The Gendered Nature of Liquefied Petroleum Gas Stove Adoption and Use in Rural India

Supporting Information

August 29, 2019

Contents

A1 Survey Data

A1.1 Survey Design

We use data from a 45-minute survey on energy access in rural households in India (Aklin, Cheng, Urpelainen, Ganesan, and Jain, 2016; Jain et al., 2015; Aklin, Cheng, Ganesan, Jain, Urpelainen, and Council on Energy, Environment and Water, 2016). Besides characteristics for respondents and households, the survey has a module on access to electricity and another one on access to cooking fuels. There are also sub-modules on the current energy situation, satisfaction and aspirations, and a final one on policy preferences.

A1.2 Sampling Frame

The six states were chosen on substantive grounds. For budgetary reasons, one district within each administrative division of each state was sampled. In West Bengal, there are only three large administrative divisions, and therefore two districts were sampled within each administrative division. Each district had a probability of being chosen proportional to population relative to the total population of the division. Overall, there are 51 districts in the sample.

Within a district, the 2011 census identifies villages for the sample (non-urban communities). The household population of each district is split into two mutually exclusive groups, with (i) one living in villages above the median and (ii) the other in villages below the median. The number of households in each is the same, but the large-village group consists of fewer but larger villages. Seven villages were sampled within each group based on the census household counts of the villages. The stratified sampling ensures that sampling is self-weighting within a district, but we can also be certain to have both small and large villages in the sample. In each sampled village, 12 household surveys were done. Thus, there were 714 villages and 8,568 households in total.

A1.3 Fieldwork

The fieldwork was conducted between November 2014 and May 2015 by a company called MORSEL India. The company has extensive experience with energy access surveys in rural India. One

team conducted the survey in Madhya Pradesh, another in Uttar Pradesh, a third in Bihar and Jharkhand, a fourth in West Bengal, and a fifth in Odisha. The surveys were always conducted in a local language. This language was Hindi, except for West Bengal (Bangla) and Odisha (Odia). The enumerators were all professionals with experience and trained by one of the academic researchers, as well as the research supervisors of the company. Each training was followed by a field pilot. For the surveys, pen and paper were used.

A1.4 Data Entry and Cleaning

The collected data were entered into a spreadsheet in the MORSEL India office, and then cleaned and verified by researchers, state by state. In the data entry and cleaning, particular attention was paid to any possible differences across survey teams. Researchers made phone calls to the respondents to check the accuracy of the data collected by the enumerators. In some cases, the survey team was sent back to the field to re-collect data that was not deemed good enough.

A2 Supporting Methods

A2.1 Elaboration on Supporting Analyses of LPG Adoption Across States, LPG Non-Adoption, Cooking Satisfaction, and Fuel Use

Here we provide a full description of each supporting analysis. Some text is repeated from the main text.

State-by-State Analysis. A strength of the ACCESS data is the wide variety of socio-economic, cultural, and geographic contexts captured across the six study states. We assess the heterogeneity of findings across study states by carrying out the main results' analysis within each study state.

LPG Non-Adoption. Given the relative scarcity of LPG usage in our sample (22 percent), it is important to also study the reasons that limit LPG adoption. The factors related to the non-adoption of LPG have received much attention recently, including in a recent effort to analyze efforts to scale-up clean cooking fuels around the world through 11 distinct country case studies and a systematic review (Quinn et al., 2018; Puzzolo et al., 2016). While there are distinct energy policy and social contexts around the world, four central barriers to clean cooking fuel adoption appear to be consistent: (i) access, (ii) high upfront costs for initial investment, (iii) high fuel prices, and (iv) lack of knowledge. To respond to these barriers, households reporting to not have LPG were asked "Why don't you have LPG?" There were four coded responses: (i) "Is it not available or too far from your village?", (ii) "Is it too expensive to install an LPG connection?", (iii) "Is the monthly expense of LPG too expensive?", and (iv) "Don't know how to get or whom to ask?" Selection of multiple reasons was possible. We describe the distribution of reported reasons for not having LPG by household decision-maker, the total number of reasons reported, and extend our regression framework to explore potential associations of covariates with individual reasons for not having LPG.

Overall Cooking Satisfaction. Furthermore, we describe the associations that gender and LPG use have with overall cooking satisfaction to help describe the changes that occur with LPG in a household. Respondents were asked: "Overall, how satisfied are you with your primary cooking

arrangement?" Responses were coded into Unsatisfied (1), Neutral (2), and Satisfied (3). Here, we utilize the gender of the respondent as our primary contrast (Man: $N = 7,309$; Woman: $N = 1,257$) – which we expect to be randomly distributed across fuel user groups. When a woman was the respondent, she was the primary cook 97% of the time.

