Survey data on household electricity consumption and living status in Northwestern China

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A B S T R A C T

Based on 1128 survey questionnaires, main information on urban and rural household electricity consumption was obtained. Original data included household income, the price of electricity, all kinds of electrical appliances, purchase price of main appliances, household size, electricity consumption, as well as power, daily use time of electrical appliances in this data article. These data fully reflected behavior, preferences and living pattern of sample households in electricity use and provided the basis for analyzing the relationship between household electricity consumption and the quality of life (“Does electricity consumption improve residential living status in less developed regions? An empirical analysis using the quantile regression approach” [1]).

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Specifications table

| Subject area                        | Energy social economics |
|-------------------------------------|-------------------------|
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How data was acquired

Field survey

Data format

Raw

Experimental factors

N/A

Experimental features

Random investigations were carried out at respondents’ homes using a questionnaire

Data source location

Northwestern China

Data accessibility

Data is within this article

Value of the data

- These data contain a lot of useful information on electricity consumption in resident household. This type of information is rare in existing publications.
- The data presented here is useful to analyze the structure and pattern of household electricity consumption.
- The data provides the evidence for understanding the behavior of electricity users.
- The data may be used to conduct comparative analysis with such information in other places.

1. Data

The data presented here are table and figure formats. There are 1128 samples. Contents include household per capita income (PCI), the price of electricity (EP), the diversity of home appliance (AD), purchase price of main appliances (APC), household size (PO), electricity consumption per capita (ECp) (see data “mmc9.csv” – “mmc13.csv” supplementary files), these data are sorted out from questionnaires. Using these data, we can analyze general statistical characteristics of six variables, correlations among them, and estimate the results of OLS and quantile regressions [2,3] for 5th, 10th 90th, 95th quantiles in our research article [1].

2. Experimental design, materials and methods

The data was obtained by field household survey, we stated work process from questionnaire design, survey location to samples distribution as follows:

2.1. Questionnaire design

According to differences in consumption patterns between urban and rural residents [4], two types of questionnaire (urban and rural questionnaires) with different content were designed. Survey contents included home address, number of household member (do not include migrant workers), yearly household income (include salary, service revenue, sale of agricultural products, governmental subsidy, and so on), electricity consumption and electricity price (account on the basis of home electricity receipt), types of and use status of main appliances, willingness to pay for electricity use., All electrical appliances are listed in questionnaire, investigators add the ticks (√) for the terms that a family owns. Meanwhile, investigators must ask daily time of electrical appliances use.

2.2. Data source location

Northwestern China has a vast territory. The samples used in this study came from the Eastern Part of Northwestern China. This region is located in the Loess Plateau north of the Qinling Mountains and extends south to the Great Wall [5], east to the Yellow River, and west to Riyue Mountain (at 100°54′–
110°29' degrees East longitude and 33°35'–38°53' degrees North latitude) (see Fig. 1). This region, with a land area of 255.6 thousand km², is a transition zone between China's three natural regions (the eastern monsoon region, the western arid region, and the Qinghai-Tibet Plateau region). The study region contains many different types of climate and terrain. The annual mean temperature is 3.0–13.2 °C. 200–800 mm of rain falls per annum, decreasing from southeast to northwest. The samples were broadly distributed, involving three provincial capitals, 13 prefecture-level cities, and 83 counties in Shanxi Province, Gansu Province, Qinghai Province, and Ningxia Autonomous Region. This region had a population of 37.08 million at the end of 2012, of which the urban population accounted for about 42.02% [6]. In this less developed area of China, the income of urban and rural residents is lower than in the eastern and central regions, and many people still live in poverty [7].

