How do Internet-based social networks affect China's household energy consumption and energy equality?

Yilan WANG
School of Economics and Management, China University of Geosciences (Wuhan), Wuhan, 430074, China

Chuanmin SHUAI
School of Economics and Management, China University of Geosciences (Wuhan), Wuhan, 430074, China,
shuaicm@cug.edu.cn

How do Internet-based social networks affect China's household energy consumption and energy equality?

Yilan WANG [1] and Chuanmin SHUAI [1*]

[1] School of Economics and Management, China University of Geosciences (Wuhan), Wuhan, 430074, China
shuaicm@cug.edu.cn(Chuanmin Shuai,corresponding author)

1. INTRODUCTION AND RESEARCH QUESTIONS

Being in this era of change, the use of internet technology has permeated every aspect of people's lives [1]. Energy is the key to global prosperity and well-being and is the basis of human life and industrial activity [2-3]. Previous studies have confirmed that the Internet is gradually changing the way people live, behave, and think in ways that expand their life networks [4-5]. The term "social network" refers to the relatively stable relationships formed between individual members of society as a result of their interactions, and focuses on the interactions and linkages between individuals in society, which also influence people's social behaviors and cognitive level. While the rapid growth of the internet has dramatically changed people's social networks, little attention has been paid to the impact of residents' social networks on household energy consumption and energy equality from this perspective. Consider that mobile internet penetration is not only related to the individual level, but also includes regional differences in penetration rates. In other words, the impact of the Internet on household energy consumption and energy equality can have heterogeneous effects at different levels.

This study therefore presents a micro- and macro-analysis of the relationship between internet-based social networks and household energy consumption and energy equality. Our research questions are as follows: (1) What is the current status of household energy equality in China? (2) How do Internet-enabled social networks affect household energy consumption and energy equality? (3) Is there individual-level and regional-level heterogeneity in the impact of internet-enabled social networks on household energy consumption and energy equality?

2. THEORY AND RESEARCH FRAMEWORK

Based on social network theory and energy equality theory, this paper presents the hypothesis and research framework (Figure
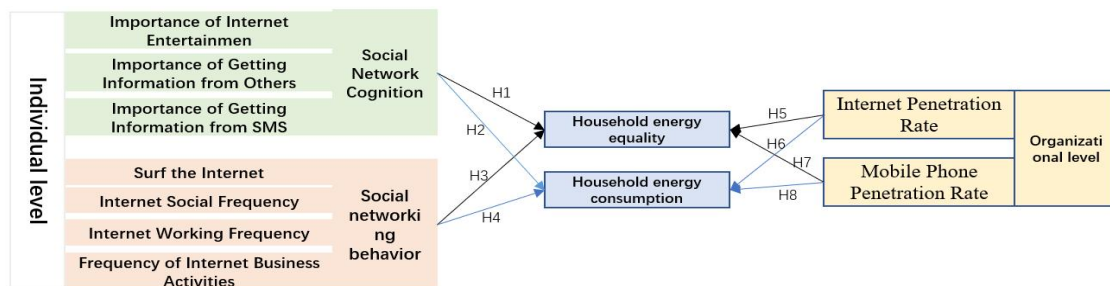

Figure 1. Research framework

The microdata used in this paper are based on the China Family Panel Studies, (CFPS) 2018 data from the China Social Science Survey Centre, Peking University. In this paper, 17,741 sets of valid individual data and 114 sets of low-level municipal data were collected in the 2018 data. In addition, macroeconomic data were selected from the China Statistical Yearbook. The Gini coefficient and Lorentz asymmetry coefficient were also applied to calculate energy equality indicators, and our hypotheses were tested by the Hierarchical Linear Model.

3. RESULTS AND MAJOR FINDINGS

Some valuable and interesting findings were observed in this study: (1) Household energy inequality in China is manifested across regions and between urban and rural areas, with generally higher levels of household energy inequality in

rural areas than in urban areas. In contrast to urban areas, high per capita household energy expenditure is an important factor contributing to household energy inequality in rural areas. (2) At the individual level, residents' social network behavior and cognitive level can significantly influence rural household energy expenditure and energy equality, but not as a driver of urban household energy expenditure and energy equality. (3) At the organizational level, the penetration of the internet and mobile phones has a greater impact on energy expenditure and energy equality in urban households than in rural households.

