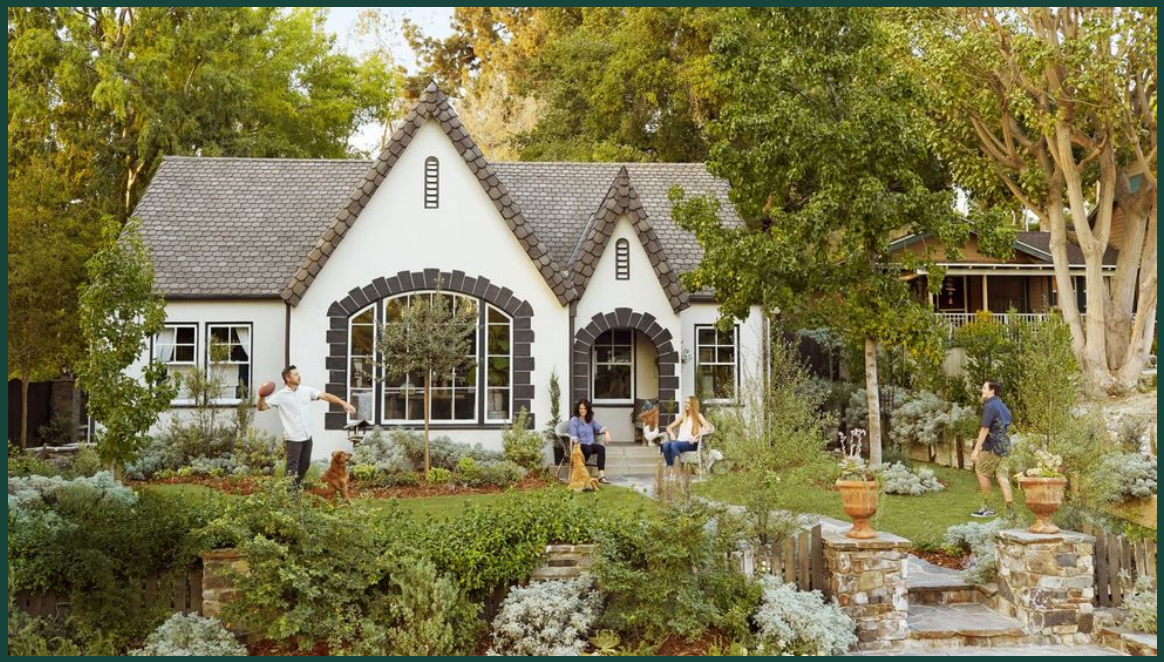
The (Dis)amenity of Visible Solar Panels

Michigan EEE Day - August 23, 2023

Bryan Bollinger (NYU), Ken Gillingham (Yale)
Justin Kirkpatrick (Michigan State)

Last updated August 23, 2023

Household solar decisions



What do I think?

- Offset electricity bill (irradiance)
- Balanced against up-front cost
- Aesthetics
- "**Warm glow**"

What will the neighbors think?

- Aesthetics
- **Signaling**

Context

Q1: Do households consider the visibility of their own potential solar panels when adopting?

Q2: What moderates that effect?

Warm glow

1. "Warm glow" (Andreoni, 1990; Kotchen, 2006)
   - $\rightarrow$ Observe how people adopt when private payoff is low

"Signaling"

1. Conspicuous conservation (Sexton and Sexton, 2014; Dastrup et al, 2011)
   - Environmental bona fides
   - $\rightarrow$ How people change adoption when potential installation would/would not be visible
2. Identity + group norms (Akerlof and Kranton, 2000; Khan, 2007)
   - Signaling, but only when consistent with group norms
   - $\rightarrow$ How that changes with different surroundings