Cooking Fuel Use. Finally, we discuss the determinants of cooking fuel use in three principal outcomes. First, do households owning LPG report it to be their primary cooking fuel? Second, how much LPG is used in adopting households? Respondents are asked how many large (14.2 kg) and small (5 kg) cylinders of LPG they purchase in a year. With this information, we calculate kilograms of LPG purchased per month for our primary measure of LPG use. Since LPG purchases are usually regular and LPG is used nearly exclusively, if not exclusively, for cooking, we expect that this variable closely reflects a household's LPG use for cooking. Third, how much firewood is used in households? Similar to LPG use, respondents are asked how much firewood they typically use in a week (if they report to use firewood as a cooking fuel) in kilograms. First, we assess the association of our regression covariates with each of the three primary outcomes, accounting for State dummy variables. Then, we incorporate into our regression analyses additional covariates that describe the various costs of each cooking fuel: cost of a large LPG cylinder purchased from the market, one-way distance to acquire an LPG cylinder (in kilometers), one-way distance to collect firewood (in kilometers), and whether a household mostly collects firewood as compared with mostly purchasing firewood. Further information about these analyses is available in Section A7 of Supplementary Information.

A2.2 Collinearity between variables

Collinearity – or the correlation between covariates that would lead to unreliable and biased standard errors and unstable p-values – was assessed in all models using the Variance Inflation Factor (VIF). A VIF of 10 would indicate extreme multicollinearity, with 4 being a more conservative estimate (corresponding to tolerance of 0.10 or 0.25) (Vatcheva and Lee, 2016). No variable exceeded a VIF of 4 in models, suggesting limited correlation between variables included in regression.

A3 Supporting Results

Figure A1 shows conditional marginal effects from the main results model presented in Table 3 Model 6.

A4 Robustness

Regressions including village-level dummy variables confirm the main results of our analysis of LPG adoption. Although the results shown in Table A1 are linear regressions and those in the main results are quasi-binomial regressions, we can observe the same directions for our coefficients and comparatively similar effect sizes for both our explanatory variables and our covariates. Results suggest that, holding all else equal, households where the decision-maker is a woman are more likely to adopt LPG than their man decision-maker counterparts ($p = 0.06$).

We additionally carried out a regression that uses a dummy variable for having a woman household head as an alternative specification for capturing women's decision-making power. As we show in Table A2, this alternately specified models yields very similar results to the main analyses that directly use household decision-making.

A5 State-by-State Regressions

State-level variability in LPG ownership is shown in Figure A2. Study states have somewhat different profiles in terms household characteristics, wealth, and educational achievement (Table A3). In turn, regression models run within each state have varying results as shown in Table A4.

A6 LPG Non-Adoption

Characterizing the reasons for not having LPG is important because it was relatively rare in our study sample and remains limited around the world where much of the population continues to rely on traditional solid fuel combustion for cooking. Table 4 in the main text shows tabulated self-reported reasons for not having LPG. Next, Table A5 shows regressions assessing the associations

