Split Incentives in Residential Energy Consumption

Kenneth Gillingham, **Matt Harding** and David Rapson

mch@stanford.edu

Split Incentives

- Differing incentives between owners and occupants
- (NYT, 2010) building managers estimate that apartments that don’t pay for electricity expend 30% more electricity at considerable environmental cost
- EIA estimates that residential buildings make up just over 20% of primary energy demand and one third of all housing units are rentals

Current evidence

- (Murtishaw and Sathaye, 06; IEA, 07) find that up to 35% of the residential energy use may be affected
- Levinson and Niemann (04) winter indoor temperature is higher when not paying for heat
- Davis (09) landlords who don't pay for electricity are less likely to purchase "Energy Star" appliances

Matrix of possible split incentives

	Occupant owns	Occupant rents
Occupant pays for energy use	(1) No split incentives	(2) (owner) Under-insulation & less efficient appliances; optimal effort to reduce energy use
Occupant does not pay for energy use	(3) (both) Lower effort to reduce energy use; [under-insulation & less efficient appliances]	(4) (occupant) Lower effort to reduce energy use; ambiguous effect on insulation & appliances

Data

- California Statewide Residential Appliance Saturation Study (RASS)
- Funded by CA utilities and conducted by the CA Energy Commission
- Total of just over 20,000 responses
- Also data on electricity prices, rate schedules

Observations on heating/cooling

TABLE 2—CROSS-TABULATIONS CORRESPONDING TO FIGURE 1

	Own dwelling	Rent dwelling	Total
Pay for heating	7,738	2,237	9,975
Do not pay for heating	50	209	259
Total	7,788	2,446	10,234

	Own dwelling	Rent dwelling	Total
Pay for central cooling	4,336	903	5,239
Do not pay for central cooling	1,274	986	2,260
Total	5,610	1,889	7,499

Heating/cooling

- *Hypothesis: rational individuals invest effort to minimize the costs when they pay the bills*
- Find some evidence that individuals who pay for heat are more likely to choose low heating settings
- Overall *weak* evidence however
- No measurable effect for cooling

Demographics/Technology

- Homes with children and elderly are heated more
- Homes with thermostats have *higher* settings
  - Over 300% more likely to set high settings in the morning
- No effect of income and family size
- No effect of marginal price
- None of these seem to matter for cooling settings

Changing settings

- *Hypothesis: Another way of economizing is to turn down the heating during the day*
- Individuals who pay for heating are more likely to make changes during the day
- Having a thermostat makes it easier
- Older and more educated individuals optimize more

Insulation

- Owner-occupied dwellings where the resident pays for heating and cooling are 20% more likely to be well insulated
- Rented dwellings where resident pays for heating and/or cooling are 15% less likely to be well insulated
- Overall the energy impact of insulation is larger than that of heating settings

Environmental impact

- Energy efficiency gain from addressing insulation issue is larger then the savings from addressing the heating/cooling problem
- Savings would be spread over electricity/gas
- Emissions in CA would be reduced by 23,200 mtons of CO2 per year (residential emissions are 28m mtons – so quite small)

Environmental impact

- Small gain from solving the heating/cooling problem
  - Only about 7,600 mtons of CO2 per year
- Why is the impact so small?
  - Nationwide only about 5% of households don't pay for electric heat and 4% don't pay for natural gas heating.
- Policy?
  - Minimum standards for rental units would address the insulation issue effectively.