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Selected Poster prepared for presentation at the Agricultural & Applied Economics Association's 2013 AAEA & CAES Joint Annual Meeting, Washington, DC, August 4-6, 2013.

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Energy Efficiency Paradox

- Households can reduce energy consumption and energy bills through adoption of Energy-Efficient:
 - Appliances (e.g. CFLs, refrigerators)
 - HVAC systems
 - Building technologies (e.g. energy-saving windows)
- Despite economic benefits & government subsidies slow diffusion of energy-efficient technologies
→ “efficiency paradox” problem
- Consumer behavior contributes significantly to the “efficiency paradox”

Research Objectives

- Assess the relationship between consumer behavior and household willingness to purchase energy efficient technologies
- Measure how *Risk Aversion* and *Time Preferences* affect household willingness to purchase appliances with uncertain future benefits
- Investigate the relationship between household *Risk Aversion* and *Time Preferences* when considering residential energy efficient technologies

Methodological background

- Data were collected in Spring 2013 using online choice experiments with 607 homeowners in Arizona and California including a risk and discount rate experiment
- The survey included four separate Multiple Price List (MPL) experiments:

	Generic Frame	Energy Efficient Appliance Frame
Risk Aversion	MPL (Holt and Laury, 2002) with no gamble context for the risky alternatives	MPL with risky life time energy cost savings from an energy efficient appliance
Time Preference	MPL with no context for the tradeoff between dollars today and dollars in the future	MPL with tradeoff between higher fixed purchase price and lower future annual appliance energy costs

- Key Hypotheses:**
 - Measures of Household *Time Preferences* and *Risk Attitudes* will differ between the Generic Frame and Energy Efficient Appliance Frame
 - There is a positive relationship between household measures of *Time Preferences* and *Risk Attitudes* when considering Energy Efficient Appliances
 - Risk Aversion* will have a significant impact on Energy Efficient expenditures

Conclusions

- Measures of *Risk Aversion* in the context of energy efficient appliance purchases differ from measures elicited in the generic frame
- No difference in household *Discount Rates* are found between the generic and energy efficient appliance frame
- Households that are more *Risk Averse* tend to have a higher *Discount Rates*
- Households that are more *Risk Averse* or have higher *Discount Rates* are less likely to engage in energy efficient retrofits

Empirical results

	T-test of Mean MPL Response		
	Generic Frame	Appliance Frame	Difference
Risk Aversion (CRRA Coefficient)	2.593	3.548	0.955***
Time Preference (Discount Rate)	4.241	4.244	0.003

	Selected Parameter Estimates		
	Ordered Probit Model: Determinants of Household Energy Efficient Appliance Discount Rate	Ordered Probit Model: Determinants of Household Energy Efficient Appliance Risk Aversion	Logistic Model: Household Decision to Conduct Energy Efficient Retrofits
Risk aversion	0.051***		-0.001
Discount rate		0.027**	-0.067**
Education level	0.003	0.084***	0.047
Annual household income	-0.001	-0.016	0.037*
Age of home	0.000	-0.001	-0.000
Shares home with tenants	0.092	-0.191	0.016
Pr of moving within in 5 years	-0.043*	0.010	-0.055

Implications

- Researchers need to be careful in properly specifying the frame of the decision when measuring *Risk Attitudes*
- Policies and information that can reduce the perception of cost saving risk from residential energy efficient technology adoption can foster energy efficient purchases

Acknowledgements

Funding provided by the SSE grant from the College of Technology and Innovation at Arizona State University is gratefully acknowledged.