8,563 households were available in both waves.

The villages were randomly selected following a stratified sampling strategy. In each state, one district was randomly selected from each administrative division (using weights based on the relative population share of each district). Then, each district was divided in two groups of equivalent population based on village size, with a group of small villages and one of relatively large villages. Within each group, seven villages were selected randomly (using weights based on each village's relative population share). See Aklin et al. (2016) for more details regarding sampling.

Each respondent was asked a wide range of questions regarding energy access. In addition, the survey included questions on the respondent's and his/her household's socioeconomic background (gender, caste, age, and so forth). The survey lasted about 45 min.

We use several variables in the analysis that follows. The appendix contains additional details (e.g. on exact phrasing of the questions; Section S1). Here, we briefly summarize the key variables.

Electricity access is measured in several ways. To begin with, we simply flag households that have any form of electricity in their home, whether from the grid, from a solar household system, from a diesel

[2] "India election 2019: Bringing power to the people" *BBC*, March 26, 2019; "India likely to achieve universal household electrification by January-end" *Financial Express*, January 20, 2019.

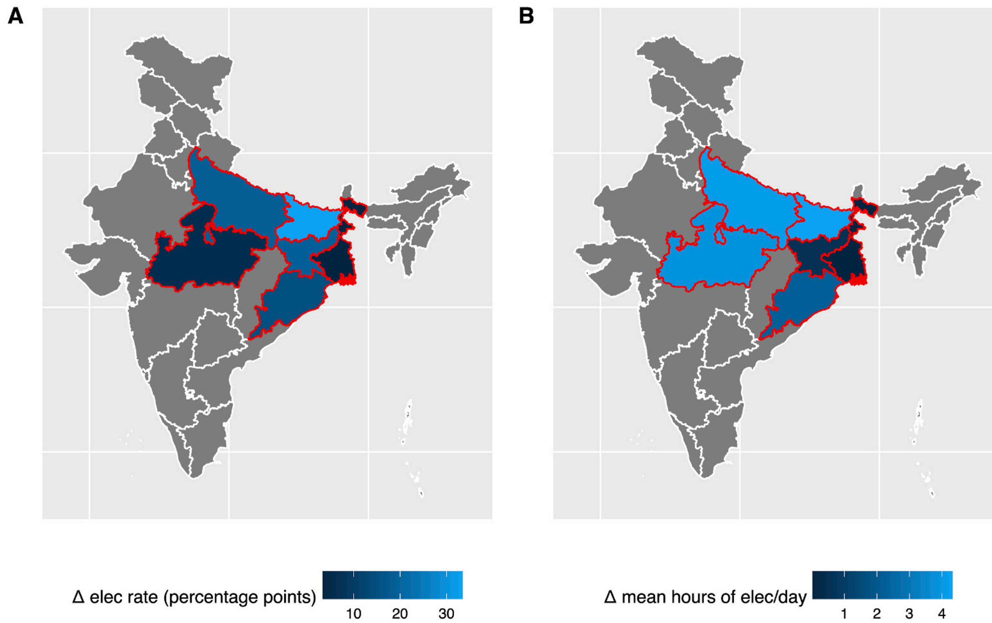

Fig. 1. Panel A. Average change in access to electricity between 2015 and 2018. **Panel B**. Average change in the number of hours of electricity per day.

generator, or from a micro grid. We then examine the quality of power supply in three ways. First, we ask households how many hours of electricity they have per day (from 0 to 24). Second, we ask them how many days per month they experience a voltage that is too low to run appliances (from 0 to 30). Our measure of quality of supply then equals the number of days in which voltage is not a problem. Third, we ask respondents how many days they suffered from blackouts (from 0 to 30). Again, we take 30 minus this number to get a sense of the reliability of power.

To replicate the findings of Aklin et al. (2016), we then take each of these measures and standardize them to have a mean of zero and a standard deviation of 1. This increases their comparability by reducing the difference in scale.

Our key outcomes are measures of satisfaction with electricity and lighting. Typically, households were asked "Generally, how satisfied are you with the electricity [respectively: lighting] situation in your household?" Responses ranged from 0 (unsatisfied) to 2 (satisfied).

