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The Impact of Low Income Home Energy Assistance Program (LIHEAP) Participation on Household Energy Insecurity

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Introduction

-LIHEAP created in 1981 to help both poor households and utility companies.

-LIHEAP helps households with:

1. Direct monetary payments to utility companies on behalf of households
2. "Crisis" funds (termination imminent)
3. Replace broken residential infrastructure

-Which households are eligible:

- Income at or below 150% of poverty line or below 60% state median income
- Receive other entitlement benefits like AFDC or SNAP

-LIHEAP is a block grant:

- States receive specific funding each year
- Varies by state based on population and climate
- If funds exhausted eligible households may not receive benefits.

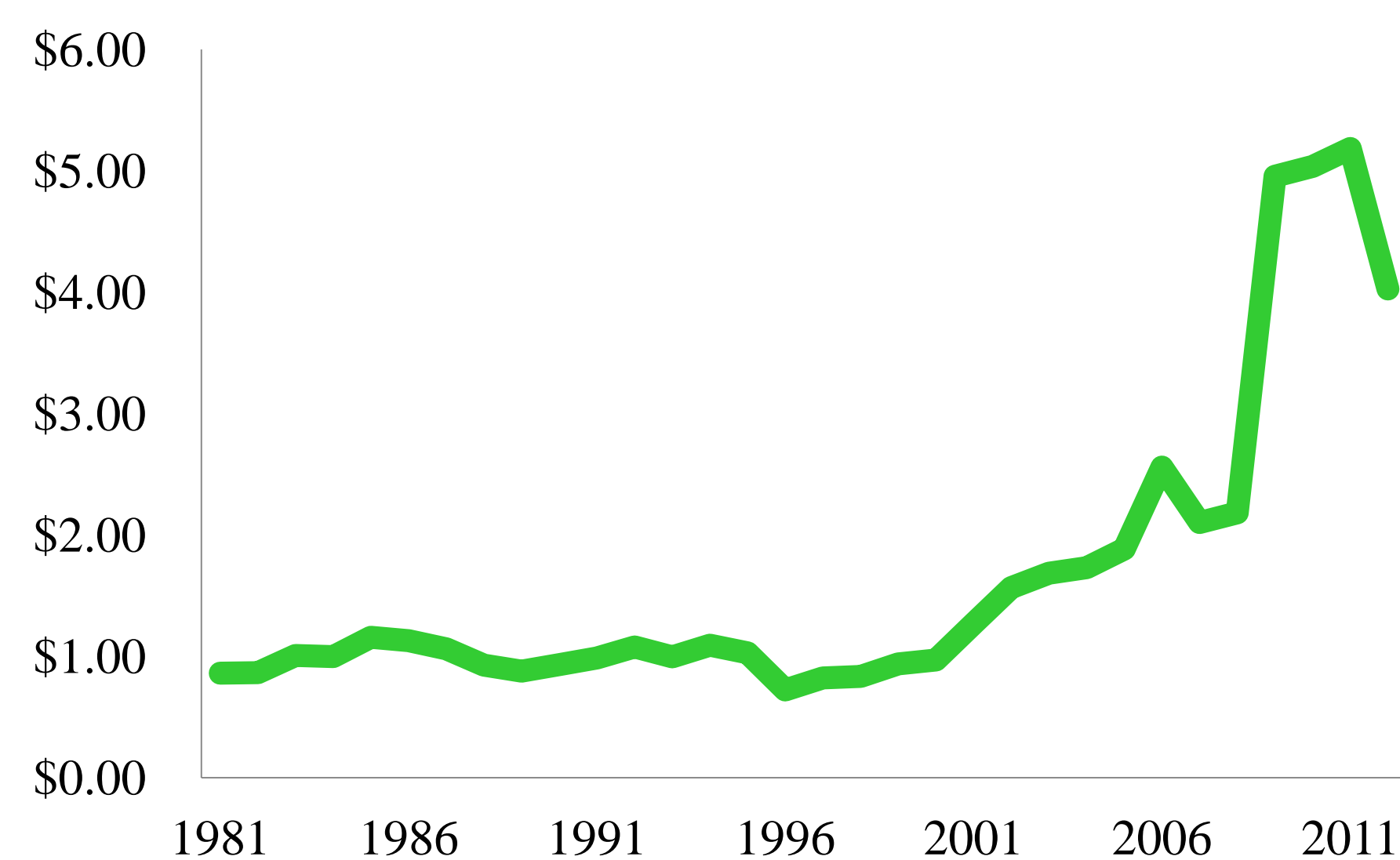


Figure 1. LIHEAP Funding by year (billions, 2005 dollars)

Research Question

- Does LIHEAP participation make households more energy secure?
- What happens to the number of low-income energy secure households if Congress eliminates LIHEAP?

