Consumer Inattention in the Adoption of Energy-Efficient Technologies: Evidence from the Air Conditioner Market

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Outline

Section 1

Introduction

Motivation: The Energy Efficiency Gap

The ”Gap” (Hausman, 1979)

A persistent failure to adopt technologies where **lifetime savings > upfront costs**.

Behavioral Frictions

- **Inattention** to non-salient costs (Allcott and Taubinsky, 2015).
- **Cognitive Load** from processing attributes (Gabaix, 2019).

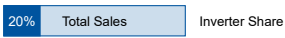
Policy Instruments

- **Monetary disclosures** often outperform kWh units (Blasch et al., 2019).
- Labels increase *salience*.

Setting and Contributions

The Setting: Indonesia

- **High Potential:** Inverters save up to 44% electricity (Almogbel et al., 2020).
- **The Gap:** Only ∼20% market share (JRAIA, 2019).
- **Market Friction:** 6.5% awareness of labels (CLASP, 2020)—a ”blind” market compared to EU/US.



Our Contribution

- ✓ **Causal Mechanism:** First study to jointly vary salience and complexity of energy info.
- ✓ **Structural Modeling:** Estimating attention *s* for emerging economies.
- ✓ **Policy Design:** Evidence-based labels for the ”super-low-awareness” AC consumers.

Research Question

How does information design bridge the gap between 6.5% awareness and 44% savings potential?

Section 2

Theoretical Framework

Modeling Limited Attention

Consumers face a trade-off between **Upfront Price** (p_j) and **Operating Costs** (c_j). We model decision utility following Gabaix (2019):

Decision Utility with Attention Parameter s

$$U_{ij}(s) = \alpha \cdot p_j + \underbrace{s \cdot \beta \cdot c_j}_{\text{Salience Modifier}} + \gamma \cdot \text{Inverter}_j + \varepsilon_{ij}$$

The Attention Parameter ($s \in [0, 1]$)

- $s = 1$: **Full Attention.** Standard rational benchmark.
- $s = 0$: **Inattention.** Operating costs are ignored.

Mechanism of Information

- Treatments (T_e) act as *exogenous shifters* of s.
- **Goal:** Identify how label design moves $s \to 1$.

Empirical Predictions

How do salience and complexity interact?

- **P1 (Salience):** Integrated info (T_3) $\rightarrow$ Largest $|\beta|$ $\rightarrow$ Max WTP.
- **P2 (Framing):** Monthly costs (T_1) $>$ kWh units.
- **P3 (Heterogeneity):** Effects are stronger for:
  - High-usage households (higher stakes).
  - Low-income (higher budget constraint).

Identification

Variation in *s* is recovered from the **Randomized Treatment Arms**.

Next: How did we implement these treatments in the field?

Section 3

Methodology

Empirical Strategy: Discrete Choice Experiment

Random Utility Framework

$$U_{ijt} = \beta_{1e}\text{Price}_{ijt} + \beta_{2e}\text{Inverter}_j + \varepsilon_{ijt}$$

- Estimated via **Conditional Logit**.
- Identification: Coefficients β vary by experimental arm e.

Key Metrics

- **WTP for Inverter:** $-\beta_{2e}/\beta_{1e}$
- **Causal Effect:** Difference in β across arms (T_1, T_2, T_3).
- **Heterogeneity:** Interacting β_{2e} with income and usage (H_i).

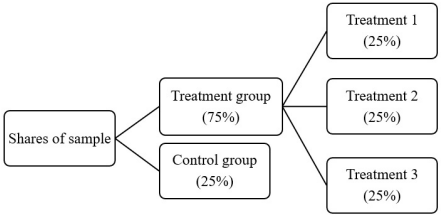
The Advantage of Randomization

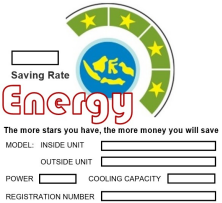
Assignment to information arms is orthogonal to household preferences, allowing for clean causal interpretation of info-design effects.

Experimental Design: The 4 Treatment Arms

We randomized 1,126 households into different ”Information Environments”:

Group	Information Provided	Mechanism	Salience
Control	Price + Power only	Baseline	Low
T1 (Cost)	+ Monthly operating cost	*Economic Content*	Med
T2 (Label)	+ Star Rating (Indo Label)	*Visual Complexity*	Med
T3 (L+C)	Label + Monthly Cost	*Integrated Info*	High





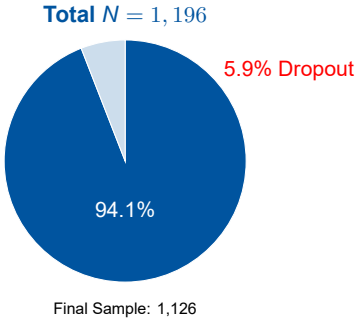
Data: Sample Selection and Quality

Final Analytical Sample

- **Total Interviews:** 1,196
- **Exclusions:** Incomplete or ineligible responses.
- **Final Sample (*N*):** 1,126
- **Dropout Rate:** 5.9%

Data Integrity

A low dropout rate ($< 6\%$) indicates high respondent engagement and a successful CAPI implementation.