As noted earlier, our key analysis replicates and extends Aklin et al. (2016). As such, we estimate variants of the following model:

$$\begin{aligned}\text{Satisfaction with elec. or light.}_{i,t} &= \tau_i + \varphi_{2018} \\ &+ \beta\text{Duration(std)}_{i,t} + \lambda\text{Duration(std)}_{i,t}\cdot\varphi_{2018} \\ &+ \gamma\text{Voltage stab.(std)}_{i,t} + \psi\text{Voltage stab.(std)}_{i,t}\cdot\varphi_{2018} \\ &+ \delta\text{Reliability(std)}_{i,t} + \rho\text{Reliability (std)}_{i,t}\cdot\varphi_{2018} \\ &+ \epsilon_{i,t}.\end{aligned}$$

where τ_i are household fixed effects, φ_{2018} is an indicator for the second wave of the survey, and β, γ, and δ capture the effect of (standardized) duration of electricity, voltage stability, and reliability, respectively, in 2015. The parameters for interaction terms (i.e., λ, ψ, and ρ) measure how the effect of these variables changed in 2018. Lastly, ϵ is a random error term. The standard errors are clustered by village.

Before reporting the results of this analysis, we first present a description of electricity access between 2015 and 2018, based on our longitudinal dataset.

4. Trends in electricity access

Next, we describe how electricity access changed between 2015 and 2018. We rely on longitudinal data collected from rural households located in six Indian states (Bihar, Jharkhand, Madhya Pradesh, Odisha, Uttar Pradesh, and West Bengal). Historically, these states have had higher levels of energy poverty. In both waves, 8,568 households were interviewed on a range of topics pertaining to energy issues. The data are described in detail in the Methods section.

In line with national trends, electricity access increased substantially between 2015 and 2018 (Figs. 1 and 2, and Table S1). In 2015, 70% of all households in our sample benefited from some kind of electric connection (whether through the grid or an off-grid technology). In 2018, this share climbed to 86%. Almost all districts experienced an increase in electrification rates (Fig. 3). States such as Bihar (from 56% to 90%) and Jharkhand (from 66% to 85%) saw rates increase the most. Others, like West Bengal, remained at a relatively high level (from 93% to 97%). The ten districts whose electrification rates increased the most were all located in Bihar or Uttar Pradesh. This could reflect a catching-up effect, whereby states that start at a lower electrification rate have more room to grow quickly.

Table 1 reports average changes for various measures of energy access. The estimates provide the average three-year change within households for each outcome listed at the top of the column. As model 1 shows, the likelihood of a household having electricity increased by 17 percentage points during this period (95% CI: [15,19]).

Who benefited most from this growth? Looking only at households that did not have electricity in 2015, we split the sample by household expenditure levels that same year. We create five groups of roughly the same size and estimate the change over these three years. Doing so, we

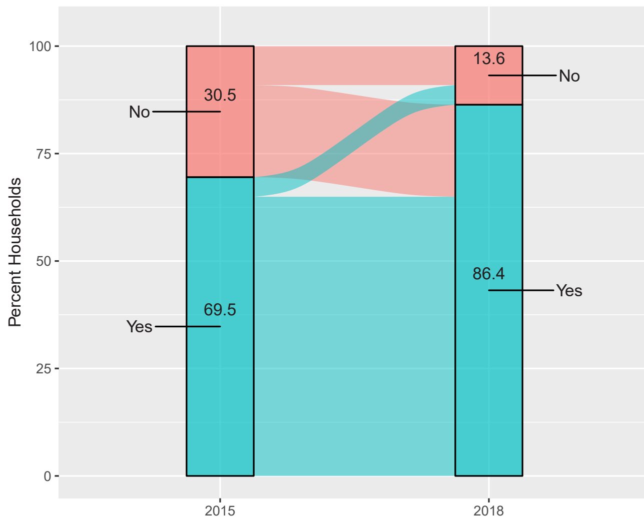

Fig. 2. Electricity access in 2015 and 2018. See Table S1 for the detailed results.

find that it is households in the highest expenditure bracket that saw the strongest growth in electrification rates (Figure S1). Likewise, richer households had marginally fewer days with voltage fluctuations than those closer to the median (Figure S3). Hours increased most for the poorest and the richest, with the dataset's middle class lagging behind (Figure S2). Note that in all cases, the differences across groups are generally not statistically significant. With this caveat in mind, the results suggest inequality in supply improvements. This echoes other studies that highlight that the benefits of electrification are not equally shared within societies (Rosenberg et al., 2020).