2.3. Distribution of survey samples

The survey locations were divided into four types (large cities, medium-sized cities, county towns, and rural areas), and random investigations were carried out at respondents’ homes using a questionnaires. Three large cities, Lanzhou City, Xining City, and Yinchuan City, are the provincial capitals of Gansu, Qinghai, and Ningxia respectively. Five medium-sized cities included Tianshui City and Baiyin City in Gansu Province and Baoji City, Xianyan City, and Yan’an City in Shanxi Province (see Fig. 1). Survey respondents were chosen in various blocks of each city, with three to five households chosen in the same block. Samples were distributed from the city center to the suburbs. Approximately 100 households were chosen in each large city and about 40 households in each medium-sized city. County towns included 20 small cities or towns, including Tongchuan, Yulin, Fenxiang, Qishan, and Zhidan in Shanxi Province; Anding, Kongntong, Hezue, Wushan, Hueining, Yundeng, Lintao, Zhuoni, Jinchuan, and Ninxian in Gansu Province; Wuzhong, Haiyuan, and Xiji in Ningxia Autonomous Region; and Datong and Huangzhun in Qinghai Province. Approximately 10 households were chosen in each county town. Rural samples were distributed over 40 villages in 26 counties of four provinces (including one autonomous region), with 10–20 households chosen in each village.
| HEA                                      | Power range (kW) | Low income (133) | Lower-middle income (232) | Middle income (340) | Upper-middle income (234) | High income (189) |
|------------------------------------------|------------------|------------------|---------------------------|---------------------|---------------------------|------------------|
|                                          |                  | Number | Use time (h a⁻¹) | ECₗ (kW h) | Number | Use time (h a⁻¹) | ECₗ (kW h) | Number | Use time (h a⁻¹) | ECₗ (kW h) | Number | Use time (h a⁻¹) | ECₗ (kW h) |
| Decorative lighting                      | 0.04 ± 0.02      | 213    | 74              | 629       | 252    | 292              | 2943      | 507    | 432              | 8767      | 511    | 689              | 14,076    |
| Energy-saving lamps                      | 0.02 ± 0.01      | 424    | 561             | 4755      | 436    | 567              | 4045      | 754    | 797              | 12,019    | 680    | 438              | 5951      |
| Ordinary lamp                            | 0.03 ± 0.01      | 988    | 1329            | 39,380    | 413    | 1140             | 14,126    | 337    | 422              | 4265      | 324    | 289              | 2805      |
| Fridge                                   | 0.12 ± 0.05      | 121    | 814             | 11,917    | 103    | 963              | 12,008    | 189    | 986              | 22,537    | 184    | 1212             | 26,980    |
| Kitchen                                  | 0.12 ± 0.05      | 28     | 204             | 687       | 74     | 287              | 2553      | 180    | 298              | 6443      | 182    | 434              | 9484      |
| Rice cooker                              | 0.03 ± 0.03      | 177    | 104             | 15,314    | 119    | 91               | 8837      | 158    | 109              | 14,358    | 161    | 176              | 23,590    |
| Electric kettle                          | 1.00 ± 0.5       | 92     | 11              | 988       | 56     | 29               | 1669      | 162    | 40               | 6544      | 178    | 61               | 10,795    |
| Water fountain                           | 0.20 ± 0.05      | 63     | 16              | 201       | 54     | 172              | 1856      | 87     | 224              | 3900      | 98     | 330              | 6465      |
| Microwave oven                           | 0.70 ± 0.5       | 14     | 25              | 242       | 39     | 24               | 666       | 70     | 51               | 2510      | 81     | 73               | 4125      |
| Induction cooker                         | 1.35 ± 0.5       | 108    | 67              | 9744      | 82     | 83               | 9225      | 90     | 234              | 28,371    | 109    | 258              | 37,995    |
| Refrigerator                            | 1.20 ± 0.5       | 29     | 22              | 783       | 41     | 8                | 370       | 132    | 7               | 1073      | 136    | 15               | 2478      |
| Soybean milk machine                     | 0.75 ± 0.25      | 54     | 0               | 0         | 0      | 20               | 749       | 86     | 37               | 2376      | 97     | 42               | 3039      |
| Heated pan                              | 0.80 ± 0.25      | 35     | 797             | 22,316    | 13     | 551              | 5732      | 68     | 61               | 3322      | 81     | 0                | 0         |
| Disinfection cabinet                     | 0.08 ± 0.02      | 0      | 0               | 0         | 0      | 0                | 0         | 4      | 4                | 8         | 6     | 7                | 24        |
| Electric oven                            | 0.60 ± 0.01      | 0      | 0               | 0         | 0      | 0                | 0         | 4      | 4                | 8         | 6     | 7                | 24        |
| Refrigerated cabinet                     | 0.10 ± 0.02      | 0      | 0               | 0         | 0      | 0                | 0         | 10     | 183              | 183       | 15    | 475              | 712       |
| TV                                      | 0.12 ± 0.05      | 412    | 1304            | 64,450    | 175    | 1503             | 31,569    | 209    | 1144             | 28,698    | 204    | 1279             | 31,330    |
| Computer                                | 0.27 ± 0.05      | 55     | 332             | 4924      | 87     | 324              | 7617      | 159    | 328              | 14,062    | 172    | 464              | 21,535    |
| Video                                   | 0.02 ± 0.01      | 352    | 285             | 2207      | 144    | 363              | 1151      | 186    | 363              | 1484      | 183    | 159              | 639       |
| Sound system                            | 0.19 ± 0.02      | 75     | 41              | 584       | 103    | 33               | 649       | 180    | 44               | 1522      | 179    | 59               | 1992      |
| Air conditioner                          | 0.80 ± 0.5       | 6      | 30              | 145       | 19     | 75               | 1147      | 42     | 131              | 4397      | 64     | 207              | 10,606    |
| Electric heater                          | 1.20 ± 0.03      | 52     | 38              | 6073      | 74     | 55               | 4898      | 140    | 67               | 11,337    | 151    | 87               | 15,850    |
| Electric fan                             | 0.06 ± 0.01      | 143    | 112             | 1044      | 106    | 145              | 1000      | 155    | 190              | 1918      | 163    | 220              | 2335      |
| Electric blanket                         | 0.05 ± 0.01      | 62     | 60              | 186       | 128    | 51               | 326       | 368    | 30               | 316       |
| Warm air distributor                     | 1.20 ± 0.03      | 0      | 0               | 0         | 6      | 30               | 213       | 33     | 52               | 2044      | 45     | 65               | 3487      |
| Washing machine                          | 0.40 ± 0.30      | 303    | 46              | 5538      | 149    | 50               | 2956      | 189    | 49               | 3676      | 184    | 68               | 5011      |
| Electric shower                          | 1.60 ± 0.4       | 22     | 65              | 2301      | 45     | 98               | 7081      | 74     | 125              | 14,761    | 96     | 166              | 25,455    |
| HEA               | Power range (kW) | Low income (133) | Lower-middle income (232) | Middle income (340) | Upper-middle income (234) | High income (189) |
|------------------|------------------|------------------|--------------------------|---------------------|---------------------------|------------------|
|                  | Number Use time (h a⁻¹) | ECₙ (kW h) | Number Use time (h a⁻¹) | ECₙ (kW h) | Number Use time (h a⁻¹) | ECₙ (kW h) | Number Use time (h a⁻¹) | ECₙ (kW h) | Number Use time (h a⁻¹) | ECₙ (kW h) |
| Vacuum cleaner   | 0.80 ± 0.4       | 0    | 0             | 0             | 0             | 0             | 23            | 24            | 451           | 33           | 39           | 1026          |
| Garment steamer  | 0.59 ± 0.3       | 0    | 0             | 0             | 0             | 0             | 451           | 179           | 11            | 472           | 51           | 16           | 1644          |
| Electric iron    | 1.00 ± 0.2       | 172  | 2             | 385           | 120           | 5             | 656           | 181           | 7             | 1305          | 179          | 11           | 2032          |
| Electric bicycle | 0.35 ± 0.02      | 37   | 183           | 2363          | 53            | 201           | 3724          | 72            | 256           | 6439          | 81           | 219          | 6209          |
| Electric motorcycle | 0.75 ± 0.2   | 36   | 110           | 2957          | 56            | 146           | 6132          | 78            | 183           | 10,676        | 92           | 146          | 10,074        |
| Total            | 4053             | 6971  | 201,023       | 2998          | 7785          | 134,772       | 4764          | 219,645       | 4883          | 8395          | 286,485       | 5666         | 9238         | 362,617       |
2.4. The annual household electricity consumption

