

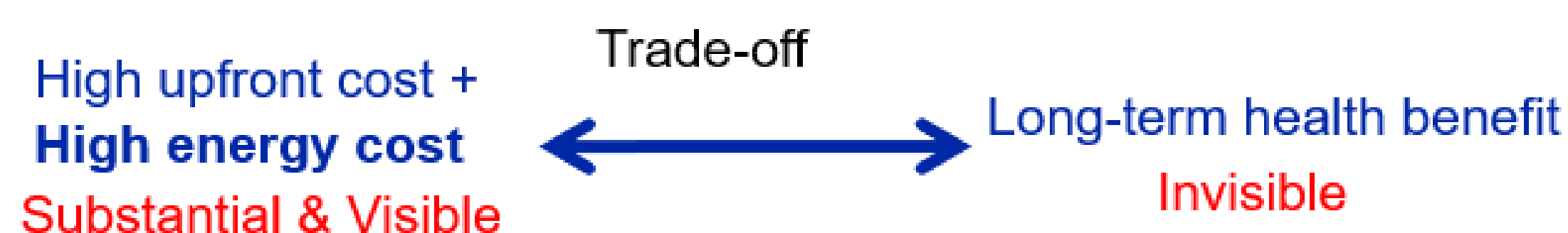
Burn Coal or Go Electric: A Randomized Field Experiment

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Motivation

- Many households in developing countries rely heavily on low-efficient + high carbon intensive energy, i.e. coal, fuel-wood, and straw.
- In China, over 1/3 households uses coal heating = 83% heating area uses coal in the north = 37% of total coal consumptions by households (200 million tons of standard coal)
- Coal heating & cooking
 - Air pollution
 - Health: 3.8 million lives lost globally due to indoor pollution = 7.7% of global mortality in 2016 (WHO)
 - Climate change: main source of greenhouse gas emissions

Electric heating



What We Do?

Stage 1: Survey: heating preferences, overestimation on cost, underestimation on health damage

- Stage 2: Control Treatment SMS Treatments:**
- Cost SMS
 - Health SMS
 - Social Comparison SMS