As several studies noted (Aklin et al., 2016; Pelz et al., 2020), electricity access is a multi-dimensional concept. Being connected to an electric system does not guarantee satisfactory access. Thus, we also considered how the quality of supply varied between the two survey waves. On average, a household (among those who did have a connection of some kind) benefited from 12 h of power per day in 2015. Three years later, this household had almost 15 h of available supply. A within-household regression yields an estimated increase of 2.97 h (95% CI: [2.09; 3.86]). We note again that the gains are concentrated in Bihar and Uttar Pradesh. We also note that despite progress, the goal of uninterrupted 24/7 electric supply has yet to be achieved. A simplistic back-of-the-envelope calculation suggests that an hour of electricity has been added every year; at the current pace, uninterrupted electricity should be achieved in about ten years.

Besides duration, voltage fluctuation is a common problem in countries with poor electric infrastructure (Andersen and Dalgaard, 2013). The survey asked respondents how many days, in the last month, they experienced voltage fluctuation. Households reported a decline of about half a day (from 3.9 to 3.3 days per month), demonstrating that progress on this front has been slower and therefore remains a problem.

Despite concerns over quality, households are willing to use their grid connections as their primary source of lighting. In 2015, about 42% of households responded doing so. Three years later, this share increased to 72%. Fig. 4 shows how lighting sources changed. The growth of the grid took place at the expense of kerosene, which saw its share decline from 53% to 21%. Despite this decline, kerosene remains the second most widely used source of lighting. Electric lighting is typically used with LED bulbs (1.8 bulbs per household in 2018), and incandescent bulbs are on the decline (from 1.7 to 1 bulb per household).

Distributed power, whether from micro-grids or from solar home systems and solar lanterns has not managed to penetrate these markets on a large scale. Diesel-powered micro-grids disappeared almost entirely, while solar home systems and solar lanterns marginally increased to 3%.

Higher electrification rates appear to be tied to higher levels of subjective satisfaction. The share of households that report being satisfied with electricity increased from 16% to 49% (Fig. 5). At the same