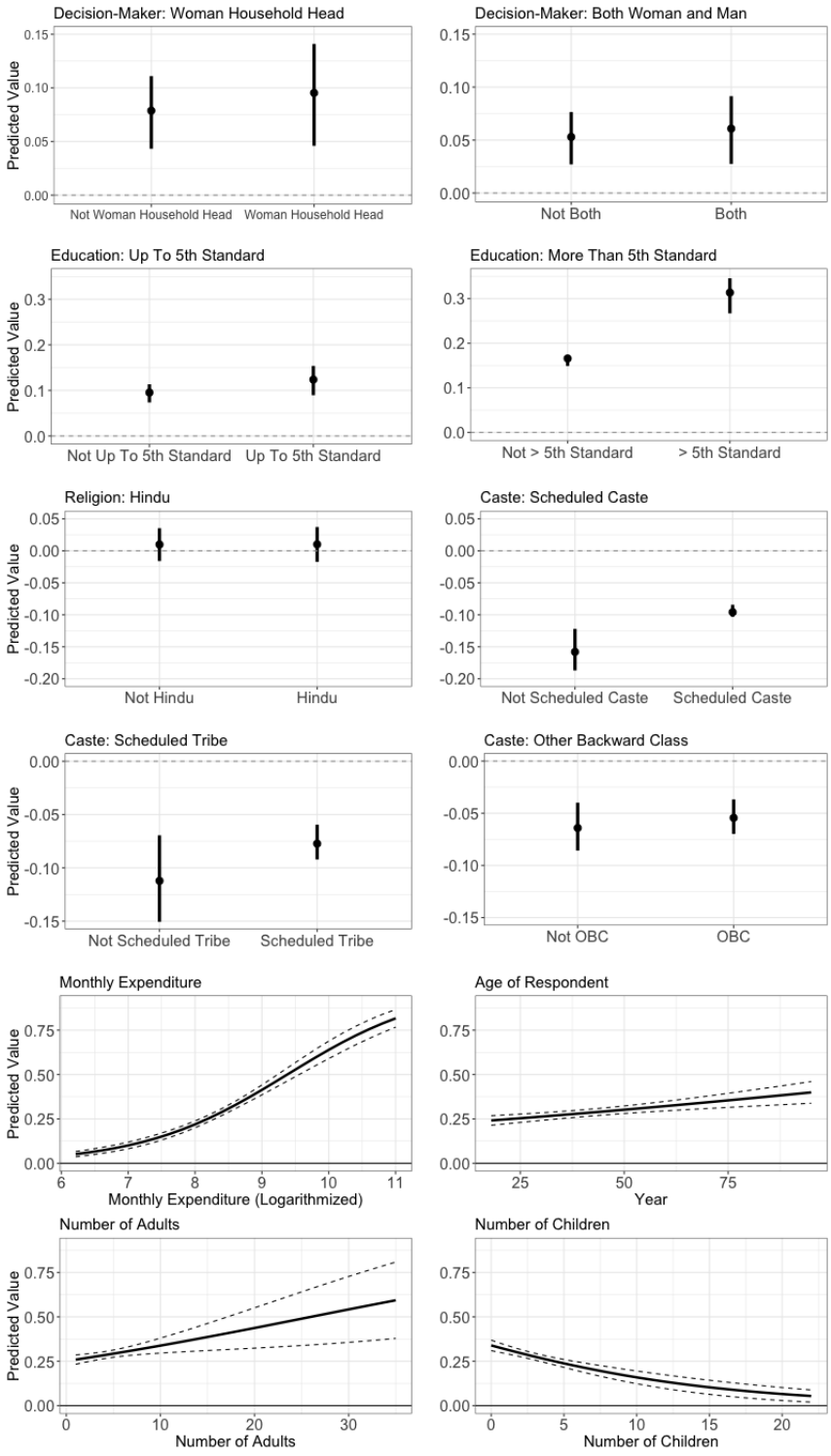

Figure A1: Conditional marginal effects plots are shown for each covariate in model 6 (the full model) from Table 3 across the distribution for each covariate. Marginal effects are estimated for dummy variables when they are zero and one and for continuous variables across the entirety of their distribution. Plots can be interpreted as the predicted probability of a household having LPG given the covariate value, i.e., at respondent age 25 years the probability of having LPG is 0.25 and at 75 years is 0.35. Data come from ACCESS and models account for village-clustered sampling strategy.

	Dependent variable:					
	LPG Adoption					
	(1)	(2)	(3)	(4)	(5)	(6)
Decision-Maker (Ref: Man Household Head):						
Woman Household Head (=1)	0.054**	−0.009			0.095***	0.033
	(0.019)	(0.019)			(0.018)	(0.018)
Both (=1)	−0.004	−0.004			0.027*	0.026*
	(0.013)	(0.012)			(0.012)	(0.012)
Monthly Expenditure (logarithmized)			0.134***	0.110***	0.133***	0.110***
			(0.008)	(0.008)	(0.008)	(0.008)
Number of Adults			0.006**	0.006**	0.007***	0.007***
			(0.002)	(0.002)	(0.002)	(0.002)
Number of Children			−0.013***	−0.012***	−0.013***	−0.012***
			(0.002)	(0.002)	(0.002)	(0.002)
Age of Respondent			0.001***	0.001***	0.001***	0.001***
			(0.0003)	(0.0003)	(0.0003)	(0.0003)
Religion (Ref: Other):						
Hindu (=1)			0.027*	0.042**	0.029*	0.042**
			(0.013)	(0.016)	(0.013)	(0.016)
Caste (Ref: General Caste):						
Scheduled Caste (=1)			−0.156***	−0.176***	−0.154***	−0.176***
			(0.013)	(0.014)	(0.013)	(0.014)
Scheduled Tribe (=1)			−0.173***	−0.148***	−0.171***	−0.148***
			(0.016)	(0.019)	(0.016)	(0.019)
Other Backward Caste (=1)			−0.096***	−0.093***	−0.095***	−0.093***
			(0.010)	(0.011)	(0.010)	(0.011)
Education (Ref: No Formal Education):						
Up to 5th Standard (=1)			0.068***	0.064***	0.072***	0.066***
			(0.011)	(0.010)	(0.011)	(0.010)
More than 5th Standard (=1)			0.209***	0.182***	0.215***	0.185***
			(0.011)	(0.011)	(0.011)	(0.011)
Village Dummy Variables		Yes		Yes		Yes
Observations	8,563	8,563	8,563	8,563	8,563	8,563
R^2	<0.001	0.264	0.146	0.353	0.150	0.354
Note:						*p<0.05; **p<0.01; ***p<0.001
						This analysis does not include survey weights.

Table A1: Non-survey weighted linear regressions (OLS) including village-level dummy variables. In total, there are 714 villages included in the linear regressions as dummy variables. Data come from ACCESS.

between our main covariates of interest and self-reported reasons for not having LPG (as binary outcomes). In Table A6 we show counts for the number of reasons cited in each household that does not have LPG, by decision-making type.

