



Limited Attention and the Residential Energy Efficiency Gap

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Introduction

- Information failures contribute to the EE Gap
 - Gerarden et al. (forthcoming), Gillingham et al. (2009)
- Limited attention to energy attributes of durables can also contribute to the EE gap
 - Cars: Sallee (forthcoming), Allcott, Mullainathan and Taubinsky (2014)
 - Appliances: Houde (2013)
- Houses may be especially prone to issues of inattentiveness
 - Household energy use is complex ; depends on many home attributes including windows and doors, insulation, lighting, heating and cooling equipment efficiency, etc.
 - Consumers are heterogeneous in how much attention they pay to these features
 - Home investment decisions may not be optimal if providers (insulation experts, HVAC installers) exploit inattention with selective information and advice
- Home Energy Audits provide a potential solution



Home Energy Audits

- An audit is a professional evaluation that helps determine where a house is losing energy and how to make the home more energy efficient.



Background...

- From 2009 Residential Energy Consumption Survey
 - ~3% of homeowners nationwide have had an audit within last 4 years
 - Higher in some states (7.5% in MA; 8.1% in FL)
- From our 2011 auditor survey
 - Average price = \$350
 - Most common recommendations: air sealing, attic insulation
 - Incomplete follow-up
 - Some homeowners do nothing



Air Exchange (at 50 cubic feet per minute)

Blower Door Test Results: 3181

Your Home's Building Airflow Standard: 2404

Your home is 132% of standard

Information Theory and Research Questions

- Standard value of information theory suggests that consumers will purchase information if expected value of better decision resulting from information acquisition outweighs cost of acquiring it (Stigler 1961, Hirschleifer and Riley 1979).
- Why do so few home owners get home energy audits?
- Can inattention partially explain the low uptake of home energy audits?



Survey Basics

- 1,700 homeowners in 24 states where audits are available (Palmer et al. 2013)
- Oversampling of homeowners who have had audits (500) in last 4 years
- Used GfK panel
- RFF-run focus groups, some pre-testing
- Questions about features of home, characteristics of occupants, and knowledge of audits
- For those who had audits
 - Questions about audit features (costs, features, quality)
 - Availability of incentives
 - Questions about extent of follow up (future research)

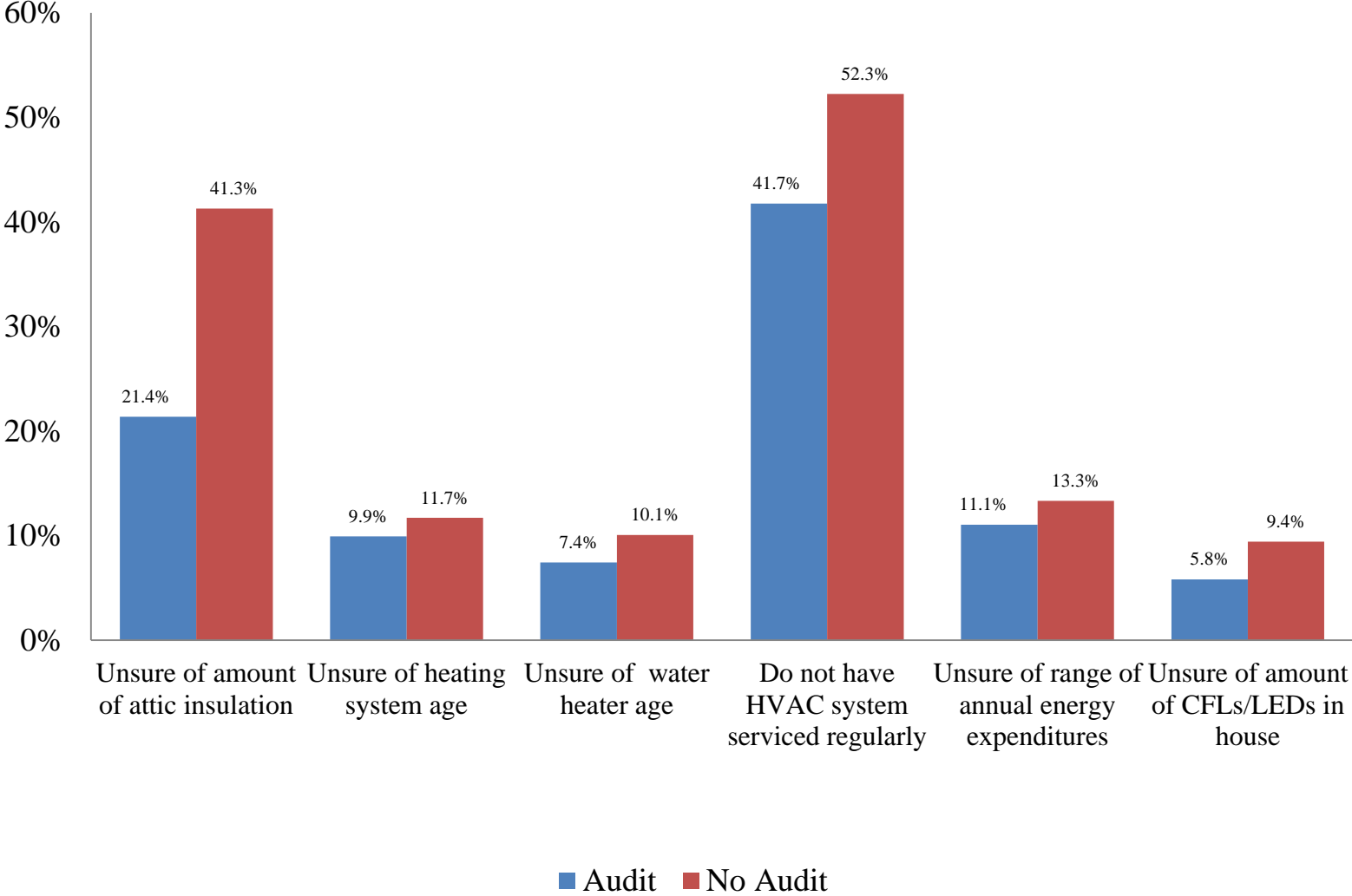
Variables from Survey (and *other sources*):