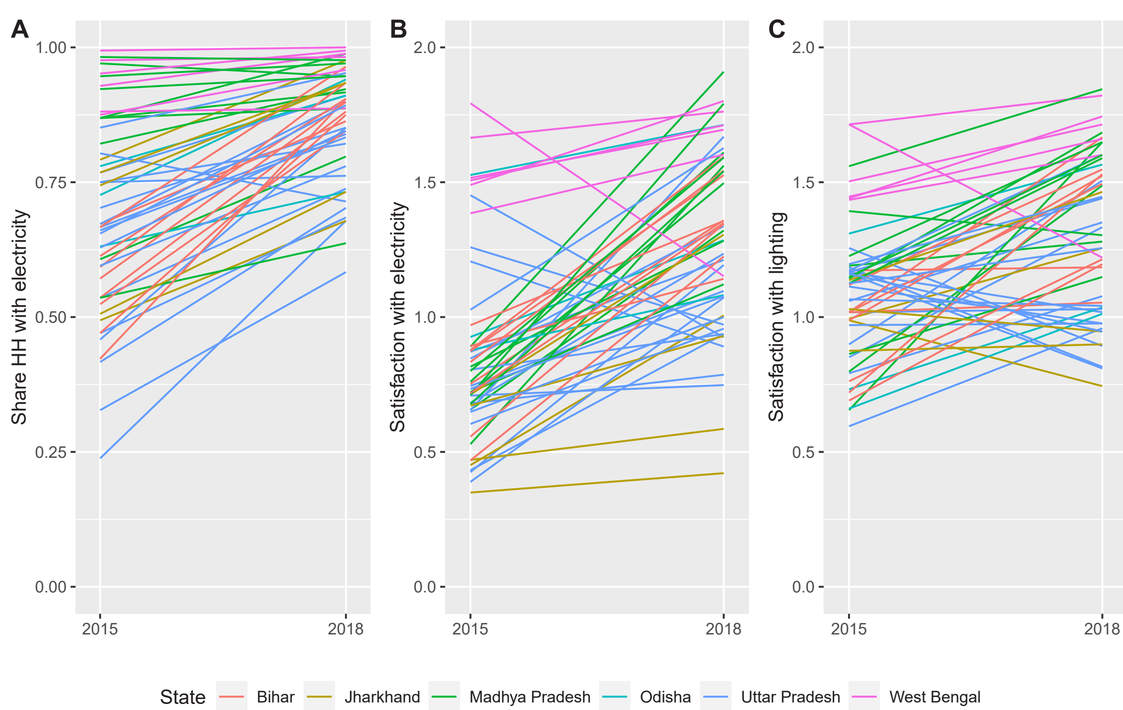

Fig. 3. Panel A. Trend for electrification rates (by district). Mean electrification rates, averaged by district and by survey wave. **Panel B**. Trend for satisfaction with electricity, averaged by district and by survey wave (on a [0; 2] scale). **Panel C**. Trend for satisfaction with lighting, averaged by district and by survey wave (on a [0; 2] scale).

Table 1
Dependent variables: *Elec*: the household has electricity (= 1). *Elec Hours*: number of hours per day a household benefits from electricity. *#Days low voltage*: number of days, over the last month, in which voltage was too low to run appliances. *Light Sat*: satisfaction with lighting. *Elec Sat*: satisfaction with electricity. Standard errors clustered by village. Symbols: *: $p < 0.1$; **: $p < 0.05$; ***$p < 0.01$.

Change in Energy Access, 2015–2018					
	(1)	(2)	(3)	(4)	(5)
	Elec	Elec Hours	#Days low voltage	Light Sat	Elec Sat
Change 2015–2018	0.17***	2.97***	−0.67***	0.22***	0.43***
	[0.15,0.19]	[2.65,3.30]	[-0.99,-0.35]	[0.18,0.26]	[0.38,0.48]
Household FE	✓	✓	✓	✓	✓
N	17635	13787	13514	17635	13786
R^2	0.11	0.19	0.01	0.04	0.14
Range of outcome	{0; 1}	[0; 24]	[0; 30]	{0; 1; 2}	{0; 1; 2}
Mean in 2015	0.70	12.28	3.89	2.09	0.90
Within-HH standard dev.	0.25	3.05	3.70	0.54	0.51

time, a sizable minority remains unsatisfied and that minority has not decreased (from 23 to 22%). This stable share is driven by three groups. The first group consists of individuals who were already unsatisfied in 2015 and remained so. The second group represents those who got electric connections between 2015 and 2018 but remained unsatisfied with it. However, the largest group is comprised of households that were neutral in 2015 and whose expectations have increased; we return to them at the end of the article.

5. Satisfaction in 2015 and 2018: increasing expectations

Next, we replicate the main analysis conducted by Aklin et al. (2016). The study identified how various facets of electricity supply affected subjective satisfaction with electricity and lighting. The key dimensions were duration (how many hours of electricity are available per day), reliability (number of days in the last month without blackouts), and voltage stability (number of days without low voltage). Each of these variables is standardized (with mean zero and standard deviation of 1) to facilitate comparability.

Using only 2018 data, we demonstrate that the earlier findings by Aklin et al. (2016) continue to hold (Tables S3 and S4). The strongest predictor of satisfaction remains duration. Satisfaction with electricity increases by 0.4 points (95% CI: [0,37,0.44]) in the first model and 0.39 in the full model with an increase in duration by one standard deviation. Increasing reliability and voltage stability by one standard deviation improves satisfaction by 0.12 points in models (2) and (3), and by 0.06 and 0.1 in the full model. The effects are statistically significant in all models. We observe similar estimates for satisfaction with lighting.

To conclude this paper, we examine whether the determinants of satisfaction changed between 2015 and 2018. To answer this question, we replicate Tables S3 and S4 but now use our entire dataset. We then examine whether the effect of quality of supply changed between the two survey waves. This also allows us to do a within-household comparison: we can examine whether households' level of satisfaction with electricity and lighting became more or less sensitive to changes in supply quality. The results are reported in Fig. 6 (see Tables S6 and S7 for full results).