Balance Check & Randomization Success

Baseline characteristics are statistically balanced across all four treatment arms:

Variable	Control	T1	T2	T3
Middle Income (1.5–5M)	71%	81%	76%	77%
Female Resp.	37%	38%	32%	37%
Urban Residence	65%	52%	87%	83%

Takeaway

Successful randomization allows us to attribute differences in DCE choices directly to the **information treatments**.

Section 4

Results and Discussion

Main Treatment Effects: Information Drives Adoption

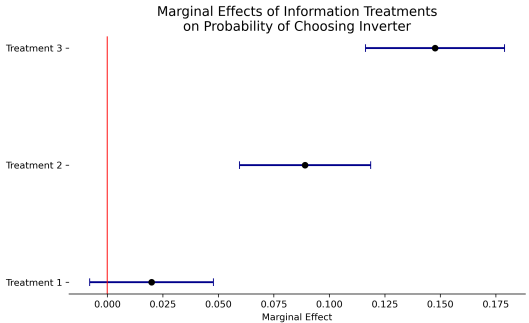


Figure: Average Marginal Effects (AME)

Key Findings:

- **Control:** 72% choose Inverter.
- **T3 (Label+Cost):** +15 pp increase.
- **T2 (Label): +9 pp** increase.
- **T1 (Cost):** +2 pp (Insignificant).

The ”Salience” Insight

Providing costs alone isn’t enough. Information must be **integrated** to maximize adoption.

Mechanism: How Info Reshapes Decision Utility

We estimate how treatments shift the weight on price (β_{Price}):

Treatment Arm	Implied Price Coeff.
Control	-0.277^{***}
Cost Info (T1)	-0.113^{***}
Label Only (T2)	$+0.263^{***}$
Label + Cost (T3)	$+0.604^{***}$

Theoretical Insight

Consistent with **limited attention** (Gabaix, 2019): Information shifts focus from upfront costs to long-term efficiency.

The "Price Puzzle"

- **Sign Reversal:** In T2 and T3, β_{Price} becomes **positive**.
- **Interpretation:** Under high salience, price acts as a **proxy for quality/efficiency**.
- **Heuristic Shift:** Efficiency gains now dominate the disutility of price.

Economic Valuation: Willingness-to-Pay (WTP)

WTP:

- **Control Group:** Households value inverters at **4.3M IDR**.
- **T1 (Cost Info):** Valuation jumps to **10.5M IDR**.

Caution on Welfare Metrics

In Label-based treatments (T_2, T_3), WTP loses its standard interpretation because price sensitivity is no longer negative.

Discussion:

- This highlights a **Heuristic Shift**: Information doesn't just "nudge" preferences; it changes the *rules* of the decision.
- Demand becomes "price-inelastic" once the energy-saving benefits are made salient.

Heterogeneity: The ”High-Bill” Paradox

Less Sensitive Groups:

- **High-Income:** Have the ”slack” to ignore upfront costs.
- **High-Usage:** Focus on the 44% technical savings.

The Most Sensitive Group:

- **High-Bill Households**
- Despite the highest potential savings, they remain **most price-sensitive**.

Policy Implication

Information alone may not be enough for low-income/high-bill households. They likely face **liquidity constraints** that require financing, not just labels.

Policy Recommendations for Indonesia

1. **Prioritize Integration:** Don’t just provide numbers. Embed ”Monthly Cost” directly into the categorical star label.
2. **Targeted Communication:** Focus on ”High-Bill” segments where the efficiency gap is widest but price sensitivity is highest.
3. **Beyond Incentives:** Behavioral design (Salience) is a low-cost lever that can complement (or substitute) expensive subsidies.

Salience + Economic Content = Max Adoption

Section 5

Conclusion

Conclusion

Key Insights:

- **Main Finding:** Combined info increases inverter adoption by 15 percentage points.
- **Mechanism:** Information ”de-biases” the consumer by shifting attention from purchase price to life-cycle costs.

Limitations & Future Work:

- **Hypothetical Bias:** Do survey choices match actual store behavior?
- **Persistence:** Does the ”Attention Shift” last, or is it a one-time effect?
- **External Validity:** Testing beyond the AC market in Indonesia.

Thank you for your attention!

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