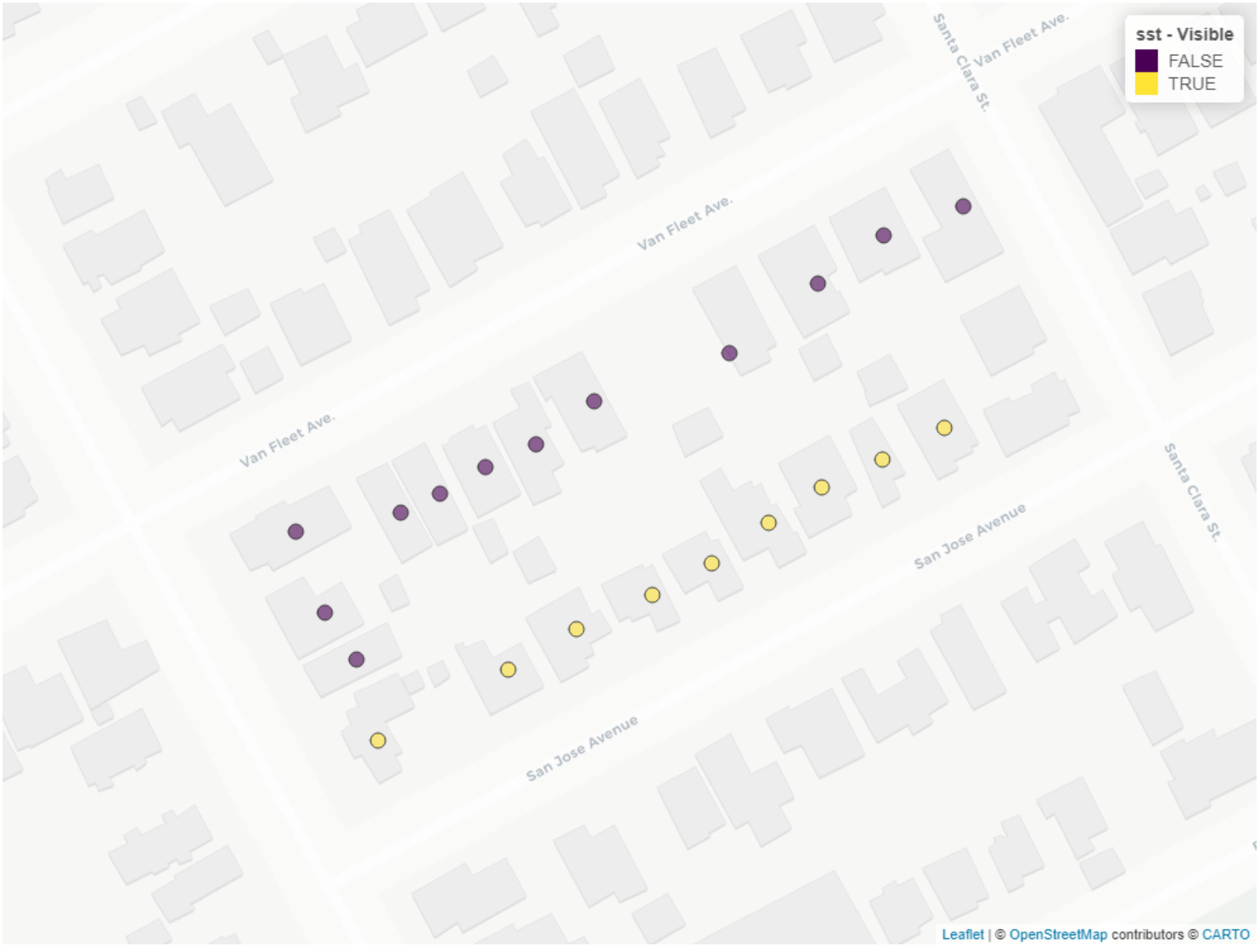
Individual Household adoption decisions

- Binary adoption variable, a function of:
  - EV: Expected value (payoff) of adopting solar
  - Household voter affiliation
  - Visibility of the potential solar installation
  - Household characteristics

Identification: Visibility is exogenous

- Determined by "side of street" and house orientation
- Visibility, EV, and voter affiliation are conditionally exogenous

Data


sst - Visible
FALSE
TRUE
Van Fleet Ave.
Santa Clara St.
Van Fleet Ave.
Van Fleet Ave.
San Jose Avenue
Santa Clara St.
San Jose Avenue
Leaflet | © OpenStreetMap contributors © CARTO

<!-- -->

Regress adoption (binary) on

- Visibility
- Expected Value
- Non-Republican voter registration
- EV x Non-Republican
- Visible x Non-Republican