The results suggest that respondents' level of satisfaction with electricity and lighting was more sensitive to quality of supply in 2018 than in 2015. First, access to electricity had a stronger effect on people's satisfaction with lighting. In 2015, having electricity increased satisfaction with lighting by 0.3 units (95% CI: [0.24,0.38]). In 2018, the effect was 0.55 units (95% CI: [0.47,0.63]). Second, households also became more sensitive toward the duration of electricity and voltage

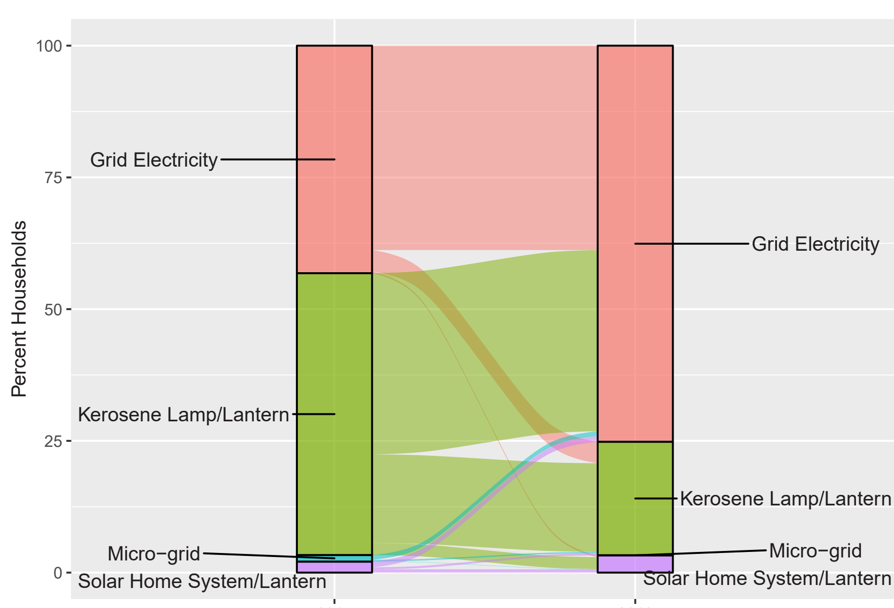

Fig. 4. Trend in the primary source of lighting, 2015–2018. Percent of households whose primary source of lighting is the grid, kerosene, micro-grids, or solar home systems/solar lanterns. Respondents who used other sources or did not respond were removed.

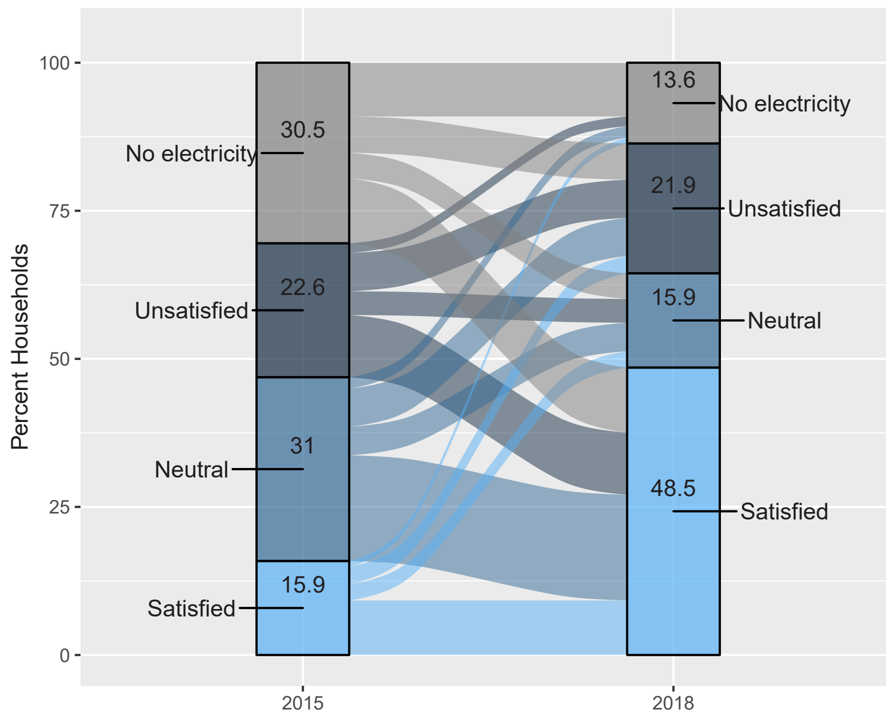

Fig. 5. Trend in satisfaction with electricity, 2015–2018. Percent of households that are unsatisfied, neutral, or satisfied with their electricity situation.

