Valuing Residential Energy Efficiency in the Anchorage Real Estate Market: A Hedonic Approach

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ACEP
Alaska Center for Energy and Power

the Resilience and Adaptation Program
at the University of Alaska Fairbanks

Research question

- Do energy efficiency ratings have an effect on the transaction prices of single-family homes in the Anchorage residential real estate market?

Hedonic pricing framework

- The price of a house is a function of its structural (S_j), locational (L_k), and environmental characteristics (E_m)

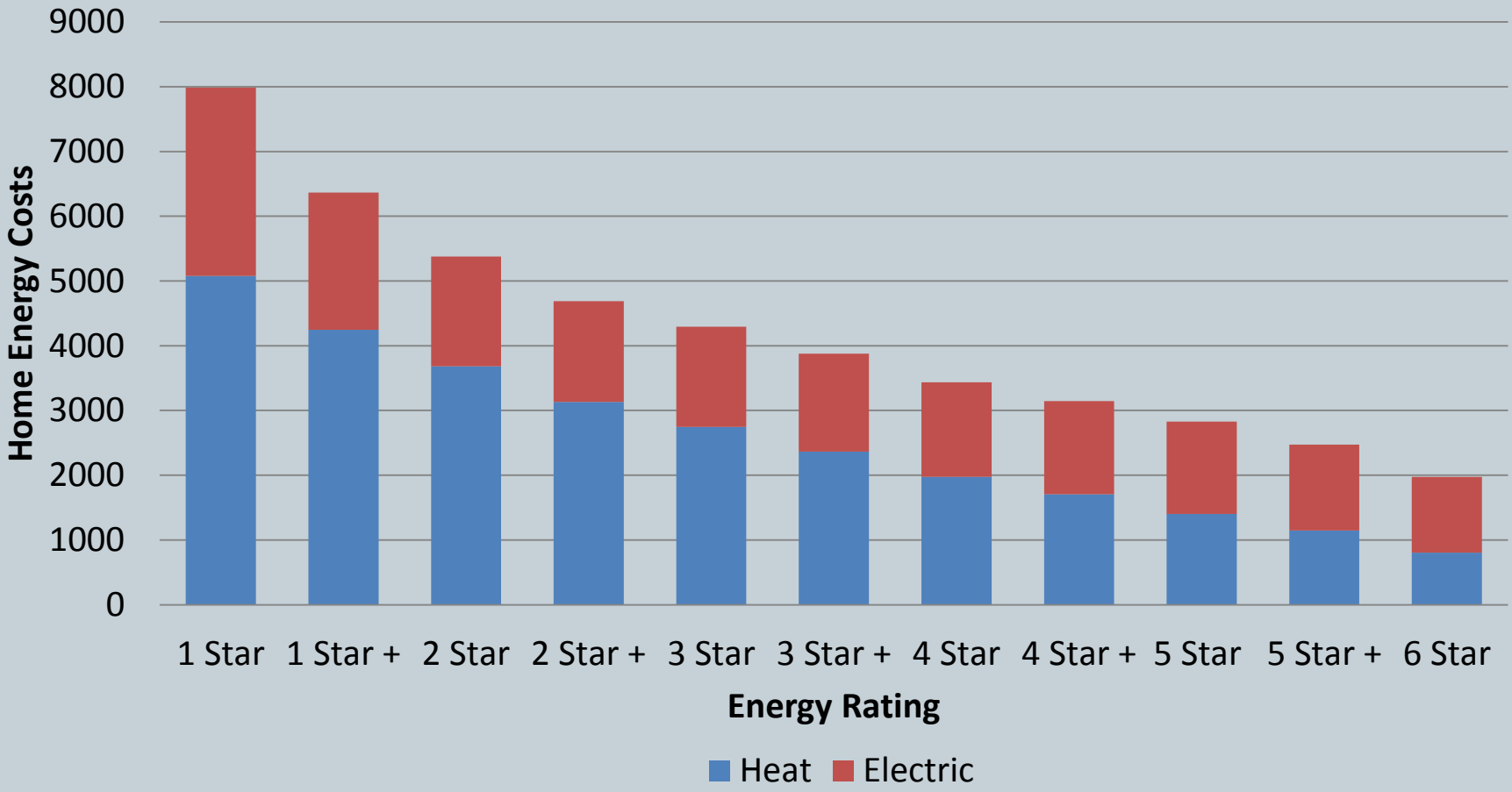
- $P_{hi} = P_h(S_{i1}, \ldots, S_{ij}, L_{i1}, \ldots, L_{ik}, E_{i1}, \ldots, E_{im})$

- $\frac{\partial P_h}{\partial S_j} = P_{Sj}(S_j)$

Anchorage

- Subarctic climate with maritime influence
- 10,570 heating degree days
- More than 80% of the housing stock is more than 20 years old
- 71% of household energy use dedicated to space heating
- $2,800 annual household energy costs, 30% above the national average

Estimated annual household energy cost by rating



Model

$$Ln(price_i) = \alpha + \beta_i X_i + \gamma_j A_j + \delta_k Q_k + \varphi R_i + \varepsilon_i$$