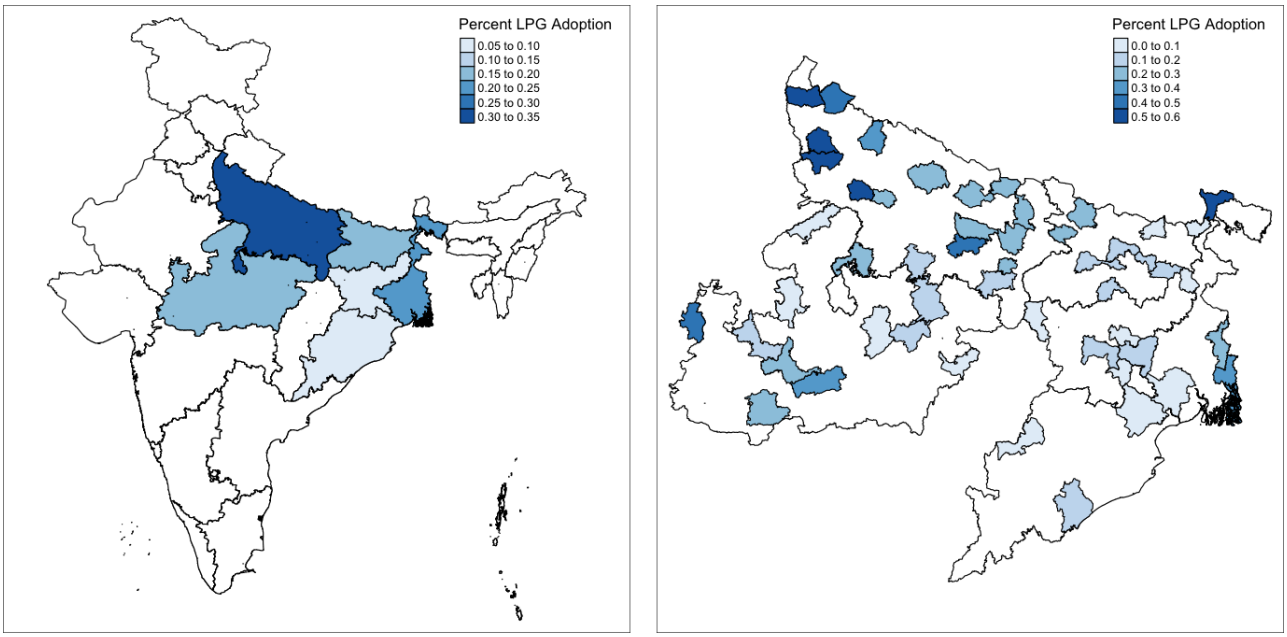

Figure A2: Percent LPG adoption in the study at the state (left) and district (right) level in the ACCESS dataset. States and districts in white are outside the study sample. Reproduced with permission from the authors (Gould and Urpelainen, 2018).

A7 Exploratory Analyses: Cooking Fuel Use

While our primary analyses focus on LPG adoption, here we explore the associations between covariates used in the main analyses and the use of LPG and firewood through three outcome variables: the use of LPG as the primary cooking fuel, LPG used (kg/person/month), and firewood used (kg/person/week). Figure A3 shows density plots describing the continuous distribution of LPG and firewood used (separated by LPG ownership). The outcomes were calculated as follows:

- **LPG as the primary cooking fuel.** Participants were asked "What is your primary cooking fuel?" The options were coded as 1) Firewood and chips, 2) Dung cakes, 3) LPG, and 4) Other. We limit these calculations to the study households that own LPG to assess the determinants of elevating LPG to the primary cooking fuel after adoption.

- **LPG use.** Participants were asked how many large cylinders they use per year and how many small cylinders they use per year. To calculate LPG use, we summed the results of multiplying the number of large cylinders used each year by 14.2 kilograms and the number of

small cylinders by 5 kilograms. Then we divided by 12 months and by the number of people living in the household permanently at the time of the survey.

- **Firewood use.** Participants were asked first if they use firewood for cooking and, if they responded yes, "Typically, how much firewood do you use per week for cooking?" They were instructed to provide a value in kilograms per week. This number was divided by the number of people living in the household permanently at the time of the survey.

In addition the covariates used in the main analyses, we incorporated several new variables that account for the various costs of LPG and firewood use in exploratory analyses. These new covariates were developed and utilized as follows:

- **LPG cylinder cost.** Participants were asked how many cylinders – both large and small – they acquired from authorized distributors and from the market in separate questions. Then, they were asked the cost of each cylinder type they purchased. Nearly all purchases reported were large cylinders from authorized distributors. Therefore, we utilize the responses to the question "How much does a large cylinder of LPG from authorized distributors cost?" The distribution of costs is discussed in depth elsewhere (Gould and Urpelainen, 2018); briefly, 95% of respondents reported paying between 400-550 Indian rupees (INR) for one large cylinder. In analyses, we scaled this variable such that we assessed the impact of increasing the cost per 100 INR, rather than 1 INR, to assess a more interpretable price change.

- **LPG cylinder access.** Participants were asked "Is the domestic gas cylinder delivered at your doorstep?" If they reported to not have LPG delivered to their household, they were asked "What is the one-way distance in kilometers that your household typically travels to get LPG?" Participants for whom LPG is delivered to their household had their one-way distance coded as 0 kilometers in analysis.

- **Firewood access.** Participants reporting to collect firewood (83% of firewood users) were asked "What is the one-way distance in kilometers that your household typically travels to collect firewood and chips?"

