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RURAL ELECTRICITY SUPPLY: COMMODITY OR ENTITLEMENT?

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The following is a summary of the work by the authors, "Explaining Willingness to Pay for Pricing Reforms that Improve Electricity Service in India," published by the Initiative for Sustainable Energy Policy in January 2019, funded by CGEP's Faculty Grant Program. <https://energypolicy.columbia.edu/about-us/cgep-faculty-grant-program-2017-18>

Executive Summary

Quality of electricity service remains poor in many developing countries. Reforms to distorted pricing mechanisms involving citizens increasing their payments in exchange for better service must be done carefully to avoid political backlash and persistent theft. Are people not willing to pay for better electricity quality because they feel entitled to electricity provision, or is it because they do not *trust* one another to also do their part?

In a survey conducted in rural Uttar Pradesh, India, we examine factors that influence stated willingness to pay for better service (i.e., more hours of power per day) among rural households. Our results indicate that the general levels of trust are low, and that entitlement plays less of a role as to whether households are willing or not to contribute to improved electricity quality. Low willingness to pay remains a major obstacle to pricing reform. Generalized trust is strongly associated with higher willingness to pay for better electricity. Delays in service improvements and a lack of community support for pricing reform reduce willingness to pay for better quality.

To better foster public support for increasing payments in return for better service, we provide three recommendations as follows.



- **Building trust within the community, across agents, and with utilities could help achieve better rural electricity outcomes.** Citizens are unlikely to be willing to contribute or make efforts to participate if the background level of trust remains low. Utilities can help by making credible promises and reducing service delay, or first deliver service improvements before collecting increased payments, as to build upon the trust with the community members, who will in turn be more willing to pay.
- **Properly reducing incentives for theft is important for rural electricity reform.** 76 percent of the respondents reported theft as an important obstacle to proper electricity supply, and based on what is observable and on the survey results, we estimate a lower-bound usage rate of illegal night lines to be 20 percent. While proper enforcement can be difficult, a potential solution is to focus on the katiyamen and on the officials who check the villages for theft activities. To disincentivize katiyamen, perhaps a training conversion into a utility company position can reduce katiya spread and actually help convince local residents to join the legal grid system. With officials who neglect theft through night lines or meter tampering, a proper incentive scheme should be in place to prevent accepting bribes. Currently, the incentive structures are set up such that the offending households have an incentive to bribe or bypass the proper process, creating these collected rents—the gap between the willingness to accept illegal payments and the punishment for the resident. Further policy should properly reduce incentives for theft, not only from the household perspective but also from a systems perspective.
- **Poverty alleviation must be taken into account in electricity reform policies.** The average willingness to pay for extra hours of electricity tends to be very low—at 40 rupees for four more hours, on average. Continued poverty remains a significant obstacle for proper electricity reform in rural India, and national policy should take into account the impact of income when designing policies to improve electricity outcomes.



Introduction

In developing countries, the 1.1 billion people who lack electricity continue to gain access at a rapid rate. For instance, India's energy demand has been rising at a rapid 7.4 percent per year since 2013. These populations continue to receive poor electricity services and may be unable or unwilling to pay for improvements; utilities continue to stagnate in improvements in part due to the low revenues.

Electricity subsidies, in the form of artificially low electricity prices, are a highly visible and tangible benefit to the public, especially the poor, and to vested interests; removing them threatens to provoke political backlash and social unrest. If pricing reform—involving citizens paying more for better service—is a prerequisite to modern electricity access, such a policy must consider *how* it can best get the involved citizens to change their payment paradigms. Is the major obstacle to increased payments for better service a matter of *entitlement*, where citizens think the service should be provided to them in any case, or is there a lack of *trust* between citizens and institutions, where citizens do not expect improvements to happen even if they were to pay more?