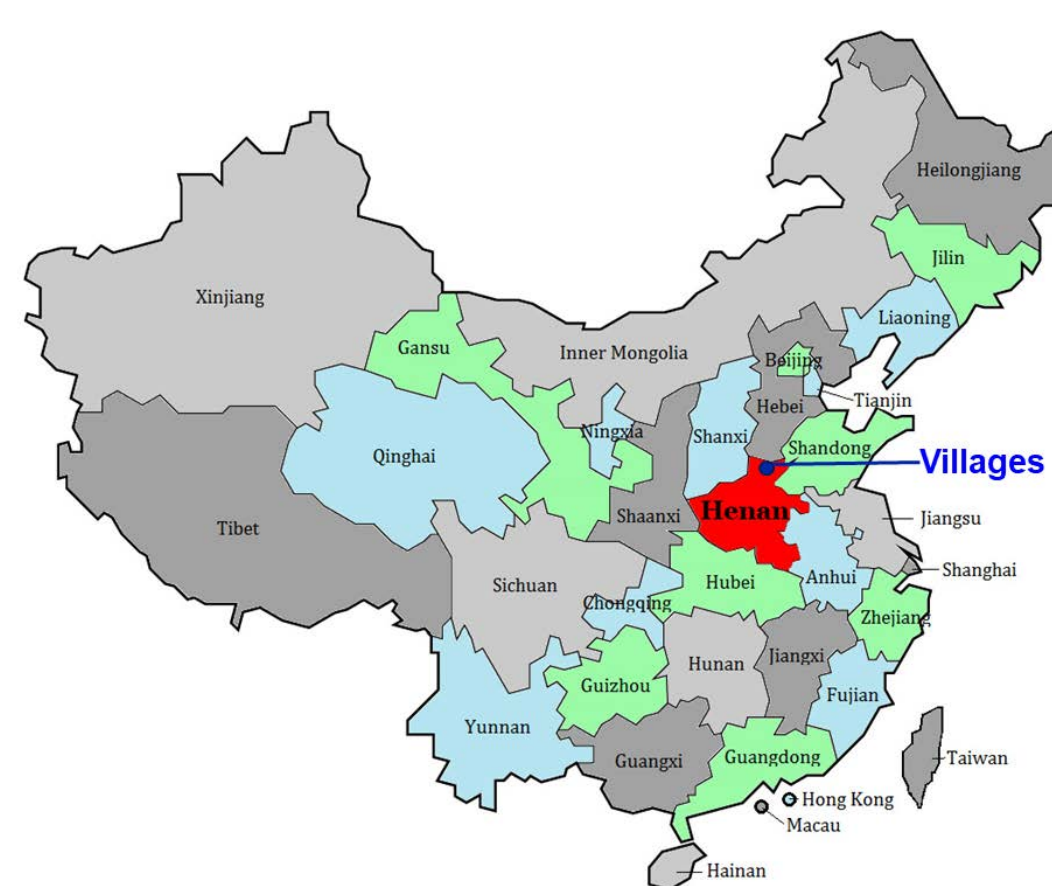
Message Intervention

SMS Period: 8 days (Feb 18-25, 2019)

Message type	Example of SMS content
Cost SMS	On Feb 23, you have consumed 7 kWh, which is 4.2 yuan.
Health SMS	Scientific evidence suggests that burning coal on average increases the chance of getting respiration diseases by 36% compared to other clean technologies.
Social comparison SMS	According to our survey, 56.7% of villagers in village A have switched to electricity heating.

Sample

- Two villages in northern China
- Population = 3,208 + 1,800
- Annual per capita disposable income = 13,260 RMB
- 243 participants
- Villagers are free to choose between coal heating and electric heating.