- Homeowner characteristics
 - Income, age, race, degree of “green” preferences, etc.
- Benefits of audit
 - Age of house, size of house, age of HVAC system, plan to sell house, *weather, electricity price*
- Costs of audit
 - Easily at home, *energy efficiency program expenditures per capita.*
- Behavioral factors
 - Salience of energy use (home energy reports)
 - Peer effects (friends had audits)
 - Attentiveness index

Constructing an Attentiveness Index

- Index constructed from answers to six questions related to home energy use/practice
 - Knowledge of range of annual energy bills
 - Knowledge of age of heating equipment
 - Knowledge of age of water heater
 - Knowledge of amount of attic insulation
 - Knowledge of number of CFL or LED light bulbs in the home
 - Whether heating and air conditioning (HVAC) equipment is serviced regularly
- Respondent gets a 1 for each “don’t know” plus if doesn’t regularly service HVAC and the index value is based on the sum, normalized to fall between 0 and 1.
- Average value is 0.217 and range goes from 0 to 1.
- *Note: questions are phrased to make them easy to answer qualitatively; so high bar for inattentiveness.*

Audit Uptake and Inattentiveness



■ Audit ■ No Audit

Logit Regression Results for Audit Choice

Category of Variable	Variable name	Coefficient Estimate	Average Marginal Effect
Selected Respondent Characteristics	Ln(household income)	-0.334**	-0.0279**
	Environmental leanings	0.239***	0.0440**
Benefits/Cost of Audit	Easily at home	0.27	0.0226
	Age of house	0.00151	0.000128
	Number of rooms (no baths)	0.0501	0.00439
	HVAC system >6 years old	0.365**	0.0293**
	Heating degree days	-2.02E-05	-1.34E-06
	Cooling degree days	2.65E-05	2.41E-06
	Electricity price	0.00525*	0.000436*
	EE expenditure per capita	0.0282*	0.00217*
	Plan to sell house dummy	-3.379***	-0.118***
	Behavioral Factors	Home energy report dummy	0.194
Audit friend dummy		2.230***	0.309***
Attentiveness index		-1.385***	-0.112***
	Constant	-1.086	
	N	1,641	1,641

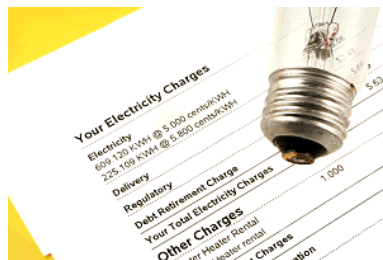
Insights from Regression Analysis

Average marginal effects estimates suggest:

- Going from fully attentive to fully inattentive lowers the probability of getting an audit by 11%
 - comparable to the -12% effect of intending to sell one's house
- To fully offset the effect of mean value of inattention requires a
 - \$11.20 increase in energy efficiency expenditures per capita (twice the sample average but sum is well below the maximum observation)
 - \$55.74 per MWh increase in the average electricity price (48% of the average level in the sample)

Concluding Observations

- Traditional economics suggests that rational consumers will become informed if expected benefits of the resulting better decisions exceed information acquisition costs.
- New literature on attentiveness reframes this proposition.
- Our research suggests that consumers may be inherently inattentive to energy use and this affects their inclination to acquire information through an audit.
- Our survey allows us to uncover inherent inattentiveness.
- Experiments (e.g. Halladay et al. 2014) could provide insights into ways to “unshroud” some aspects of home energy use.



Thank you for your attention

- For more information see:
 - Summaries of survey findings on RFF's blog, Common Resources: www.common-resources.org
 - RFF research under our energy efficiency information initiative: www.rff.org/eeinfo
 - Or contact: Palmer@rff.org or Walls@rff.org