IDENTIFYING ENERGY POVERTY GROUPS IN TAIWAN: DEMOGRAPHIC INSIGHTS FOR POLICY APPLICATION

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Overview

Energy poverty in modern society means that individuals are limited in achieving basic well-being due to insufficient fundamental energy infrastructure, which has become a critical issue that nations must address urgently. For Taiwan, promoting energy transition is one of the core strategies to realize the goal of net zero emissions. However, energy transition not only changes the structure of energy supply but also may drive up energy prices, further exacerbating the burden on low-income or disadvantaged groups, leading to worsening energy poverty problems.

In the context where identifying the characteristics and distribution features of energy poverty groups is crucial for formulating precise and fair policies, it is essential to recognize that research on energy poverty in Taiwan is still in its infancy due to the lack of relevant data and analytical tools. This limitation hinders evidence-based support and implementation effectiveness of policies. This study aims to fill this research gap by proposing three specific objectives:

Firstly, we will examine six common energy poverty indicators internationally and assess their applicability to Taiwan's unique situation. We will attempt to identify the most suitable energy poverty measurement standard for Taiwan.

Secondly, we will analyze the causes and related factors of energy poverty to systematically organize possible variables influencing energy poverty, laying the foundation for subsequent empirical analysis.

Lastly, based on the analysis results, we will identify the primary characteristics and associated factors of household energy poverty in Taiwan, providing concrete data support and evidence-based suggestions for policy design. In other words, our team used LIHC as a standard suitable for Taiwan for statistical model analysis. The results showed that household size, household head age, occupation were key influencing factors. In terms of policy contribution, we found gaps between definition and execution of existing policies. We suggest combining short-term subsidies with long-term energy efficiency measures to more effectively support vulnerable populations and enhance the fairness and sustainability of Taiwan's energy transition.

Methods

This study integrates qualitative and quantitative research methods to explore the issue of energy poverty in Taiwan.

First, focus groups are used to invite scholars from think tanks on energy policy, sociology, economics, and social work practitioners to compare and analyze the applicability of six indicators (TPR、LIHC、2M、M/2、MIS、AFCP) in Taiwan through the perspectives of academia, policy, and practice. The most suitable indicator for further analysis is selected from among them.

Second, researchers conduct a literature review to re-analyze different documents, including international academic literature, related analysis reports in Taiwan, and government policies in Taiwan, in order to integrate important influencing factors such as family characteristics (number of household members, gender of household head, age of household head, occupation of household head), policy characteristics (living alone, single-parent households, grandparent-headed households, receipt of low-income subsidies), and living conditions (housing ownership, residential area, living space, number of air conditioners, number of hot water heaters).

Finally, statistical analysis is adopted. Based on the above variables, the team builds a database using data from the Family Income and Expenditure Survey in Taiwan from 2013 to 2023. Logistic regression analysis and decision tree algorithms are then used to find possible factors contributing to energy poverty in Taiwan.

Results

This study finds that the distribution and characteristics of energy poverty in Taiwan present the following key trends:

1. Relationship between household structure and energy poverty

Household size is a major factor affecting the risk of energy poverty, with smaller households having a higher risk, especially solitary elderly people who face higher energy poverty risks due to insufficient economic support and social isolation. In addition, the occupation and age of the household head significantly impact energy poverty. However, contrary to assumptions, households receiving low-income subsidies do not significantly reduce their energy poverty risk, indicating potential inefficiencies in current subsidy mechanisms.

2. Policy and the distribution of energy poverty

Taiwan's current energy support policies focus on structural disadvantaged groups such as low-income households and aging families, but policy measures mainly concentrate on cost reduction while lacking overall strategies to improve energy efficiency or reduce energy vulnerability. Additionally, there is a lack of consistency in defining and executing policy applicability, affecting policy fairness and precision.

3. Regional and distribution of energy poverty

The study finds that the risk of energy poverty in different regions of Taiwan is relatively uniform and does not show significant regional differences, indicating that energy poverty is not a challenge specific to certain areas.

4. Challenges and suggestions for policy implementation

Experts believe that the current indicator system is insufficient to comprehensively measure energy poverty and suggest incorporating diverse energy vulnerability factors, including grid stability, energy efficiency, and energy conservation awareness. Experts emphasize that policies should avoid one-size-fits-all approaches and instead design tiered support mechanisms based on different population needs, such as special assistance programs for the elderly, combined with short-term economic assistance and long-term energy efficiency enhancement strategies.

Conclusions

As Taiwan enters super-aging society in 2025, meeting the energy demands of an aging population will be a focus of policy attention. This study identifies household scale and economic head characteristics as key factors influencing energy poverty, while also highlighting insufficiencies in current policy definition and implementation. Future policies should design targeted subsidies for elderly households and implement multi-level and precise mechanisms to ensure fairness and effectiveness.

Furthermore, data mining reveals that gasoline expenses account for a significantly higher proportion of total energy costs than electricity and natural gas (often used for bathing hot water and cooking) in Taiwanese households, indicating that transportation energy is an important factor influencing energy burden in Taiwanese families. Given that Taiwan is promoting electrification of vehicles, future research should further explore the impacts of fossil fuel vehicles, electric vehicles, and public transportation on energy poverty to provide more comprehensive bases for policy making.

Finally, to support evidence-based policy making, data collection must be imsproved, including seasonal variations and energy poverty among renters and the homeless.