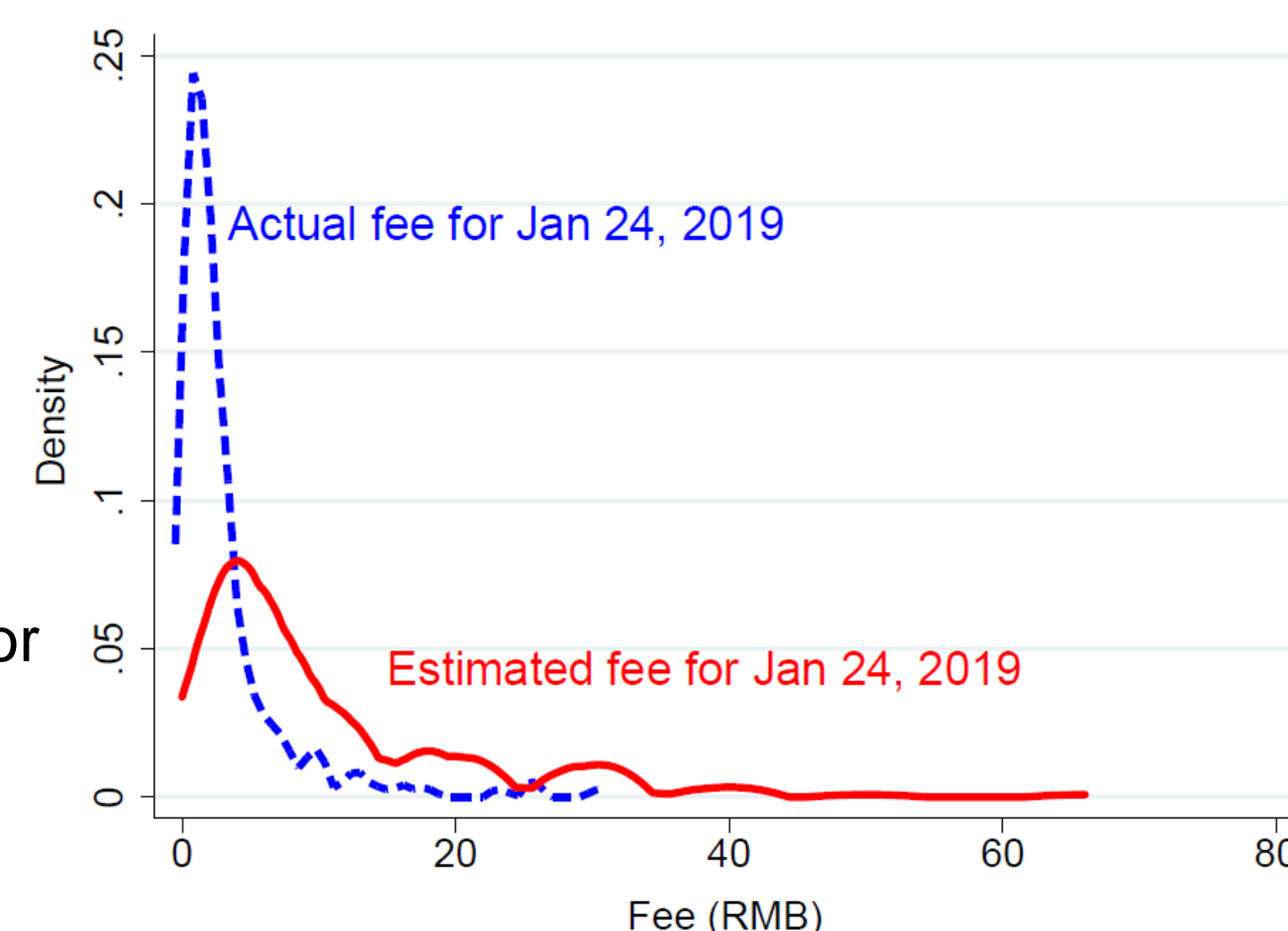


Empirical Strategy: DiD

- Household's average daily electricity consumption in October 2018 (right before heating season) as a benchmark
- Daily electricity consumption data for individual household (from the local energy utility company).
- Difference in electricity consumption between October and heating season as a proxy for changes in usage of electric heating.

Overestimation of Electricity Cost

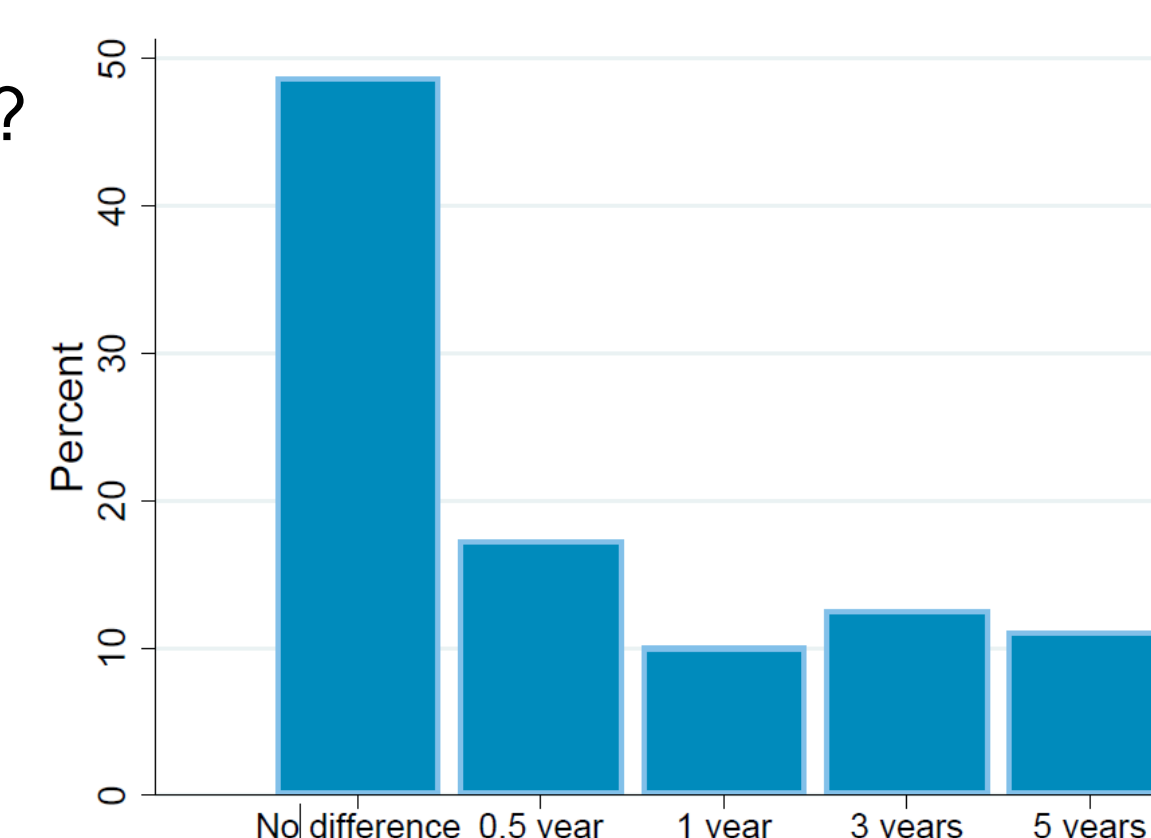
- Stylized fact 1:** A large proportion of households overestimate their electricity expenses to a great extent.
- Incentivized elicitation on estimate of electricity fee for Jan 24, 2019.