There exists much evidence that electricity quality improvements have direct implications for rural populations' lives and economies. According to the World Bank Enterprise Report for India, up to 20 percent of firms identified electricity as the second largest obstacle to business development. Firms post a significant number of losses due to poor quality electricity: 2 percent of total sales were lost due to power outages. Taking the GNI per capita to be \$1,570 in India, that is a \$31.4 per capita loss with a 1.3 billion population. In addition, firms are facing an average of 14 days of outages in a typical month (World Bank Group 2014). Research has also found strong evidence that proper electricity access brings about positive impacts in income and well-being (Ahmad, Mathai, and Parayil 2014; Chakravorty, Pelli, and Ural Marchand 2014). In particular, having a grid connection with higher quality access (few outages, more hours) increases rural household income by up to 28.6 percent (Chakravorty et al. 2014). There have also been significant positive relationships between electricity access and health and education attainment in both rural and urban settings. In rural areas, electricity availability and access have significant impacts to education and health attainments. Nonelectrified households have fewer children per household enrolled in school. Improved electricity access can improve income, human capital development, and well-being.

Two potential mechanisms help address public opposition to power sector reforms. First, do people consider electricity an entitlement instead of a tradable commodity? If people feel "entitled" to electricity, they would oppose measures to increase electricity prices, even if said increases would allow improvements in the quality of supply. Second, is the lack of trust between citizens, political institutions, and utilities stagnating the citizens' willingness to pay for potential improvement in electricity supply? If the lack of trust is the main obstacle, then policies for power sector reform must also help build trust between different agents for them to be effective. A survey of 960 rural households in the state of Uttar Pradesh was conducted to help the authors understand whether or not trust and/or entitlement are at the core of the impasse in rural electricity sector reform. The authors found significant influences of trust on people's willingness to pay for improvements. It was also found that the average willingness



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to pay for extra hours of electricity to be very low (40 rupees for four more hours, on average), signaling that persistent poverty remains a key obstacle to individual contributions to the electricity problem in rural India. Policy reforms aiming to improve rural electricity supply quality and access should pay close attention to building trust between citizens and institutions and take into account the role rural poverty plays in citizen's participation.



Background

Stagnancy in Rural Electricity Reform

There is a puzzling persistence of inefficient, distorted pricing mechanisms for electricity in developing countries. In a number of countries, including but not limited to India, households have access to a limited number of hours of electricity, and blackouts are frequent. Rural households pay either a fixed or no tariff for their electricity, meaning that distribution companies have little incentive to invest in high-quality supply (McRae 2015). When demand for electricity is high, distribution companies favor industrial and urban consumers, who pay high tariffs based on actual consumption (Harish and Tongia 2014). If rural households are receiving low-quality electricity service because of distorted pricing, why are governments not gradually moving toward a better equilibrium: higher prices in exchange for good service?

Answering this question could contribute to restarting power sector reforms after a decade of inaction in developing countries (see Erdogdu 2011; Gratwick and Eberhard 2008). Power sector reforms are not lacking in sub-Saharan Africa, South Asia, and other regions because governments, businesses, and the public are satisfied with their quality of electricity. If anything, the relevance of such concerns is bound to increase over time, as rural household electrification rates continue to increase and the quality of electricity supply becomes the primary constraint on improving access to electricity across developing countries.

There is little question about the existence of a major policy failure, but governments have faced difficulties in enacting and implementing reforms. Protests against power sector reform are common across the world (Aklin et al. 2016; Birner, Gupta, and Sharma 2011; Olukoju 2004; Santhakumar 2008), and many governments have all but given up efforts to rationalize electricity pricing and improve the governance of the power sector. Understanding the underlying concerns of the public is essential to breaking the reform gridlock both in India and other countries.

Potential Role of Trust and Entitlement

A potential explanation for the policy failure is sociopsychological: the rural population does not see electricity as a commodity but as an entitlement. If the rural population believes that the state is responsible for providing free or subsidized electricity for everyone, then the political benefits from improving the quality of supply would be offset by popular backlash against the idea of pricing an entitlement. This logic is derived from modernization theory, which emphasizes the importance of technological development in making countries truly modern and developed (Shils 1981). If electricity has outsized importance in people's minds relative to other services—such as clean water and cooking fuels—this could be the result of people regarding universal electricity access as a crucial determinant of governmental legitimacy, as access to electricity is effectively a precondition for the use of other technologies.

