

# Heterogeneous Effects of Informational Energy Audits and the Split Incentive for Renters and Owners

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## Energy efficiency has become a major part of energy policy

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## Weatherization

- IRA 2022: credits for home upgrades (30%)
  - Weatherization Assistance Program (WAP), Low-Income Energy Efficiency Program (LEEP)
  - Subsidize windows, doors, insulation, heat pumps, etc.
  - see Christensen, Francisco, Myers and Souza (2021), Fowlie, Greenstone and Wolfram (2018)



Image courtesy of Cooler Berkshires

## Renters are not eligible for WAP-style subsidies

- But renters tend to be lower-wealth, minority
  - Reames (2016) finds tracts with higher EUI (a proxy for efficiency) are more likely to be renters
  - Higher EUI suggests renters would be *more* ripe for gains from efficiency

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## The Principal-Agent Problem

- The decision-maker (landlord) may not fully capture gains from investing in efficiency
  - Information is asymmetric (Myers (2020))
  - Decision is uncertain and irreversible see Stavins et al (2013), Gillingham et al (2009)
  - Price cannot fully reflect reduced energy costs see Maruejols and Young (2011), Ramos et al. (2015)
- Most upgrades require ownership of the home
  - May need to move, cannot ensure that rent will not be increased (!)
  - Allcott, Knittel, and Taubinsky (2015) found reduced takeup of appliance credits by renters. also see Gillingham (2012), Davis (2012)

## Informational **Energy Audits**

- Voluntary program advertised in bills, community groups
- Auditor comes to your house, inspects envelope, HVAC, usage, etc.
- Writes out recommendations
  - "Clean condenser coils. Move insulation back over attic door. Tape ducts. Set AC to 74."
- Doesn't touch anything. Leaves

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## Energy Audits under-studied in the literature

- Frondel and Vance (2012) find heterogeneity in consumption response, Considine and Sapci (2016) find 4 to 10.8% decrease
  - Neither examines **renters**
- Anderson and Newell (2004) on industrial audits and upgrades; Palmer, Walls and O'Keeffe (2015) for homeowners
  - Examine follow-up actions taken, not consumption
- Also: Real-time Feedback Houde et al (2013), Jessoe and Rapson (2014), Prest (2020), Certification see Brounen and Kok (2011), Cassidy (2017), Walls et al (2017),

We examine **pure-information Energy Audits** made available to both renters and owners and ask:

1. Are the audits effective at lowering electricity consumption?
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## Implications

- Important for policy (IRA subsidizes audits)
- Welfare standpoint: purely informational audit → decreases in consumption are welfare-improving.
- Results can help bound the magnitude of the Principal-Agent problem

## Utility billing data for ~105,000 customers 2011-2020 in Gainesville, Florida.

- Used in Doremus and Maher (working paper), Hancevic and Sandoval (2022)
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### Gainesville Regional Utility / City

- Monthly kWh consumption (plus gas, water)
- Primary fuel = Electricity (58,667 Hh)
- 2,753 Energy Audits (EAU) (2010-2020)
  - Extracted text of audit recommendations
  - **Audits state homeowner/renter status**
- Building Permits (City and County)
- Meter read date
- Exact address location
- Service start/stop

