Title

Residential Solar-Adopter Income and Demographic Trends: 2022 Update

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Residential Solar-Adopter Income and Demographic Trends: 2022 Update

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     - Battery-storage pairing
     - Multi- vs. single-family housing
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Overview

Describes income and demographic trends among U.S. residential solar photovoltaic (PV) adopters

- Pairs Berkeley Lab's *Tracking the Sun* dataset and other sources of PV addresses with *household-level* income and demographic data
- Unique in its market coverage and granularity
- Descriptive and data-oriented; complements and informs other related work at Berkeley Lab

For related research at Berkeley Lab:
solardemographics.lbl.gov

What's New?

- Data on systems installed through 2020
- Household-level data on race, ethnicity, and language preference

Related Berkeley Lab Resources

- Online data visualization tool that allows users to further explore the underlying dataset in this report
- In depth topical studies on issues related to solar energy access and equity
- Analytical support to external organizations

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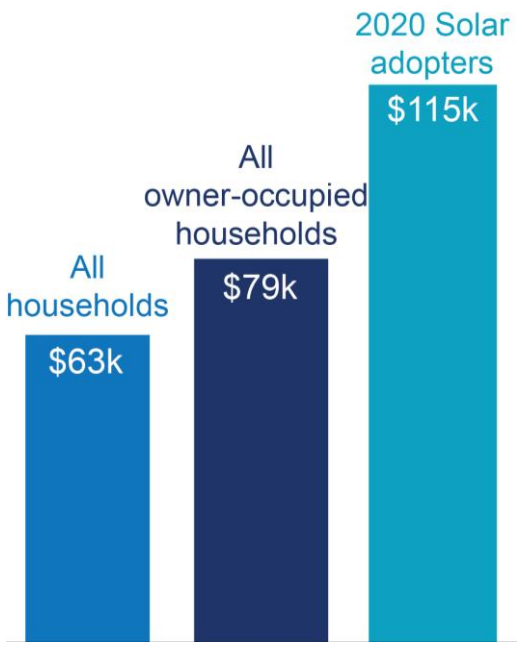
High-Level Findings

Solar adopter incomes vary considerably, but are generally higher than population averages

- The median solar adopter income was about $115k/year in 2020, compared to a U.S. median of about $63k/year
- The skew is smaller when comparing to only owner-occupied households or to other households in the same state—but all states exhibit some skew

Low- and Moderate-Income Adoption
While solar adoption skews toward high-income households, low- and moderate-income households are also adopting. In 2020, about 41% of adopters earned less than 120% of their area's median income. (120% is a threshold sometimes used to include both low and moderate income)



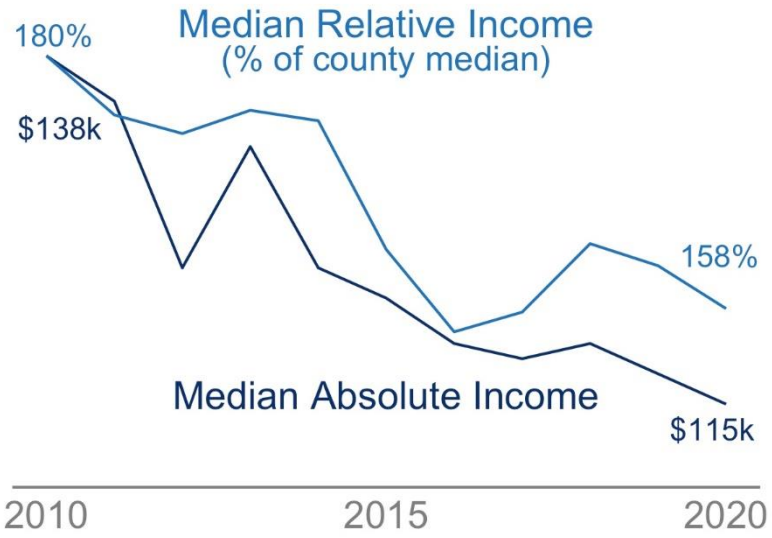
Solar adopters vary along other demographics

Compared to the broader population, solar adopters tend to:

- Identify as Non-Hispanic White
- Be primarily English-speaking
- Live in rural areas
- Have higher education levels
- Be middle-aged
- Work in business and finance-related occupations
- Live in higher-value homes
- Live in neighborhoods with higher average credit scores

The rooftop solar market is becoming more equitable over time

Solar-Adopter Household Income



Incomes are based on 2021 data, regardless of PV install date, with no inflation adjustments.