Another sociopsychological mechanism that has gained a lot of attention in recent years is trust. Trust has been an often-mentioned component of social capital that is crucial to sustainable development. Trust manifests itself in various dimensions; trust can be between people, within a village, with their village leaders, with their local government, with the



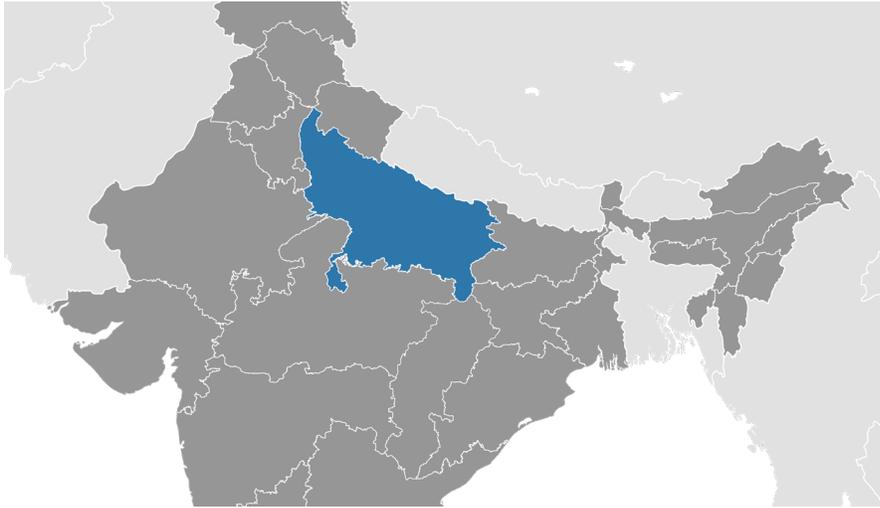
state government, with their lineman, and with their utility company. Some literature also distinguishes the different “kinds” of trust: attitudinal trust (i.e., questions on whether you trust others in general), trustworthy behavior (whether assets entrusted to someone will be returned or fairly credited back), and trusting behavior (whether a dropped envelope addressed to someone will be returned to that person successfully) (Glaeser et al. 2000). The seminal work by Glaeser et al. (2000) finds a particularly significant impact of attitudinal trust on trustworthy behavior. As the research here focuses on the question of electricity institutions, the authors are concerned with whether building attitudinal trust toward fellow citizens and institutions can lead to more trustworthy behavior, such as delivering promised increases in electricity quality from the utilities’ side and increased payments from the consumer side. Other work finds that citizens’ trust toward the government is associated strongly with the political support for reforms in rural areas (Alkon and Urpelainen 2016).

There have been ongoing efforts to better understand the behavioral and sociopolitical obstacles in ensuring quality electricity supply in rural communities. Electricity quality impacts rural livelihoods significantly—economically, socially, and health-wise. Behavioral mechanisms such as entitlement and trust intersect with political stagnancy. Successful reforms need to consider how factors such as trust and entitlement affect willingness to pay for improvements in electricity quality.



Research Approach

Figure 1: Map of India with Uttar Pradesh (area of study) highlighted



We conducted a survey of 960 households in 120 villages across 12 districts of the state of Uttar Pradesh, India, in the summer of 2017. In Uttar Pradesh, the quality of electricity supply is very poor, the use of illegal electricity connections is common (Jain et al. 2015) and power sector reforms have stalled (Aklin et al. 2016). Given the large number of districts and the random sampling of villages/households based on comprehensive Census of India listings, the survey offers a representative picture of public opinion about rural electricity access in the area. Conducted on Android smartphones, the 30-minute survey contains comprehensive background information about household electricity access, including the quality of supply and the household head's satisfaction with service delivery. Further notes on the sampling techniques can be found in the appendix section.