Underestimation of Health Damage of Coal Heating

Impact of coal heating on the life expectancy of the northern populations?

- No impact
- 0.5 years shorter
- 1 year shorter
- 3 years shorter
- 5 years shorter



Stylized fact 2: The majority of households underestimate the health damage of coal heating.

Average Treatment Effect

- Result 1:**
- Cost SMS: negative effect
 - Health SMS and Social Comparison SMS: no significant effect

	Electricity consumption for heating			
	(1)	(2)	(3)	(4)
Cost SMS × Post	-1.235*** (0.351)	-1.230*** (0.331)	-1.230*** (0.331)	-1.231*** (0.247)
Health SMS × Post	0.016 (0.270)	0.023 (0.263)	0.023 (0.263)	0.011 (0.201)
Social comparison SMS × Post	0.262 (0.280)	0.269 (0.272)	0.269 (0.272)	0.282 (0.205)
Number of observations	14834	14834	14834	14834
R ²	0.057	0.134	0.114	0.464
Adjusted R ²	0.052	0.107	0.108	0.453
Day fixed effects	Yes	Yes	Yes	Yes
Village fixed effects	Yes	Yes	Yes	Yes
Control variables	No	Yes	Yes	No
Household fixed effects	No	No	No	Yes

Cost SMS backfire

Two plausible effects:

- Debias overestimation → increase in electric heating
- Raise attention on cost, a salience bias → decrease in electric heating

Heterogeneous Treatment Effect of Cost SMS

Panel A: Heterogeneous Treatment Effects of Cost SMS

	Overestimate electricity cost		Price Concern		Monthly income ≥ 2,000 RMB	
	(Yes) (1)	(No) (2)	(Yes) (3)	(No) (4)	(Yes) (5)	(No) (6)
Cost SMS × Post	-0.170 (0.209)	-8.325*** (1.300)	-2.509*** (0.387)	-0.007 (0.312)	-1.022*** (0.362)	-2.405*** (0.373)
Observations	5,056	960	3,710	3,902	4,161	3,005
R ²	0.486	0.519	0.525	0.469	0.504	0.508
Adjusted R ²	0.471	0.475	0.509	0.452	0.488	0.489
Fixed effects: Day, Village, Individual household						
Difference [p-value]	8.155***	[0.000]	-2.502***	[0.000]	1.383***	[0.008]

Result 2: No effect on those overestimated electricity cost. Reduces electric heating of those who were cost concerned.

Heterogeneous Treatment Effect of Health SMS

Panel B: Heterogeneous Treatment Effects of Health SMS

	Underestimate health damage		Health Concern		Monthly income ≥ 2,000 RMB		Education ≥ primary school	
	(Yes) (1)	(No) (2)	(Yes) (3)	(No) (4)	(Yes) (5)	(No) (6)	(Yes) (7)	(No) (8)
Health SMS × Post	-0.333 (0.242)	0.95*** (0.359)	0.934*** (0.284)	-0.928*** (0.270)	0.451 (0.288)	-0.624** (0.263)	0.238 (0.215)	-2.009*** (0.531)
Observations	6,395	2,300	4,215	4,480	4,857	3,647	7,756	768
R ²	0.475	0.350	0.542	0.329	0.520	0.290	0.461	0.368
Adjusted R ²	0.461	0.320	0.528	0.308	0.506	0.265	0.448	0.297
Fixed effects: Day, Village, Individual household								
Difference [p-value]	-1.283***	[0.003]	1.862***	[0.000]	1.075***	[0.006]	2.247***	[0.000]

Result 3: No effect on those underestimate the health damage. Works only for those who are concerned about health impact from coal heating.

Heterogeneous Treatment Effect of Social Comparison SMS

Result 4: Social Comparison SMS has a significant positive effect only for households who were concerned about others' heating choices.

Conclusion and Policy Implications

- SMSs can be effective, but only when receivers already concerned about the informed issue.
- Only providing simple SMS is not enough.
- Health SMS is the most promising
- Need to raise villagers' knowledge in health benefit from using electric heating.