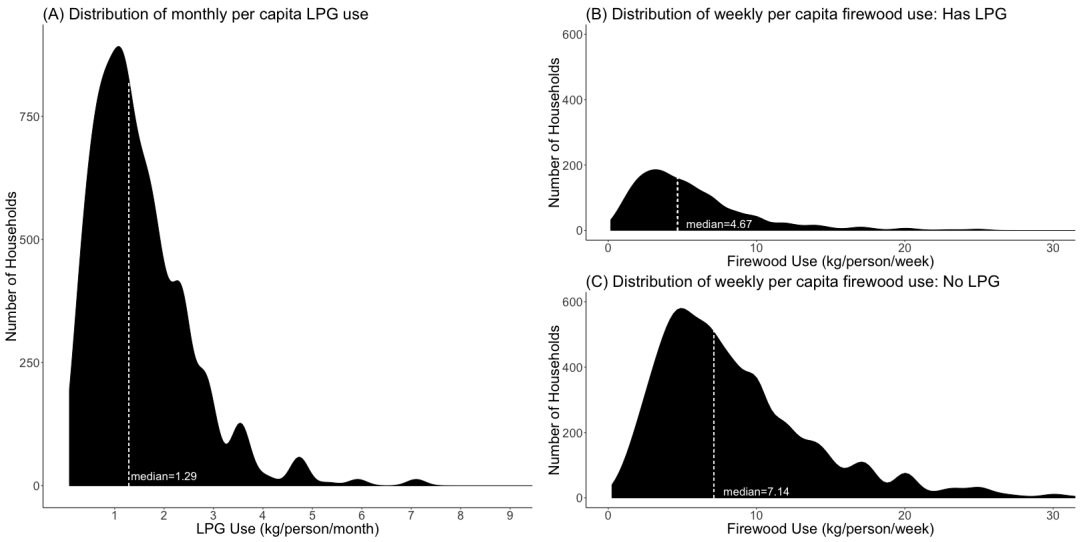

Figure A3: Distribution of cooking fuel use per capita in ACCESS data.

- **Firewood collection.** Participants were asked to provide estimates of how much firewood used in a week comes from collection by household members as opposed to brought from the market. Households reporting to collect more than half of the firewood used in a typical week were encoded to "mostly collect firewood." This applies to 77% of households using firewood.

	Dependent variable:					
	LPG Adoption					
	(1)	(2)	(3)	(4)	(5)	(6)
Household Head:						
Ref: Man Household Head						
Woman Household Head (=1)	0.003	0.001			0.099***	0.081***
	(0.002)	(0.021)			(0.020)	(0.019)
Monthly Expenditure (logarithmized)			0.121***	0.127***	0.121***	0.127***
			(0.086)	(0.008)	(0.009)	(0.008)
Number of Adults			0.006**	0.005*	0.007**	0.005**
			(0.002)	(0.002)	(0.002)	(0.002)
Number of Children			-0.012***	-0.014***	-0.011***	-0.014***
			(0.002)	(0.002)	(0.002)	(0.002)
Age of Respondent			0.001***	0.001***	0.001***	0.001***
			(<0.001)	(<0.001)	(<0.001)	(<0.001)
Religion						
Ref: Other						
Hindu (=1)			0.005	0.009	0.005	0.009
			(0.014)	(0.014)	(0.014)	(0.014)
Caste:						
Ref: General Caste						
Scheduled Caste (=1)			-0.140***	-0.145***	-0.137***	-0.143***
			(0.014)	(0.014)	(0.014)	(0.014)
Scheduled Tribe (=1)			-0.185***	-0.111***	-0.184***	-0.109***
			(0.020)	(0.020)	(0.020)	(0.020)
Other Backward Class (=1)			-0.063***	-0.059***	-0.060***	-0.057***
			(0.010)	(0.010)	(0.010)	(0.010)
Household Head Education:						
Ref: No Formal Education						
Up To 5th Standard (=1)			0.102***	0.102***	0.110***	0.109***
			(0.014)	(0.013)	(0.013)	(0.013)
More Than 5th Standard (=1)			0.218***	0.213***	0.229***	0.222***
			(0.012)	(0.012)	(0.014)	(0.013)
State Variables:						
Ref: Jharkhand						
Bihar (=1)		0.103***		0.080***		0.081***
		(0.013)		(0.013)		(0.013)
Madhya Pradesh (=1)		0.108***		0.111***		0.111***
		(0.013)		(0.013)		(0.013)
Odisha (=1)		0.026		0.049**		0.045**
		(0.015)		(0.017)		(0.017)
Uttar Pradesh (=1)		0.265***		0.254***		0.252***
		(0.012)		(0.012)		(0.012)
West Bengal (=1)		0.152***		0.166***		0.162***
		(0.014)		(0.015)		(0.015)
Observations	8563	8563	8563	8563	8563	8563
R^2	<0.001	0.047	0.142	0.190	0.145	0.192

Note: *p<0.05; **p<0.01; ***p<0.001
Average Marginal Effects are reported.

Table A2: Regression models replicating main analyses using having a woman household head as the primary indicator of women's decision-making power. Results are from quasi-binomial logistic regressions (logit link) of LPG adoption by households in the sample reporting average marginal effects. Data used come from ACCESS and standard errors are adjusted for the village-clustered sampling strategy.