To investigate the feelings of entitlement and trust, several questions were included in the survey. Respondents are asked a series of trust-related questions, such as for their response to a statement like “In general, you can’t trust people.” The answer scheme here is a scale ranging from “strongly disagree” to “strongly agree.” Respondents are also asked questions to elicit their feelings of entitlement. Specifically, respondents are given a range of goods to decide whether and what should be provided for free, ranging from relatively private to relatively public goods. Such goods include electricity, health care, fuel, water, education, food, etc.

Respondents also participated in the conjoint experiment (see appendix for a more detailed discussion). Respondents were presented with a hypothetical scenario in which four extra hours of reliable electricity will be provided with particular attributes; respondents are then asked to place a value, or a self-reported “willingness to pay” number for the increased quality, given those attributes. The attributes of the scenario include a “collective payment”

at the village needed to launch the increase in hours, a “community effort” level as to how many already agreed to contribute, and a “service delay” level as to how long it would take for the respondents’ payments to be met with the increased quality. Respondents face four different scenarios.

Electricity satisfaction

Electricity is of high importance, with over 30 percent of respondents less than satisfied with their electricity supply.

Figure 2a: Respondents reported general satisfaction with their current electricity supply. Results show a median of 4 = Satisfied, and with over 30 percent of the respondents reporting a satisfaction rating below 4.

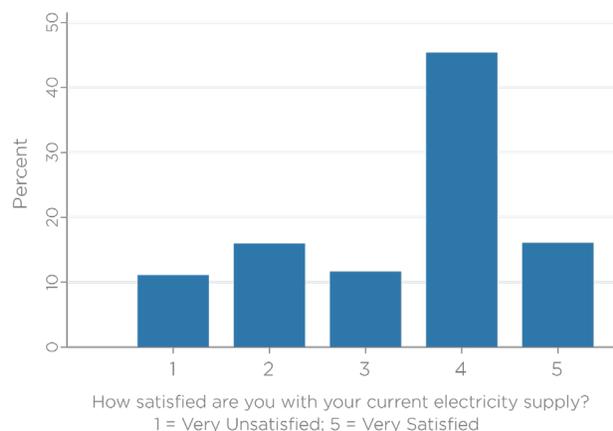
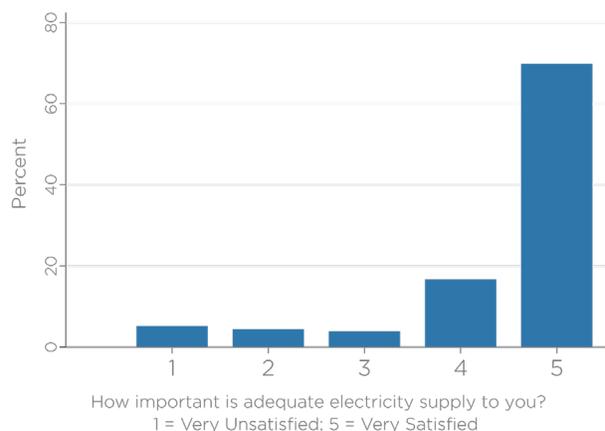


Figure 2b: Respondents were asked to rate the importance of adequate electricity supply, with the prevailing majority rating it 5 (“Very Important”).



When asked about the potential causes of poor supply, 76 percent of the respondents think that theft is a key reason, followed by too much demand at 69.8 percent. Poor maintenance was also a probable cause according to the respondents, at 68.6 percent; however, only 43 percent of the respondents thought the lack of investment is driving poor quality supply. Finally, when asked to estimate the katiya (night line, illegal wires) percentages (i.e., how many households have katiyas in their own villages), respondents guessed that an average of 18.3 percent of their villages have these katiyas. The authors also asked enumerators to spot and record the observed number of katiyas in the surveyed households; this number was observed at 14.4 percent. Given that some households hide their katiyas until nightfall to prevent detection, and that the respondents’ guesses are reasonably close to the observed number during daytime, it can be estimated that the average katiya usage in a rural village is around 18–20 percent, based on the authors’ survey.