Results

Dependent Variable:	Adopt x 100	
Model:	(1)	(2)
Variables		
Visible	-0.638***	-0.642***
	(0.180)	(0.180)
Visible × Registered Non-Rep	0.343*	0.357**
	(0.180)	(0.180)
Registered Non-Rep	-0.827***	2.44***
	(0.092)	(0.402)
Expected Value	0.874***	1.23***
	(0.049)	(0.080)
Registered Non-Rep × Expected Value		-0.446***
		(0.074)
Fixed-effects		
GEOID20-PROPERTY_STREET_NAME	Yes	Yes
Fit statistics		
Observations	994,454	994,454
R^2	0.21455	0.21577
Within R^2	0.00383	0.00537

Clustered (GEOID20-PROPERTY_STREET_NAME) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Empirical Specification 2

Regress adoption (binary) on

- Visibility
- Expected Value
- Non-Republican voter registration
- EV x Non-Republican
- Visible x Own Non-Republicanness
- Visible x Area Non-Republicanness
- Own Non-Republicanness x Area Non-Republicanness

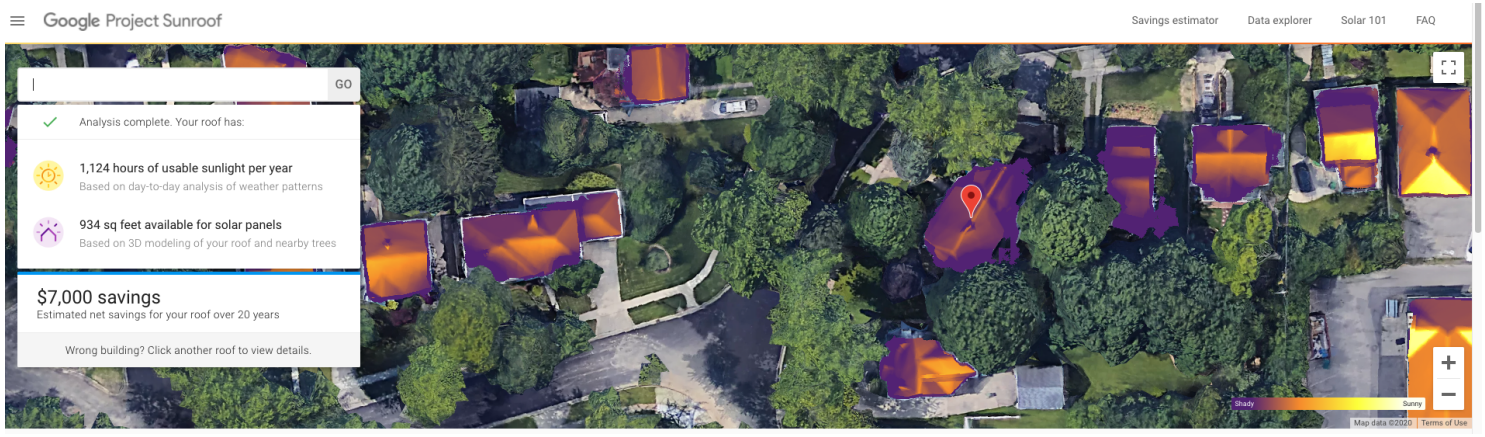
Results

Dependent Variable:	Adopt x 100
Model:	(1)
Variables	
Visible	-1.97***
	(0.719)
Registered Non-Rep	0.758
	(0.713)
Expected Value	1.21***
	(0.081)
Visible × Registered Non-Rep	0.288
	(0.183)
Registered Non-Rep × Expected Value	-0.426***
	(0.075)
Visible × Block-group average Non-Rep	1.77**
	(0.892)
Block-group average Non-Rep × Registered Non-Rep	2.12***
	(0.728)
Fixed-effects	
GEOID20-PROPERTY_STREET_NAME	Yes
Fit statistics	
Observations	994,454
R^2	0.21578
Within R^2	0.00539

Clustered (GEOID20-PROPERTY_STREET_NAME) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Google Project Sunroof (#sunroo

MICHIGAN STATE UNIVERSITY



back