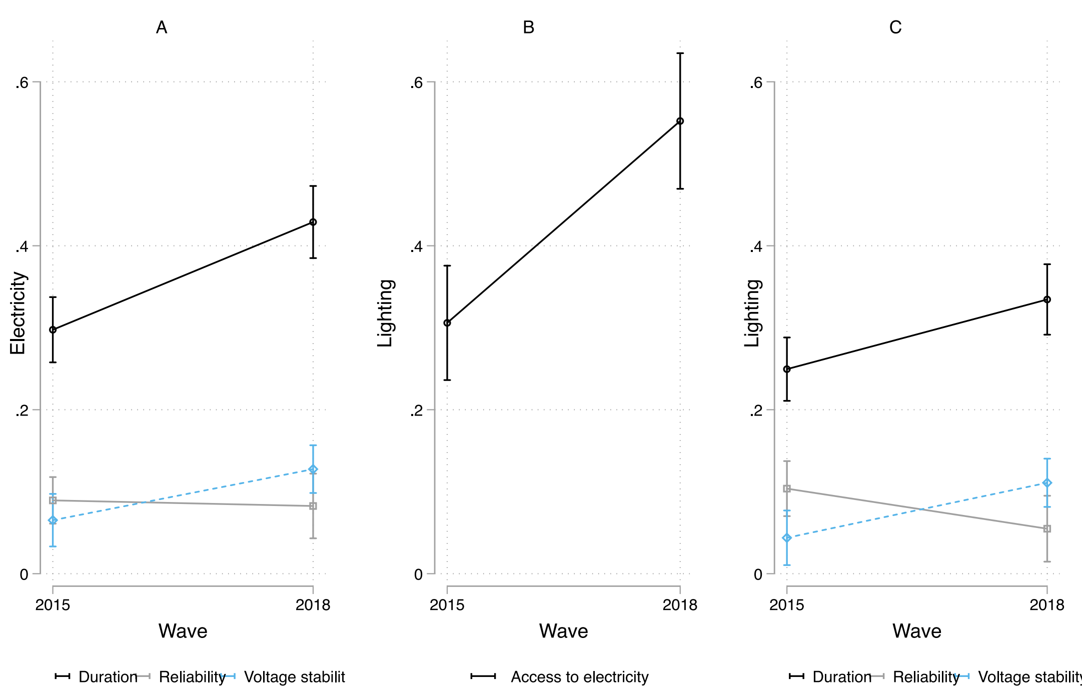

Fig. 6. Marginal effect of quality, durability, and voltage stability on satisfaction with electricity (**Panel A**) and satisfaction with lighting (**Panel B** and **C**) in 2015 and in 2018. Confidence intervals based on standard errors clustered by village. See Tables S6 and S7 for full results.

stability. When considering satisfaction with electricity, the effect increased by 0.13 units for the former (95% CI: [0.08,0.18]) and 0.06 for the latter (95% CI: [0.02,0.1]).

These results are striking and raise the question: why did people become more sensitive (over time) to these factors when forming their views over their electricity situation? We offer a conjecture for this effect