Energy Insecure Households

- Index generated similar to the food security index:
 - Continuous, positive, censored household index
 - Based on survey responses to 9 specific questions about energy security in 2005.
 - Roughly 30% of low-income sample can be classified as energy insecure

Model Specification

-Selection Issue:

- Households "self-select" into LIHEAP.
- Ignoring household choice can bias estimation results
- Household characteristics affecting LIHEAP participation likely influence household energy insecurity levels as well.

$$A^* = X_1' \alpha_1 + \varepsilon_1 \quad \text{Latent LIHEAP Participation}$$

$$y^* = \gamma_1 A + X_2' \beta_1 + \varepsilon_2 \quad \text{Latent Household Energy Insecurity}$$

-We cannot observe the latent equations and instead observe A and y which indicate

$$A_i = \begin{cases} 1 & \text{if } A_i^* > 0 \\ 0 & \text{if } A_i^* \leq 0 \end{cases} \quad y_i = \max\{0, y_i^*\}$$

-Use Full Information Maximum Likelihood (FIML) as the most efficient estimation technique to estimate both equations jointly.

$$\begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \end{bmatrix} \sim N \left(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 & \rho\sigma_2 \\ \rho\sigma_2 & \sigma_2^2 \end{bmatrix} \right)$$

-Model identified through nonlinearity

- Pagan and Vella (1989) test fails to reject joint normality assumption.
- Alternative specifications use exclusion restrictions to test robustness of results

Results

- Results presented for most general energy insecurity index
- Consistent across four different energy insecurity indexes.

-Significantly positive error correlation, ρ , for all energy insecurity indexes

-All indexes (and all alternative specifications) show that participating in LIHEAP significantly reduces household energy insecurity score!

LIHEAP Participation Equation Results

Variable	Estimate	Std. Error	Variable	Estimate	Std. Error
Black head of household	0.078	0.126	Household rents dwelling	0.0237	0.122
Hispanic Head of household	-0.0113	0.148	Household resides in an apartment complex	-0.1574	0.139
Non-White, Non-Black head of household	0.0214	0.141	Household resides in a mobile home	-0.2726	0.17
Number of household members	0.0557	0.038	Total square footage of dwelling	1.65E-05	4.94E-05
Household includes a child less than 6 years old	-0.0419	0.128	Household has air conditioning	0.1765	0.125
House includes an elderly individual greater than 65	0.1735	0.124	Price per kilowatt hour for electricity	-3.5425	2.319
Household has someone at home during the day	-0.0061	0.102	Quality of house dummy variable	0.4003**	0.127
Single-female head of household	0.2645*	0.112	Household resides in a rural environment	-0.3850**	0.136
Single-male head of household	-0.3236*	0.165	Household resides in an urban environment	-0.2169*	0.11
Household Income (x 1000\$)	-0.0205**	0.008	Annual cooling degree days	-3.18E-05	1.41E-04
Receipt of cash benefits	0.5711**	0.118	Annual heating degree days	1.62E-04*	7.01E-05
Receipt of non-cash benefits	0.8608**	0.117	Regional fixed effects (not shown) [WS Central† & Pacific*]		

Household Energy Insecurity Equation Results

Variable	Estimate	Std. Error	Variable	Estimate	Std. Error
Household receives LIHEAP benefits	-3.2167**	0.304	Household rents dwelling	0.3357	0.257
Black head of household	0.9159**	0.275	Household resides in an apartment complex	-0.8373*	0.297
Hispanic Head of household	0.0947	0.303	Household resides in a mobile home	-0.1325	0.348
Non-White, Non-Black head of household	-0.281	0.288	Total square footage of dwelling	-3.25E-05	1.04E-04
Number of household members	0.3359**	0.082	Household has air conditioning	0.4111	0.272
Household includes a child less than 6 years old	-0.4580†	0.267	Price per kilowatt hour for electricity	-5.3529	5.054
House includes an elderly individual greater than 65	-0.6070*	0.268	Quality of house dummy variable	1.6380**	0.276
Household has someone at home during the day	-0.1672	0.218	Dwelling built prior to 1970	0.1818	0.165
Single-female head of household	0.6869**	0.24	Household resides in a rural environment	-0.4919†	0.293
Single-male head of household	-0.6249†	0.335	Household resides in an urban environment	-0.3399	0.235
Household Income (x1000\$)	-0.0518**	0.016	Annual cooling degree days	1.13E-04	2.85E-04
Receipt of cash benefits	1.1586**	0.268	Annual heating degree days	3.26E-04*	1.51E-04
Receipt of non-cash benefits	1.8477**	0.265	Regional FE (significant) [ES Central*, South Atlantic* & Pacific*]		

Simulations

Policy Scenario	Impact on number of Insecure Households
Eliminate LIHEAP	18% increase
Target most EI households	14% increase
Double funding	10% decrease

Conclusions

- LIHEAP works! Households that participate have significantly lower household energy insecurity scores.
- Eliminating LIHEAP will have a major impact:
 - Large decrease in the number of energy secure households

Conclusions (cont.)

- Low quality housing leads to higher LIHEAP participation and higher energy insecurity
 - Tax credits or improved energy efficiency programs potentially beneficial
- More research analyzing federal energy assistance is needed.
 - State level data can improve analysis

For further information

Please contact amurray@vt.edu for more information about this project. The full paper with results will be provided upon request as well.