	Jharkhand (n=840)	Madhya Pradesh (n=1680)	Odisha (n=504)	Uttar Pradesh (n=3023)	West Bengal (n=1005)	Bihar (n=1511)
LPG adoption (=1)	6%	17%	9%	33%	22%	17%
Decision Maker:						
Female Household Head	1%	3%	12%	7%	9%	5%
Male Household Head	69%	77%	77%	81%	73%	80%
Both	29%	18%	11%	9%	17%	14%
Monthly expenditure (log)	8.42	8.29	8.16	8.38	8.38	8.52
Number of adults	4.08	3.96	4.05	4.62	3.57	4.57
Number of children	2.41	2.19	1.86	2.89	1.51	2.86
Age (years)	40.62	41.06	46.09	42.6	41.78	43.13
Religion:						
Hindu	83%	98%	99%	87%	75%	84%
Muslim	13%	2%	1%	13%	25%	16%
Education:						
No Formal Schooling	27%	32%	37%	30%	34%	33%
Up To 5th Standard	36%	26%	37%	29%	41%	29%
More Than 5th Standard	37%	42%	26%	40%	25%	39%
Caste:						
Scheduled Caste	10%	17%	20%	21%	22%	15%
Scheduled Tribe	23%	15%	30%	1%	15%	2%
Other Backward Class	56%	49%	19%	54%	26%	57%
General	11%	19%	30%	24%	37%	25%

Table A3: Summary statistics of dependent, explanatory, and control variables by study state in ACCESS data. NB: When exponentiated, 8.35 is 4,230 Rupees, which is equivalent to 66.02 USD at 64.07 INR to 1 USD.

	Dependent variable:					
	LPG Adoption					
	Jharkhand	Madhya Pradesh	Odisha	Uttar Pradesh	West Bengal	Bihar
Decision-Maker:						
Ref: Man Household Head						
Woman Household Head (=1)	0.089	0.078	0.055	0.103**	0.155***	-0.083
	(0.052)	(0.062)	(0.035)	(0.035)	(0.034)	(0.060)
Both (=1)	0.021	0.014	-0.005	0.076*	0.110**	0.035
	(0.019)	(0.025)	(0.048)	(0.028)	(0.031)	(0.029)
Monthly Expenditure (logarithmized)	0.071**	0.124***	0.093***	0.139***	0.138***	0.116***
	(0.021)	(0.015)	(0.027)	(0.014)	(0.030)	(0.019)
Number of Adults	<-0.001	-0.004	-0.012	0.009*	0.022**	< 0.005
	(0.003)	(0.005)	(0.007)	(0.004)	(0.007)	(0.004)
Number of Children	-0.007	-0.017**	0.001	-0.016***	-0.023**	-0.012*
	(0.006)	(0.005)	(0.009)	(0.004)	(0.008)	(0.005)
Age of Respondent	0.001	0.002**	0.002*	0.002***	< -0.001	< 0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Religion:						
Ref: Other						
Hindu (=1)	0.023	-0.030	0.804**	-0.032	0.070*	0.030
	(0.025)	(0.050)	(0.126)	(0.026)	(0.031)	(0.029)
Caste:						
Ref: General Caste						
Scheduled Caste (=1)	-0.062	-0.077**	-0.067	-0.260*	-0.078*	-0.087**
	(0.063)	(0.030)	(0.036)	(0.026)	(0.032)	(0.022)
Scheduled Tribe (=1)	-0.037	-0.162***	-0.085	-0.299**	-0.018	-0.149
	(0.034)	(0.043)	(0.031)	(0.118)	(0.033)	(0.084)
Other Backward Class (=1)	0.004	-0.053**	-0.028	-0.102***	-0.037	-0.047*
	(0.025)	(0.022)	(0.028)	(0.018)	(0.031)	(0.022)
Household Head Education:						
Ref: No Formal Education						
Up To 5th Standard (=1)	0.096*	0.131***	0.135**	0.112***	0.057	0.169**
	(0.016)	(0.032)	(0.047)	(0.024)	(0.031)	(0.038)
More Than 5th Standard (=1)	0.122***	0.239***	0.186***	0.251***	0.231***	0.237***
	(0.045)	(0.029)	(0.049)	(0.021)	(0.030)	(0.038)
Observations	840	1680	504	3023	1005	1511
R^2	0.166	0.182	0.213	0.166	0.161	0.162

Note: *p<0.05; **p<0.01; ***p<0.001
Average Marginal Effects are reported.

Table A4: Quasi-binomial logistic regressions (logit link) of LPG adoption by households within individual states reporting average marginal effects. Data used come from ACCESS and standard errors are adjusted for the village-clustered sampling strategy.