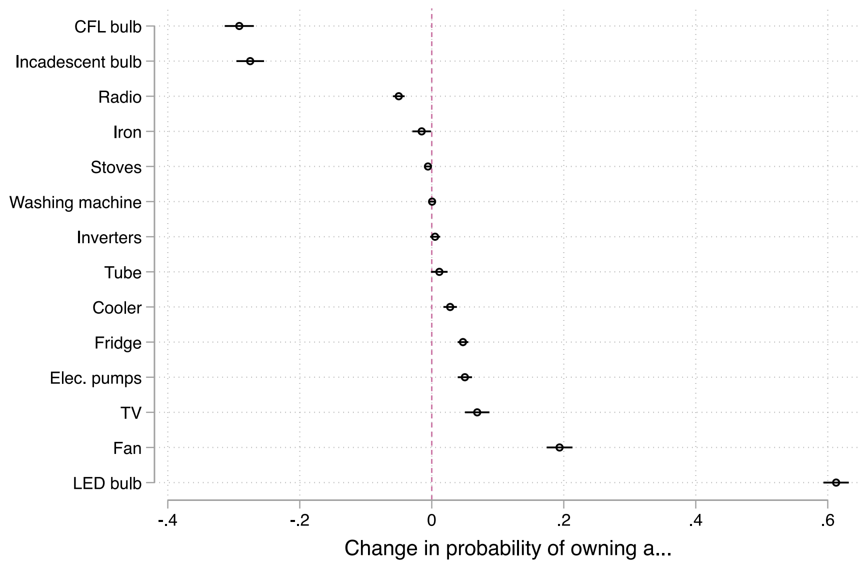

Fig. 7. Change in the probability of owning the appliance on the y-axis between 2015 and 2018. Estimates from a linear probability model with household fixed effects. Standard errors clustered by village. Full results in Table S5.

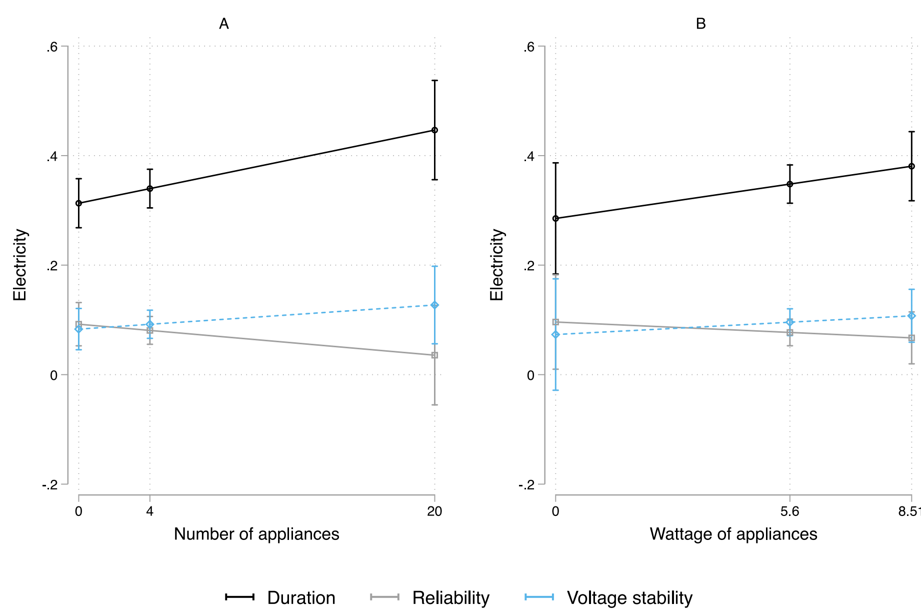

Fig. 8. Marginal effect of supply quality on satisfaction with electricity at various levels of appliance ownership (**Panel A**) and (log) wattage of owned appliances (**Panel B**). The numbers reported on the x-axis represent the smallest value, the median, and the 99th percentile. All models include household and wave fixed effects. Standard errors clustered by village.

that we call the "hierarchy of demands." The label is inspired by Maslow's hierarchy of needs (Maslow, 1970). Studies show that people becoming more demanding as a technology becomes more readily available (Walker et al., 2016). A related notion is that of adaptive preferences, whereby people calibrate their expectations and preferences depending on the constraints they face (Elster, 1982; Sen, 1997; Nussbaum, 2001).

We transpose these models to energy access. We conjecture that even if electricity access improves nominally, satisfaction may lag behind as expectations become steeper. Consumers want to use electricity to power a wider range of appliances and reap the benefits of electrification in their everyday life. Better lighting (often the first way in which electricity is used) does not suffice anymore. Other appliances, such as fans, are increasingly valued. As a result, shortcomings in terms of quality of supply become more salient. As households become more sophisticated consumers of electricity, we expect them to become more demanding.

The hierarchy of demands, in turn, helps us understand why the effect of electricity access, duration, and voltage stability became stronger over a short period of time. As electrification rates rose substantially between 2015 and 2018, rural households likely became more demanding. Those who remain without electricity have strong reasons to feel left behind and express dissatisfaction with their situation. Those who benefit from electricity access may be less inclined to tolerate poor supply.

