

25 Ways to Reduce Energy Consumption and Lower Utility Costs

In recognition of the need to improve energy efficiency in Hong Kong, the Government ...

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Energy consumption is closely related to global climate change through greenhouse gas emissions. Hence, enhancing humanity's well-being via sustainable energy consumption and environmental conservation is crucial. In this study, we aim to identify whether greenhouse gas emissions at the household level can be reduced by reducing the energy consumption expenditure of households globally. In 2015, the United Nations proposed the sustainable development goals for sustaining humanity's well-being, encompassing 17 multidimensional goals related to environment preservation, economics, and society. Subjective well-being is assumed to be a proxy for humanity's well-being both in sociological and other psychological and economic aspects^{1,2,3}.

This study contributes to the literature in the following aspects. First, the survey encompasses 37 nations, accounting for approximately 73% of the world's population, providing data that serve to illustrate the effect of energy consumption expenditure on subjective well-being. The wealth effect is also examined within this context. The results are expected to highlight whether an increase in energy consumption leads to economic development. Second, this study lists the key determinants of energy consumption expenditure in households, providing important data that may have policy implications, such as being used in the simulation of energy consumption at the household level.

The remainder of this paper is structured as follows. Section "Methods" offers the study data and outlines the methodology, Section "Results" reports the results, and Section "Discussion" presents the discussion them. Section "Conclusion" concludes the paper.

To explore the relationships between subjective well-being and energy consumption expenditure at the household level, this study conducted a large-scale, original, cross-sectional survey with samples from 37 nations using internet-based and face-to-face approaches. The data collection process was as follows. First, the random sampling process was applied to match the population age and gender characteristics. To do this, based on the gender and age distribution in each nation, the population was divided into numerous groups. Among all age and gender groups, restricted panels of women older than 60 years of age are scarce; therefore, an age group closest to it, that is, 55-59 years of age, was selected to avoid sample selection bias.

Second, the targeted respondents were randomly selected through a reputed company and the questionnaire was distributed to them via the internet. The company has comprehensive registered panels that enhance the collected samples to match the country's specified gender and age distributions. Moreover, the sample collection is conducted among countries separately, and to enhance the reliable of the empirical regression results, the sample size for each country is greater than 500. For each country, the number of observations ranged from 500-20,744, with the total number of observations being 100,956 over 2015-2017 (see Table 1).

The survey was designed to collect individuals' perceived satisfaction in their lives, concerns about the environment, cooperation in energy usage that can be seen as energy-saving behavior, household income, energy expenditure, and other households' demographics and economic background. In the choice items' design for sensitive questions (e.g., household income), the exclusive items or "do not know" or unlikely-to-answer items were added to avoid dropout by respondents and improve the accuracy of the data. The survey type and number of observations in 37 nations are displayed in Table 1.

Life satisfaction is a dependent variable based on the Organization of Economic Cooperation and Development guidelines⁵⁶. When policymakers aim to improve citizens' well-being, the individual well-being level is unobservable. Therefore, subjective well-being is adopted to reflect citizens' well-being. In measuring subjective well-being, life satisfaction and happiness are utilized in the literature, and the Cantrill ladder that measure the overall satisfaction is widely adopted^{57,58,59}. The robustness check is applied for happiness, a way to measure individual subjective well-being.

To measure life satisfaction, we asked respondents to answer the following question: "Please imagine a ladder with steps numbered 0-10. The top and bottom of the ladder represent the best and worst possible lives for you, respectively. On which step of the ladder would you say you personally feel you currently stand? (10 = Best possible life; and 0 = Worst possible life)." Regarding happiness levels, the respondents were asked, "Overall, how happy are you with your life?" The response scale ranged from 1-5 (1, unhappy; 2, slightly unhappy; 3, neither; 4, slightly happy; 5, very happy).

The dummy variables of energy-saving behaviors include (1) energy-curtailement behaviors (e.g., saving electricity, fuel, etc.); and (2) purchasing energy-saving household products. Other control variables include household income, educational attainment, age, occupational status, household status, number of children, and gender dummy.

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