	Reasons for LPG Non-Adoption							
	Unavailable		Installation Cost		Monthly Cost		Lack of Information	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Decision-Maker (Ref: Man Household Head):								
Woman Household Head (=1)	-0.069**	-0.069**	-0.029*	-0.024	-0.040	-0.034	-0.032	-0.040
	(0.025)	(0.024)	(0.011)	(0.011)	(0.018)	(0.018)	(0.029)	(0.028)
Both (=1)	-0.013	-0.029	0.013	0.011	0.021	0.013	-0.026	-0.023
	(0.017)	(0.016)	(0.010)	(0.010)	(0.013)	(0.013)	(0.019)	(0.018)
Monthly Expenditure (logarithmized)	-0.027*	-0.028*	-0.010	-0.016*	-0.015**	-0.028**	-0.019	-0.030*
	(0.012)	(0.012)	(0.007)	(0.007)	(0.009)	(0.009)	(0.013)	(0.013)
Number of Adults	0.009**	0.007*	-0.002	-0.001	-0.005*	-0.004	0.003	0.001
	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Number of Children	0.006	0.002	0.002	0.001	0.001	0.001	0.005	< 0.001
	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.004)	(0.004)
Age of Respondent	0.001	< 0.001	< 0.001	< 0.001	0.001	0.001	0.002**	0.001
	(0.001)	(< 0.001)	(< 0.001)	(< 0.001)	(< 0.001)	(< 0.001)	(0.001)	(0.001)
Religion (Ref: Other):								
Hindu (=1)	0.102***	0.059***	0.020*	0.027	-0.008	0.002	0.020	-0.008
	(0.016)	(0.016)	(0.009)	(0.011)	(0.014)	(0.014)	(0.019)	(0.019)
Caste (Ref: General Caste):								
Scheduled Caste (=1)	0.021	0.035	-0.006	-0.007	-0.005	0.001	0.042*	0.061
	(0.019)	(0.019)	(0.010)	(0.010)	(0.014)	(0.014)	(0.021)	(0.021)
Scheduled Tribe (=1)	0.146***	0.105***	-0.015	-0.004	0.006	0.013	0.103***	0.122**
	(0.026)	(0.026)	(0.012)	(0.012)	(0.018)	(0.017)	(0.024)	(0.025)
Other Backward Class (=1)	0.044**	0.029	-0.001	-0.006	-0.002	-0.003	0.022	0.017
	(0.015)	(0.015)	(0.008)	(0.008)	(0.012)	(0.012)	(0.017)	(0.017)
Education (Ref: No Formal Education):								
Up To 5th Standard (=1)	-0.006	0.002	-0.003	-0.003	-0.004	-0.004	-0.047**	-0.034*
	(0.015)	(0.014)	(0.008)	(0.008)	(0.011)	(0.011)	(0.016)	(0.015)
More Than 5th Standard (=1)	-0.008	-0.020	-0.014	-0.015	-0.004*	-0.029*	-0.109***	-0.110***
	(0.016)	(0.015)	(0.008)	(0.008)	(0.012)	(0.012)	(0.017)	(0.017)
State (Ref: Jharkhand):								
Bihar (=1)		-0.035		0.001		0.041***		0.277***
		(0.018)		(0.009)		(0.014)		(0.018)
Madhya Pradesh (=1)		-0.075***		-0.047***		-0.028		0.043*
		(0.018)		(0.010)		(0.015)		(0.018)
Odisha (=1)		0.020		-0.080***		-0.066**		0.181***
		(0.023)		(0.017)		(0.023)		(0.027)
Uttar Pradesh (=1)		-0.184***		-0.025*		-0.052***		0.024
		(0.018)		(0.009)		(0.015)		(0.017)
West Bengal (=1)		-0.308***		-0.028*		0.004		-0.050*
		(0.021)		(0.011)		(0.016)		(0.019)
Observations	6712	6712	6712	6712	6712	6712	6712	6712
R^2	0.018	0.063	0.011	0.032	0.009	0.030	0.013	0.055

Note: *p<0.05; **p<0.01; ***p<0.001
Average Marginal Effects are reported.

Table A5: Quasi-binomial logistic regressions (logit link) of reasons for LPG non-adoption among households in the sample reporting marginal effects. Standard errors are adjusted for the village-clustered sampling strategy. Data are from ACCESS.

	Female Household Head (n=356)	Male Household Head (n=5281)	Both (n=989)
0	9	86	7
1	23	258	38
2	101	1,056	197
3	121	2,132	434
4	102	1,749	313
Total Reasons	996	15,762	2,986
Mean Reasons Per Household	2.80	2.98	3.02

Note: No respondents in the described sample have LPG.

Table A6: Counts of number of reasons for LPG non-adoption cited by respondents by decision-making types, as well as a calculation of the mean number of reasons per household. Data are from ACCESS.

	Primary Fuel: LPG		
	(1)	(2)	(3)
Large LPG Cylinder (100 INR)	-0.014		-0.013
	(0.019)		(0.019)
One-way distance to acquire LPG cylinder (km)		-0.001	-0.002
		(0.002)	(0.002)
Decision-Maker (Ref: Man Household Head):			
Woman Household Head (=1)			0.050
			(0.047)
Both (=1)			-0.049
			(0.034)
Monthly Expenditure (Logarithmized)			-0.012
			(0.019)
Number of Adults			-0.012*
			(0.005)
Number of Children			0.006
			(0.006)
Age of Respondent			< 0.001
			(0.001)
Religion (Ref: Other):			
Hindu (=1)			-0.108***
			(0.039)
Caste (Ref: General Caste):			
Scheduled Caste (=1)			-0.042
			(0.041)
Scheduled Tribe (=1)			0.073
			(0.071)
Other Backward Caste (=1)			-0.047
			(0.025)
Education (Ref: No Formal Education):			
Up to 5th Standard (=1)			0.007
			(0.039)
More than 5th Standard (=1)			0.048
			(0.036)
State Dummy Variables	Yes	Yes	Yes
Observations	1,753	1,851	1,753
R^2	0.062	0.059	0.074
Note:			*p<0.05; **p<0.01; ***p<0.001
			Average Marginal Effects are reported.

Table A7: Generalized linear models (Ordinary Least Squares) testing association of covariates with predicting a household using LPG as their primary cooking fuel after adoption. ACCESS data is used and standard errors account for village-clustered sampling strategy.