In sum, adequate electricity supply is very important to the residents of rural Uttar Pradesh. High demand, issues of theft, and inadequate infrastructure and investment are among the prevailing problems identified by rural households as the key obstacles to better electricity quality.



Entitlement

Not everyone should receive free electricity.

Figure 3a: Respondents were asked whether electricity should be provided for free to everyone. A majority disagreed or strongly disagreed that electricity should be “free for all.”

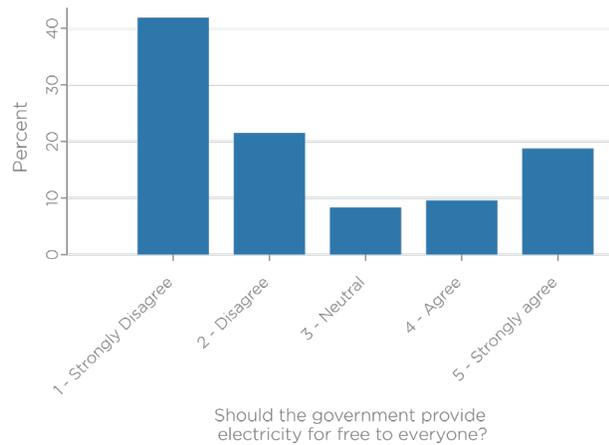
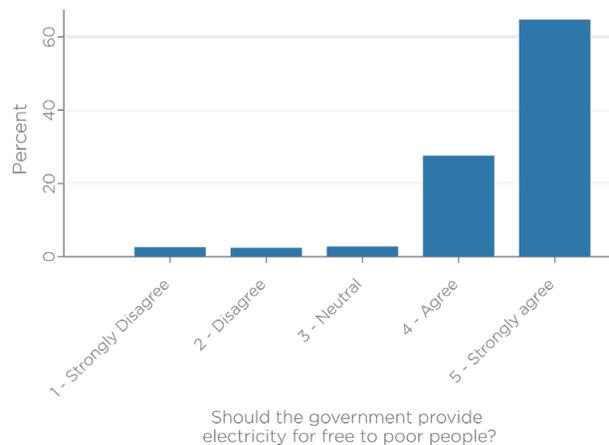


Figure 3b: Respondents were asked instead whether electricity should be provided to poor people for free. Over 60 percent of the respondents strongly agreed that electricity should be free for poorer populations.

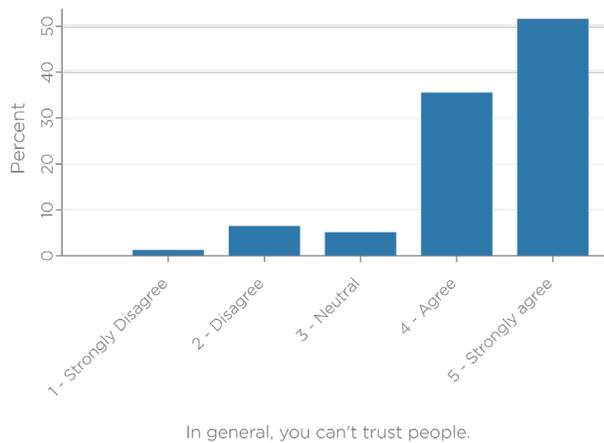


A major pattern reported in the survey was that free provision of electricity should be offered contingent on income. Overwhelmingly the respondents agreed that electricity should be provided for free for low-income people, but not for everyone. Figures 3a and 3b show this stark contrast between providing free electricity to poor people versus to everyone. This signifies a strong community preference for government provision of electricity for the poorer people, but not for the higher income people who can otherwise afford it. We see here an income-dependent sense of entitlement; electricity should be a commodity for those who can afford it but should be considered a public good for the poorest populations.

Trust

General trust level is low; stronger trust levels are associated with higher willingness to pay.