- Rooftop solar is **broadening** by expanding geographically into states with generally lower income levels
- Rooftop solar is also **deepening** by reaching lower-income households in existing markets.
- These trends reflect the effects of falling solar prices and the emergence of policies and business models that support broader adoption, among other factors

Data Sources

PV Street Addresses & System Data

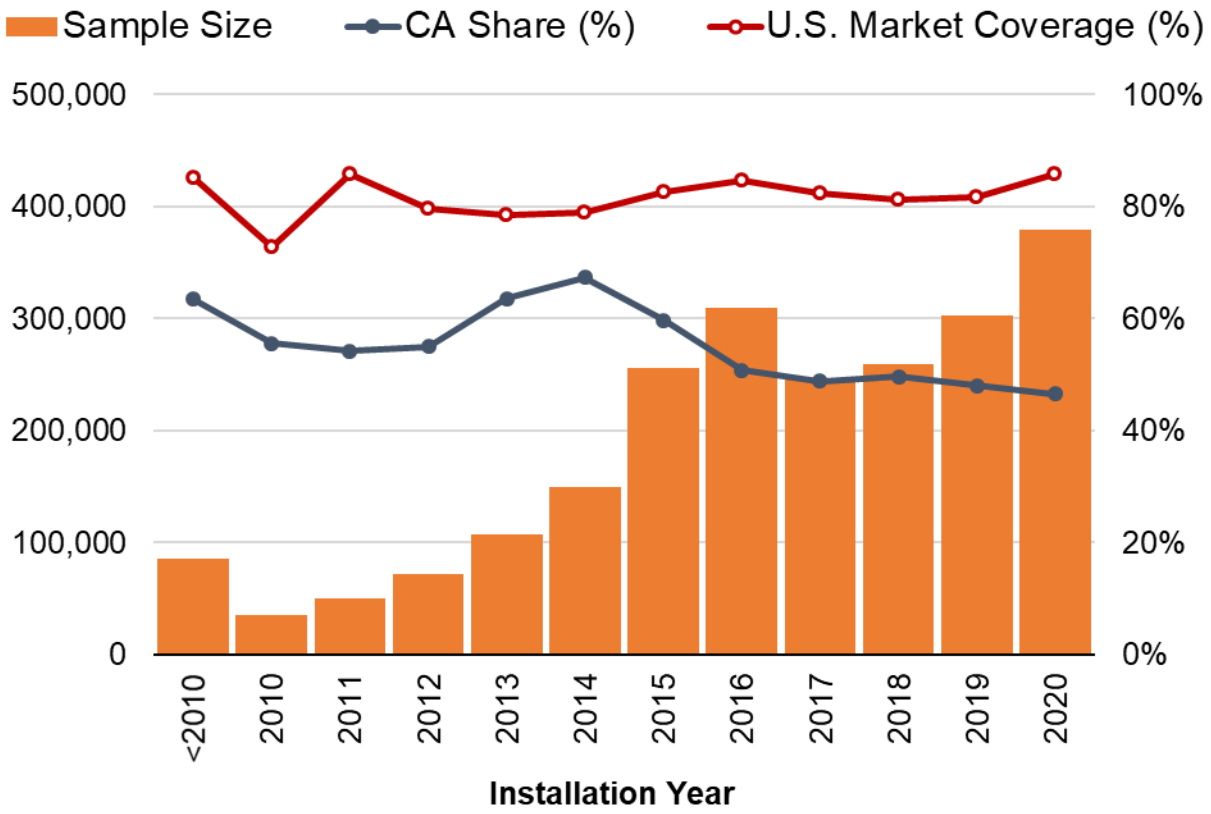
- Berkeley Lab's ***Tracking the Sun*** dataset: Primary data source; includes addresses and other data for roughly 1.6 million systems, obtained primarily from utilities and state agencies
- **BuildZoom** and **Ohm Analytics**: Purchased PV permit datasets; provide a supplementary source of PV street addresses for roughly an additional 600,000 systems