	LPG Use (kg/month)		
	(1)	(2)	(3)
Large LPG Cylinder (100 INR)	−0.022		-0.021
	(0.018)		(0.018)
One-way distance to acquire LPG cylinder (km)		0.001	-0.001
		(0.002)	(0.002)
Decision-Maker (Ref: Man Household Head):			
Woman Household Head (=1)			0.075
			(0.047)
Both (=1)			−0.001
			(0.041)
Monthly Expenditure (Logarithmized)			0.042
			(0.023)
Number of Adults			0.014*
			(0.007)
Number of Children			0.012
			(0.007)
Age of Respondent			< 0.001
			(0.001)
Religion (Ref: Other):			
Hindu (=1)			−0.088*
			(0.042)
Caste (Ref: General):			
Scheduled Caste (=1)			−0.022
			(0.042)
Scheduled Tribe (=1)			0.017
			(0.073)
Other Backward Caste (=1)			−0.152***
			(0.029)
Education (Ref: No Formal Schooling):			
Up to 5th Standard (=1)			0.058
			(0.052)
More than 5th Standard (=1)			0.139**
			(0.049)
State Dummy Variables	Yes	Yes	Yes
Observations	1,709	1,793	1,709
R^2	0.059	0.053	0.108
Note:			*p<0.05; **p<0.01; ***p<0.001
			Average Marginal Effects are reported.

Table A8: Generalized linear models (Ordinary Least Squares) testing association of covariates with predicting a household LPG use in terms of kilograms per capita per month. ACCESS data is used and standard errors account for village-clustered sampling strategy.

	Firewood Use (kg/month)		
	All firewood-using households		Non-LPG firewood households
	(1)	(2)	(3)
Has LPG	−0.285***	−0.376***	
	(0.024)	(0.024)	
Decision-Maker (Ref: Man Household Head):			
Woman Household Head (=1)		-0.066*	−0.041
		(0.040)	(0.044)
Both (=1)		-0.003	-0.009
		(0.021)	(0.022)
Monthly Expenditure (Logarithmized)		0.064***	0.054
		(0.016)	(0.017)
Number of Adults		0.034***	0.033***
		(0.004)	(0.004)
Number of Children		0.022***	0.020***
		(0.004)	(0.005)
Age of Respondent		-0.001	-0.002**
		(0.001)	(0.001)
Religion (Ref: Other):			
Hindu (=1)		0.103***	0.080**
		(0.026)	(0.025)
Caste (Ref: General Caste):			
Scheduled Caste (=1)		−0.045*	−0.049*
		(0.024)	(0.025)
Scheduled Tribe (=1)		-0.012	-0.020
		(0.029)	(0.030)
Other Backward Caste (=1)		−0.066***	−0.068***
		(0.021)	(0.022)
Education (Ref: No Formal Education):			
Up to 5th Standard (=1)		0.001	0.015
		(0.020)	(0.020)
More than 5th Standard (=1)		−0.023	−0.033*
		(0.020)	(0.020)
State Dummy Variables	Yes	Yes	Yes
Observations	7,148	7,148	5,831
R^2	0.163	0.198	0.173
Note:			*p<0.10; **p<0.05; ***p<0.01
			Average Marginal Effects are reported.

Table A9: Generalized linear models (Ordinary Least Squares) testing association of covariates with predicting a household firewood use in terms of kilograms per capita per month among households that have LPG. ACCESS data is used and standard errors account for village-clustered sampling strategy.

	Firewood Use (kg/month)				
	(1)	(2)	(3)	(4)	(5)
Large LPG Cylinder (100 INR)	0.021				0.022
	(0.041)				(0.040)
One-way distance to acquire LPG cylinder (km)		0.007*			0.006
		(0.004)			(0.004)
One-way distance to collect firewood (km)			−0.018		
			(0.038)		
Household mostly collects firewood (=1)				0.024	−0.029
				(0.054	(0.053)
Decision-Maker (Ref: Man Household Head):					
Female Household Head (=1)					−0.186**
					(0.099)
Both (=1)					0.007
					(0.065)
Monthly Expenditure (logarithmized)					0.107**
					(0.043)
Number of Adults					0.030**
					(0.012)
Number of Children					0.029**
					(0.012)
Age of Respondent					0.002
					(0.002)
Religion (Ref: Other):					
Hindu (=1)					0.197**
					(0.082)
Caste (Ref: General Caste):					
Scheduled Caste (=1)					0.018
					(0.071)
Scheduled Tribe (=1)					0.053
					(0.125)
Other Backward Caste (=1)					−0.034
					(0.052)
Education (Ref: No Formal Education):					
Up to 5th Standard (=1)					−0.099
					(0.082)
More than 5th Standard (=1)					−0.033
					(0.076)
State Dummy Variables	Yes	Yes	Yes	Yes	Yes
Observations	1,243	1,317	163	1,317	1,243
R^2	0.026	0.028	0.057	0.025	0.091

Note: *p<0.10; **p<0.05; ***p<0.01
Average Marginal Effects are reported.

Table A10: Generalized linear models (Ordinary Least Squares) testing association of fuel access and cost characteristics with predicting a household firewood use in terms of kilograms per capita per month. ACCESS data is used and standard errors account for village-clustered sampling strategy.

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