Figure 4: Respondents were asked to give a response to the statement “In general, you can’t trust people.” Respondents can choose from a five-point scale as to whether they “strongly agree” or “strongly disagree.” Overwhelmingly, respondents reported skepticism in trusting people in general.



The level of trust is generally low. In figure 4, respondents strongly tended toward “strongly agree” with the statements that one cannot trust people or should be cautious before trusting strangers. The level of trust for lending property to others is slightly higher. In figures 5a and 5b, one can see the reported level of trust of respondents toward the state government as well as toward utility companies. As compared to the trust level with people in general, the level of trust reported toward the state government is higher. The level of trust is less pronouncedly strong toward utility companies compared to the government, with the median respondent electing to “somewhat trust” the utility companies.



Figure 5a: Respondents were asked whether electricity Respondents were asked to rate their level of trust toward the state government on a five-point scale, from “strongly trust” to “strongly distrust.” Close to 50 percent of the respondents chose “strongly trust.”

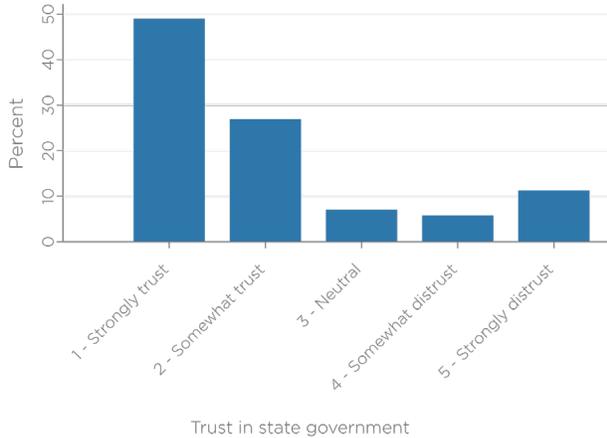
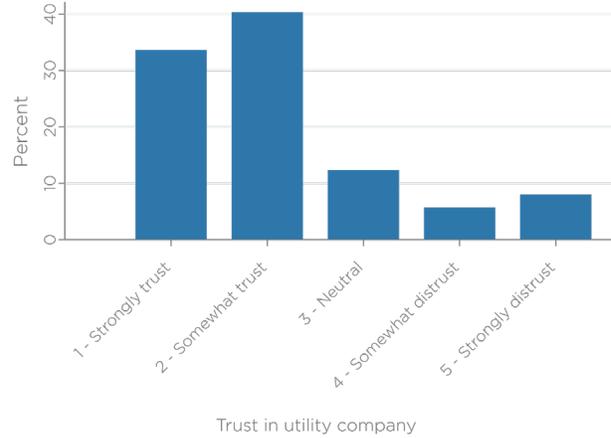


Figure 5b: Respondents were asked to rate their level of trust toward the utility company on a five-point scale, from “strongly trust” to strongly “distrust.” The median respondent chose that he or she “somewhat trusts” the utility.



Finally, using regression models to analyze whether trust and entitlement affect people’s willingness to pay for improved electricity quality, the authors identified that trust is a significant explanatory variable as to whether one would be willing to pay more for better quality electricity; however, entitlement feelings were not a significant variable explaining the variation in people’s willingness to pay for better electricity. In addition, the authors found that within the scenarios presented to the respondents, the higher the contribution levels from other villagers, the higher people are willing to contribute to improving electricity access; on the other hand, the longer the delay between contributions and service delivery, the less willing one is to contribute to bettering electricity quality.



Policy Recommendations

Based on this study, the authors have several findings that have direct implications for policy. First, entitlement does not explain the lack of willingness to contribute to electricity reform in rural areas. While villagers believe that electricity should be provided for free to poorer people, and not so for the everyone, the degree of entitlement does not strongly explain the variation in willingness to pay to contribute toward better electricity. The level of trust, on the other hand, significantly affects one's willingness to pay to improve electricity quality.

Policy Recommendation 1

Building trust within the community, across agents, and with utilities could help achieve better rural electricity outcomes.