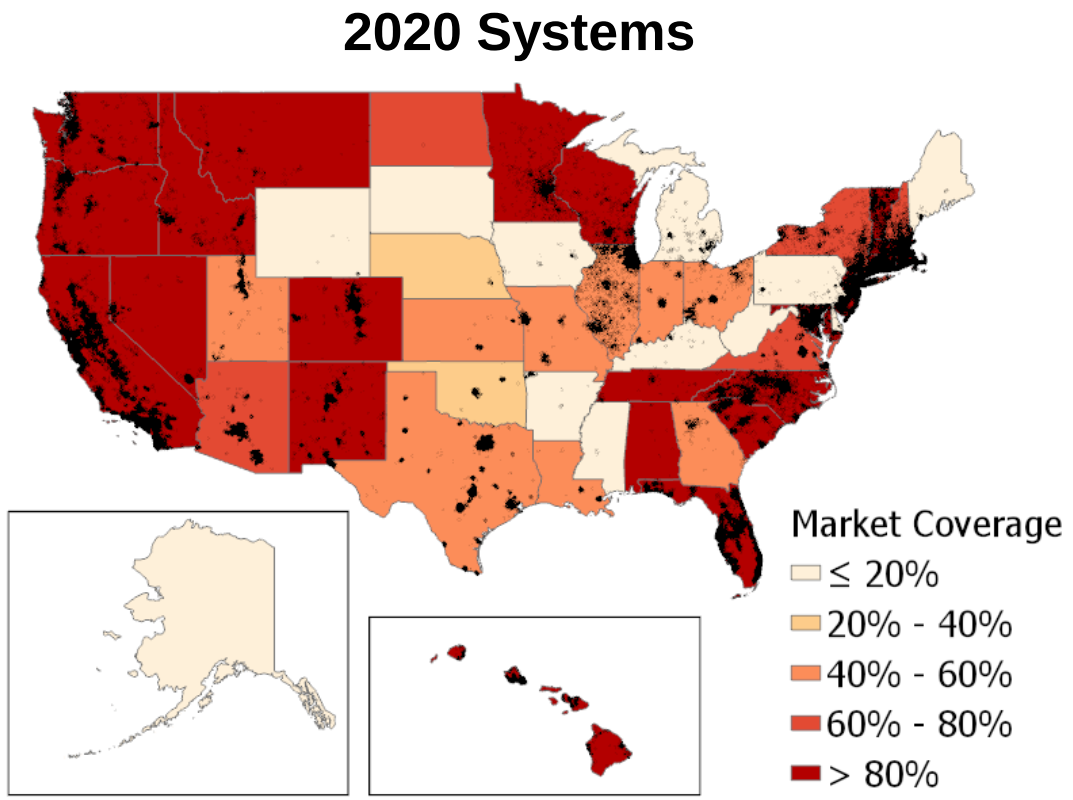
Income & Other Socio-Economic Data

- **Experian ConsumerView**: Purchased dataset providing modeled household-level income estimates for solar adopters and for population as a whole; as well as household data on other socio-economic attributes
- **U.S. Census** and **Bureau of Labor Statistics**: Used for comparison purposes to characterize demographics of total U.S. population

See appendix slides 42-43 for further details on income and other socio-economic data sources

Sample Coverage





- Sample consists of **2.3 million systems**, covering roughly **82%** of all U.S. residential systems through 2020 and **86%** of systems installed in 2020; market coverage by state varies widely, but >40% in most states
- California represents more than half of the total sample and 47% of systems installed in 2020