We find evidence supporting this hypothesis. In Fig. 7, we report the change between 2015 and 2018 in the probability of owning these appliances (Table S2 reports summary statistics on appliance ownership in both waves). We find a decline in inefficient appliances (such as CFL bulbs) and an increase in efficient (LED bulbs) or modern consumer goods (fridge, coolers, TVs). For instance, the probability of owning a TV increased by 7 percentage points (from a baseline of 47% ownership in 2015), fridges by 5 percentage points (from 6%), and fans by 19 percentage points (from 65%).

Furthermore, we find some evidence that households that own increasingly powerful appliances are more likely to be sensitive to changes in supply quality (see Fig. 8). To establish this, we interact the number of appliances (and their total wattage) with each of the three dimensions of supply quality. Presumably, those who own more appliances are more likely to value quality than those who do not. And indeed, we find some evidence that duration and voltage stability become more important for households that have higher levels of electricity usage.[3]

These findings suggest that people have become more demanding and that this is especially the case among households that have acquired more appliances. As households acquire more energy-intensive appliances and come to appreciate the services they offer, inadequate supply becomes less tolerable. Poor duration or voltage fluctuations matter more because households expect and use electricity to a higher degree. In other words, people care more about the intensive margin of electric supply.

The hierarchy of demands hypothesis has important implications. As electricity access becomes more widespread, policymakers will face a more demanding public. As households graduate to higher electricity access tiers, their expectations will adapt accordingly. Policymakers will therefore need to calibrate improved service to match ever evolving needs. Public demands are likely to gradually shift from meeting basic needs toward having reliable and high-quality power to use a wide range of modern appliances. From a grid management standpoint, this implies that the focus will move beyond adding more customers to the grid to instead making sure that those connected get what they want.

6. Conclusion and policy implications

India, like much of the emerging world, has brought electricity to most of its population. Here we have used two waves of the ACCESS panel dataset to examine how electricity access, the quality of electricity service, and appliance use have changed among rural households in six Indian states. The results confirm major improvements in electricity access, quality of service, and subjective satisfaction with lighting and electricity service. They also show, however, that households' expectations are changing. We identify a pattern of higher expectations following improvements in access and service. Now that most households have electricity access, they put more emphasis on dimensions such as hours of supply, stability of voltage, and avoiding outages.

These findings call for additional research. To begin with, our use of survey data to assess quality of service is not a substitute for technical measurements. For understanding the quality of rural electricity service, instrumentation based on statistically representative samples is an important next step. Another important direction would be to scrutinize the external validity of our finding of changing subjective expectations. Household electrification rates are improving across the world and understanding how people's expectations change will be important to inform power sector priorities. Finally, we see a clear need for more systematic theory development. Our approach does not yet constitute a full theory of how improved energy access relates to subjective expectations. Here studies on adaptive preferences (Elster, 1982; Sen, 1997; Nussbaum, 2001) and rising expectations in a "hedonic treadmill" (Knight and Gunatilaka, 2012) could prove insightful.

These limitations notwithstanding, changes in expectations essentially raise the bar for success. The past two decades have focused on village and household electrification, and highlighted rural electricity access as a political priority. These commendable actions have raised people's expectations, and the next frontier for India's rural electrification agenda should be the improved quality of service. Indian policymakers should reject the traditional emphasis on low cost, and instead campaign for higher quality based on prices that cover the full cost of service, improved billing and collection practices, and more forceful measures against electricity theft (Sharma et al., 2016; Thomas and Urpelainen, 2018; Sankhyayan and Dasgupta, 2019). The good news is that recent research (Kennedy et al., 2019; Blankenship et al., 2019) provides evidence for a social contract that simultaneously improves quality of service and moves toward electricity as a commodity for which people need to pay. In this sense, India's hedonic treadmill in electricity access could break new ground for improved financial and technical performance in electricity distribution, as people no longer tolerate poor quality of supply.

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

Supplementary data to this article can be found online at https://doi.org/10.1016/j.enpol.2021.112391.

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[3] We note that these results are speculative because of the presence of endogeneity: households that benefit from bad electricity are also unlikely to buy powerful appliances. Further research on parsing out the causal effect of quality would be valuable.

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