In order for reform policies in the context of rural electricity to be successful, the authors argue that a significant constraint remains—that is, citizens are unlikely to be willing to contribute or make efforts to participate if the background level of trust remains low. Building a stronger sense of trust among villagers can promote collective action behavior, where more will be willing to contribute to improving the quality of service. Strong trust between the community and utility companies could also improve contributions to improving quality. Utilities can help by making credible promises and reducing service delay, or first delivering service improvements before collecting increased payments, to build upon the trust with the community members, who will in turn be more willing to pay. Higher trust between utilities and villagers could also mean more on-time and proper payments, further incentivizing utilities to continue to deliver good electricity to the region.

Policy Recommendation 2

Properly reducing incentives for theft is important for rural electricity reform.

Among the factors identified as the prime causes of poor electricity quality is the issue of theft. 76 percent of the respondents reported theft as an important obstacle to proper electricity supply, and based on what is observable and on the survey results, the authors estimate a lower-bound usage rate of illegal night lines to be 20 percent. While previous policy has tried to tackle theft via increased punishments and reduced connection rates, incentives for theft have not been properly reduced due to middlemen and corruption, thereby increasing the rents for these behaviors. While proper enforcement can be difficult, a potential solution is to focus on the katiyamen and on the officials who check the villages for theft activities. To disincentivize katiyamen, perhaps a training conversion into a utility company position can reduce katiya spread and actually help convince local residents to join the legal grid system. With officials who neglect theft through night lines or meter tampering, a proper incentive scheme should be in place to prevent accepting bribes. Currently, the incentive structures are set up such that the offending households have an incentive to bribe or bypass the proper process, creating these collected rents—the gap between the willingness to accept illegal payments and the punishment for the resident. Further policy should properly reduce incentives for theft, not only from the household perspective but from a systems perspective.



Policy Recommendation 3

Poverty alleviation must be taken into account in electricity reform policies.

Finally, we report that the average willingness to pay for extra hours of electricity to be very low—at 40 rupees for four more hours, on average. Continued poverty remains a significant obstacle for proper electricity reform in rural India, and national policy should take into account the impact of income when designing policies to improve electricity outcomes.



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Appendix

Method: Survey and Contingent Valuation

The core component of the survey is a contingent valuation (CV) module (Mitchell and Carson 1989). To disentangle whether rural electricity is viewed as a commodity or entitled provision, CV surveys can be employed to find out which factors affect households' willingness to pay (WTP) for improved electricity supply, for better electricity policy options, and for metering. Contingent valuation surveys have been used in many cases in the past, most prominently in hypothetical public good provisions and on valuing nonmarket goods. This is particularly fitting as one cannot actually implement a variety of different policies to examine ex-post outcomes, so using contingent valuation can conveniently test a variety of factors affecting optimal electricity policy design.

First, CV surveys can be used to study the willingness to pay for metering or legal connections. There may be reasons to believe that if given the choice, rural households would be willing to pay for metering, as it would imply improved connection and supply quality. Such question instruments could help researchers get at a rough demand function of legal, better electricity supply and estimate what kinds of connection fees might be suitable for villages of different socioeconomic and demographic characteristics, to better foster electricity policies that would be amenable to the population.

Second, one can also ask the question how much people are willing to pay for better quality (via more hours) of electricity, rather than just the connection. For longer hours or for more devices to be powered reliably, it is expected that households should be willing to pay more for such improvements. An entitlement hypothesis would imply that the WTP is very low or zero, meaning that households expect certain levels of free provision. Varying the reliable hours or appliances managed will help determine what are the baseline levels of expected provision people have and how they interact with different WTP offer amounts.

Third, a CV survey can also test the popular support of a hypothetical subsidy scheme to fully electrify rural households. Are households willing to accept rebates in order to pay up front costs of metering and increased electricity costs but at a higher quality? Using a CV setup, researchers can elicit an upper bound for an incentive program to promote better electrification in rural areas.