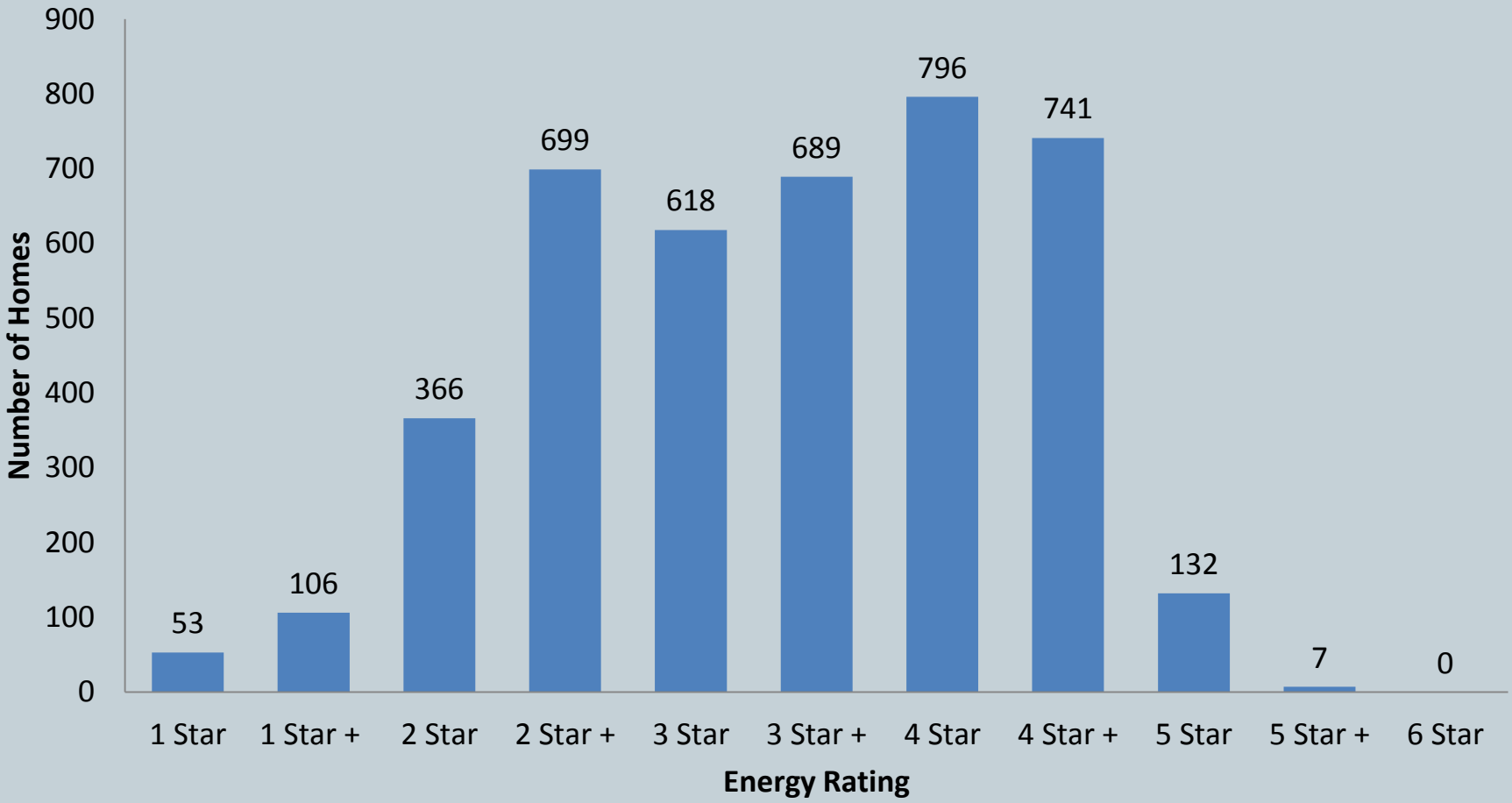
- $Ln(price_i)$ is the natural log of the transaction price
- α is a constant; ε is an error term
- X_i is a vector of house characteristics
- A_j is a set of binary variables for the MLS area
- Q_k is a set of binary variables for the transaction year-quarter
- R_i is a set of binary variables for the 1 Star through 6 Star energy efficiency rating level of the home i at the time of the transaction.
- β, γ, δ, and φ are estimated parameters

Parameter of interest

$$Ln(price_i) = \alpha + \beta_i X_i + \gamma_j A_j + \delta_k Q_k + \varphi R_i + \varepsilon_i$$

- φ is the parameter of interest which measures the average price premium/discount associated with an energy efficiency rating level

Housing transactions by energy rating



Data

Variable	Mean
Price	347,451
lnRprice	12.71
Square feet	2,070
Bathrooms	2.26
Bedrooms	3.43
Garage capacity	1.72
Age	37.86
Acres	0.35
Observations	4,207

Results

Variable	Parameter Estimate	Discount/ Premium
1 Star	-0.071***	-7.40%
1 Star +	-0.074***	-7.70%
2 Star	-0.026***	-2.60%
2 Star +	-0.013*	-1.30%
3 Star	Holdout	
3 Star +	0.018***	1.80%
4 Star	0.031***	3.10%
4 Star +	0.045***	4.60%
5 Star	0.058***	6.00%
5 Star +	0.045	4.60%
Observations	4,207	
R-squared	0.64	

Note: Significance at the 0.10, 0.05, and 0.01 levels are indicated by *, **, and ***, respectively.

Discussion

- Benefits associated with purchasing an energy efficient home
  - Qualify for AHFC's Energy Efficiency Interest Rate Reduction program
  - Lower annual household energy costs
  - No energy efficiency upgrades needed
  - Reduced carbon footprint
  - Command a price premium when resold

Future research

- Focus on actual energy saving associated with energy efficiency improvements
- Sample size could be increased by including all homes that have energy efficiency ratings instead of only homes that eventually participated in the Rebate or Weatherization program
- Conduct similar studies on other Alaska housing markets

Questions?

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