Table 1. Results for Hierarchical Linear Model.

	Variable	Total samples (ICC1=0.177; ICC2=0.962)			Urban samples (ICC1=0.214; ICC2=0.917)		Rural samples (ICC1=0.142; ICC2=0.895)	
		Model1	Model2	Model3	**Model4**	Model5	**Model6**	Model7
Social networking behavior	IFS		-0.0103***	-0.0103***		-0.0068		-0.0167***
			(0.0040)	(0.0033)		(0.0046)		(0.0058)
	FIBA		0.0143***	0.01400***		0.0099*		0.0171**
			(0.0045)	(0.0044)		(0.0052)		(0.0077)
	IWF		0.0063*	0.0063*		-0.0040		0.0120**
			(0.0034)	(0.0034)		(0.0036)		(0.0058)
Social Network Cognition	IIE		0.0110***	0.0111***		0.0057		0.0192**
			(0.0053)	(0.0041)		(0.0059)		(0.0073)
	IGI-SMS		0.0162***	0.0160***		0.0037		0.0221***
			(0.0042)	(0.0044)		(0.0055)		(0.0068)
	IGIO		-0.0198***	-0.0199***		-0.0181*		-0.0184***
			(0.0043)	(0.0040)		(0.0064)		(0.0063)
	IPR			-0.5970***		-0.8087***		-0.3440
				(0.1811)		(0.1783)		(0.2423)
	MPPR			0.4793***		0.4567***		0.3499***
				(0.0558)		(0.0607)		(0.0902)
Variance component								
σ^2		0.5252	0.5200	0.5199	0.4582	0.4548	0.5569	0.5514
		(0.7247)	(0.7212)	(0.7211)	(0.6769)	(0.6744)	(0.7463)	(0.7426)
τ_{00}		0.1128***	0.1041***	0.0783***	0.1250***	0.0961***	0.0922***	0.0827***
		(0.3358)	(0.3223)	(0.2797)	(0.3537)	(0.3100)	(0.3036)	(0.2877)

Note: The robust standard errors are reported in parentheses.
*, **, and *** indicate the significance at the 10%, 5%, and 1% levels, respectively.

4. CONTRIBUTIONS

The main contributions of this study are as follows: (1) This study has incorporated social network behavior and cognitive level of residents in the Internet era into the research framework of energy consumption and energy equality, which has broadened the scope of research in the energy field; (2) This study has introduced social network theory for the first time on the basis of energy equality theory and constructs the mechanism of social network influence on household energy from an individual level and organizational level; (3) In the empirical analysis, this study used nationwide microdata (China Family Panel Studies, CFPS) to explore how social networks of urban and rural residents affect intra-household energy consumption and household energy equality, which will provide empirical evidence to explore energy equality from a social network perspective.

REFERENCES

1. Al Asbahi, Novel approach of Principal Component Analysis method to assess the national energy performance via Energy Trilemma Index. Energy Reports 5, 704-713 (2019).

2. Bento, N.: Calling for change? Innovation, diffusion, and the energy impacts of global mobile telephony. Energy Research & Social Science 21, 84-100 (2016).

3. Brülisauer, M., Goette, L., Jiang, Z., Schmitz, J., Schubert, R..: Appliance-specific feedback and social comparisons: Evidence from a field experiment on energy conservation. Energy Policy 145, 111742 (2020).

4. Hu, S., Yan, D., Guo, S., Cui, Y., Dong, B.: A survey on energy consumption and energy usage behavior of households and residential building in urban China. Energy and Buildings 148, 366-378 (2017).

5. Wu, S., Zheng, X., Wei, C.: Measurement of inequality using household energy consumption data in rural China. Nature Energy 2(10), 795-803 (2017).