### InfoUSA

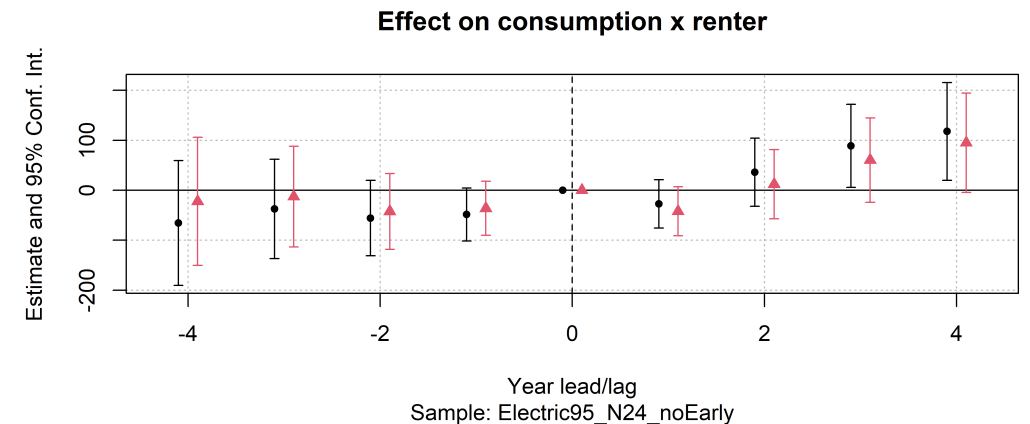
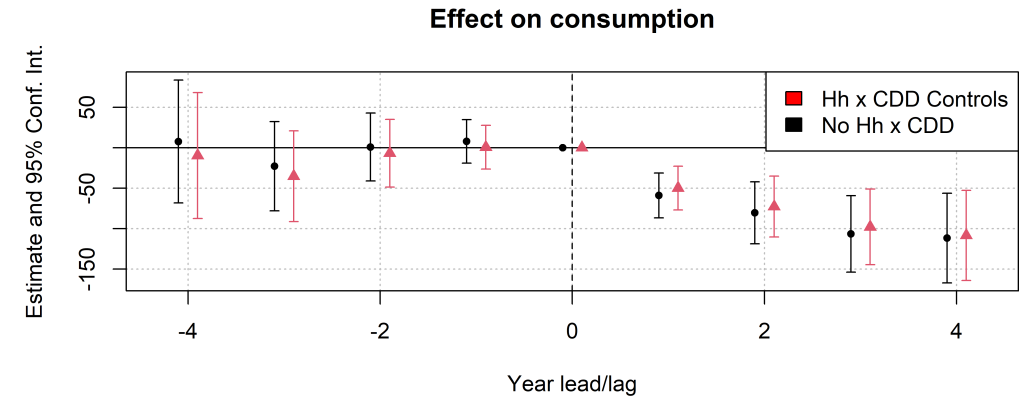
- Renter vs. Owner status
- Wealth, income

### PRISM (OSU)

- Daily HDD, CDD
- Daily max and min temp
- Combined with meter read date, monthly CDD, HDD for each household

## Consumption in levels

- Regress *consumption* on leads/lags of EAU
- FE:
  - **household x calendar month**
  - **household x CDD** and **household x HDD**
  - **month-of-sample**
- Dropping 4 periods prior to calling for an EAU
- Dropping any home for which a building permit was issued after the EAU
- Treatment effect heterogeneity will be largely driven by *the month* in which the EAU occurs
  - Measure treatment effects not at monthly, but rather **yearly** lags
- Examine (1) effect on consumption after EAU, and (2) interaction with renter status



## CDD and HDD effects

- We examine the **change in the relationship** between consumption and CDD/HDD before/after an EAU
  - "slope shifts"
- Cooling and heating consumption represents ~31% and 8% of all consumption
- About 30% reduction for CDD, but renters only get about 50% of that

## Plausibly exogenous variation

- 55 EAUs that were for *water* audits
- Same audit was given including electricity conservation
- Similar main effect, unclear on renters

	Main Sample	Water EAU Calls
	kWh	kWh
EAU x HDD	-0.434*** (0.078)	-0.551* (0.223)
EAU x HDD x renter (infoUSA)	0.282+ (0.168)	-0.677 (0.619)
EAU x CDD	-0.484*** (0.058)	-0.559*** (0.158)
EAU x CDD x renter (infoUSA)	0.236* (0.106)	0.050 (0.307)
Num.Obs.	4111505	2869633
RMSE	190.28	190.96
Std.Errors	by: uID	by: uID
FE: uID <sup>mo</sup>	X	X
FE: uID	X	X
FE: uID <sup>hadEAU</sup>	X	X
FE: uID <sup>yr</sup>	X	X
FE: Month	X	X
Avg uIDxCDD	1.523	1.625
Avg uIDxHDD	2.268	2.547

+ p < 0.1, \* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001

# Thanks

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