Combining power and usage time of appliances together, we calculated annual electricity consumption per household \( (E_{Ch}, \text{kW h/a}) \). Table 1 shows electricity consumption of major electrical appliances in five income groups.

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Appendix A. Supplementary material

Supplementary data associated with this article can be found in the online version at http://dx.doi.org/10.1016/j.dib.2016.03.093.

References

[1] Shuwen Niu, Jia Yanqin, Ye Lijiong, Dai Runqi, Li Na. Does electricity consumption improve residential living status in less developed regions? An empirical analysis using the quantile regression approach, Energy 95 (2016) 550–560.

[2] R. Koenker, K. Hallock, Quantile regression, J. Econ. Perspect. 15 (2001) 143–156.

[3] A.C. Marques, J.A. Fuinhas, J.P. Manso, A quantile approach to identify factors promoting renewable energy in European countries, Environ. Resour. Econ. 49 (2011) 351–366.

[4] M. Akinohu, K. Yasuhiko, M. Hailin, Z. Weisheng, Electricity demand in the Chinese urban household sector, Appl. Energy 85 (12) (2008) 1113–1125.

[5] G.Z. Li, S.W. Niu, L.B. Ma, X. Zhang, Assessment of environmental and economic costs of rural household energy consumption in Loess Hilly Region, Gansu Province, China, Renew. Energy 34 (2009) 1438–1444.

[6] National Bureau of Statistics of China, China Statistical Yearbook, China Statistical Press, 2013.

[7] S.W. Niu, X. Zhang, C.S. Zhao, Y.Z. Niu, Variations in energy consumption and survival status between rural and urban households: a case study of the Western Loess Plateau, China. Energy Policy 49 (2012) 515–527.