Taken together, contingent valuation surveys can help identify 1) whether the entitlement and trust hypotheses hold, 2) factors affecting the willingness for households to pay for different kinds of improved provision, and 3) if price or demand thresholds exist for entitled provisions and for optimal incentive programs. Further, one can distinguish between user types, types of distribution systems (such as grid electricity versus distributed power), as well as public versus private electricity providers. These different aspects of the survey allow the authors to conduct a theoretically informed and comprehensive test of the entitlement and trust hypotheses.

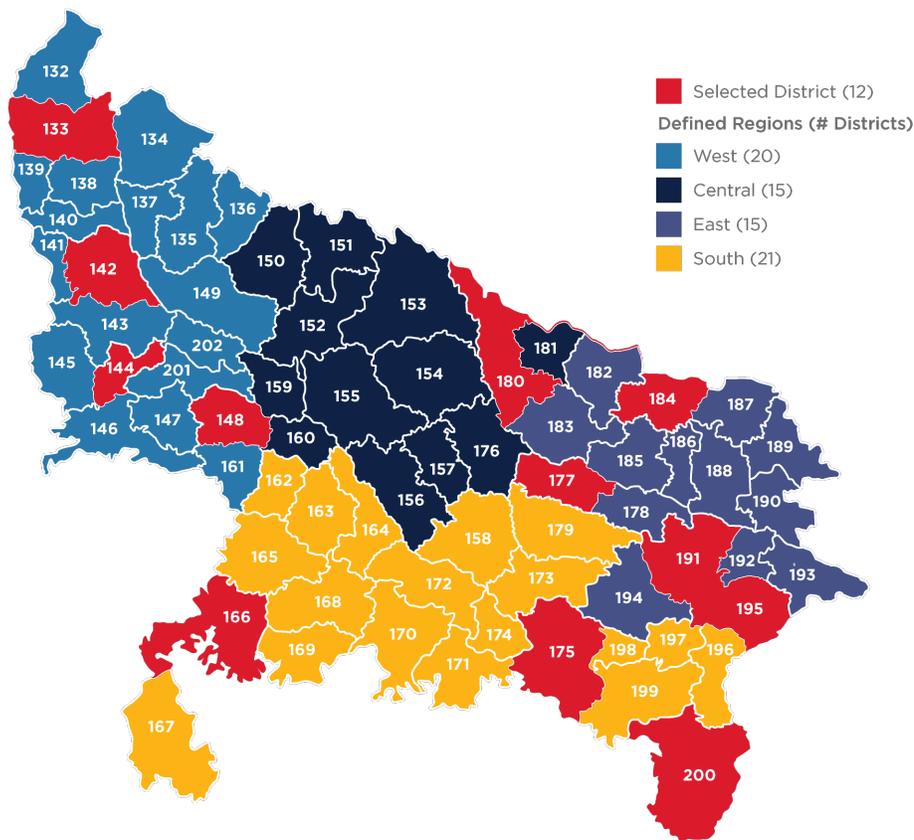
Study Area and Sample

To select rural villages for our sample, the authors first organized districts in Uttar Pradesh



into four groups: east, west, south, central/north. The groups were arranged such that the total number of rural households, as per the 2011 Census of India, of each group is approximately identical and contiguous (see figure A1). Within each region group, three districts were randomly sampled with the probability that a district is chosen being the district rural households divided by total group rural households. In each of the 12 resultant districts, villages were ranked by total number of households and sorted two groups: “small” and “large” villages by size. The determination of size was done by ranking village size and partitioning them until the large and small group each contained roughly the same number of households (i.e., large should contain fewer, larger villages and small numerous but smaller villages). Finally, within “small” and “large” groups, the authors sampled four villages in each, with the probability that a chosen village should be the village households divided by total group households. In each chosen village, 10 households are surveyed. This yields 96 villages with 960 respondents in the rural areas, with the probability a household is chosen randomized by the spatial concentration of the population in the state.

Figure A1: Sample area, with selected districts in red



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