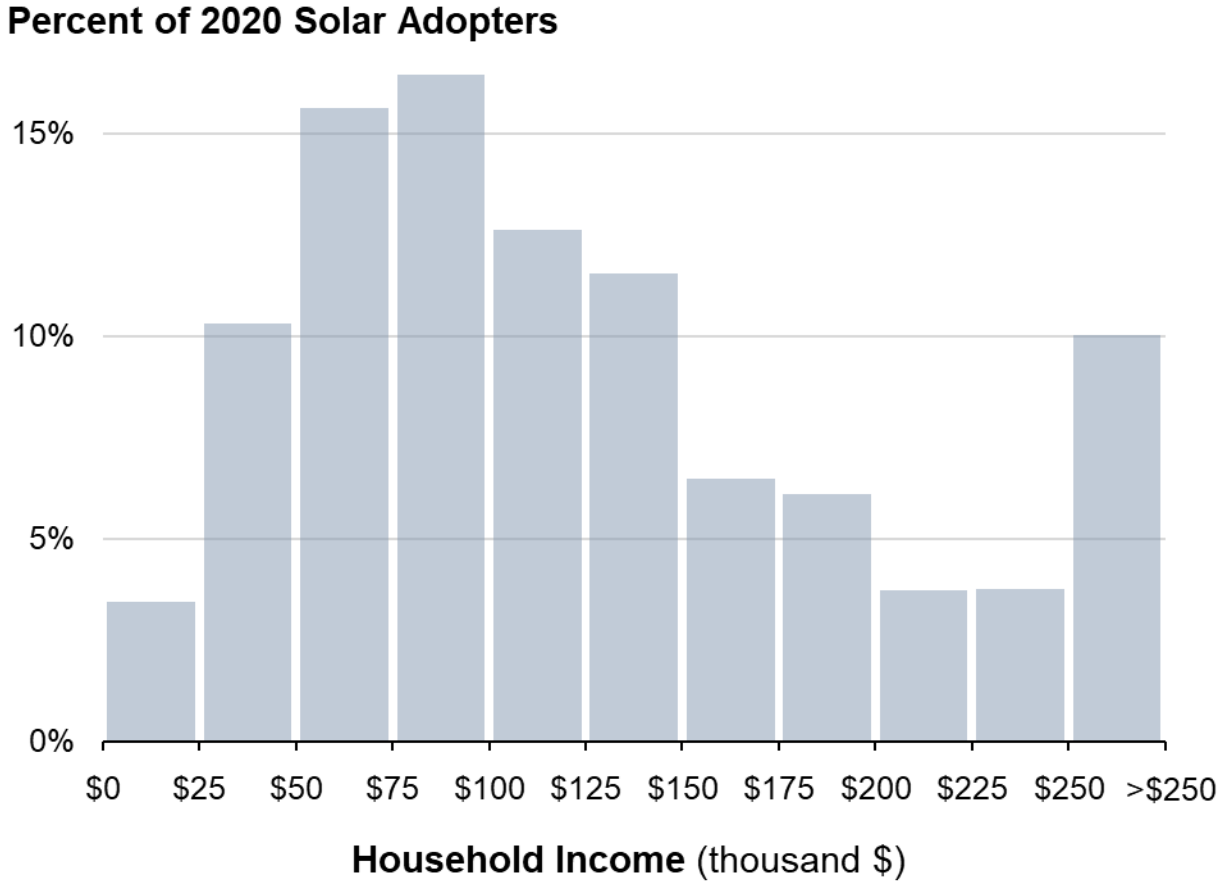
See appendix slides 44-45 for further details on sample sizes

General Points on the Data and Descriptive Approach

- We focus here on national and state-level trends, with an emphasis on PV systems installed from 2010-2020; additional data, including county- and Census tract-level trends, as well as data for earlier years, are available through Berkeley Lab's online data visualization tool
- PV adopter income and demographic data reflect *current* values based on Experian ConsumerView data obtained in Q3 2021, rather than at time of adoption; consequently, the data may not be representative of the household at the time of adoption (especially if the home since sold)
- Income estimates refer to total household income, while most of the other demographic attributes (race, language, occupation, education) are based on the primary householder; regardless, we describe trends in terms of "households" as the relevant unit for PV adoption
- All national trends are heavily impacted by California, given its large share of the market
- Unless otherwise noted, we present state-level data only if the underlying sample consists of at least 100 systems and at least 10% market coverage for the applicable state and year
- Sample sizes vary across different elements of the analysis, depending on the underlying data sources and completeness of the associated data fields; see appendix slide 45 for details

Solar-Adopter Income Trends

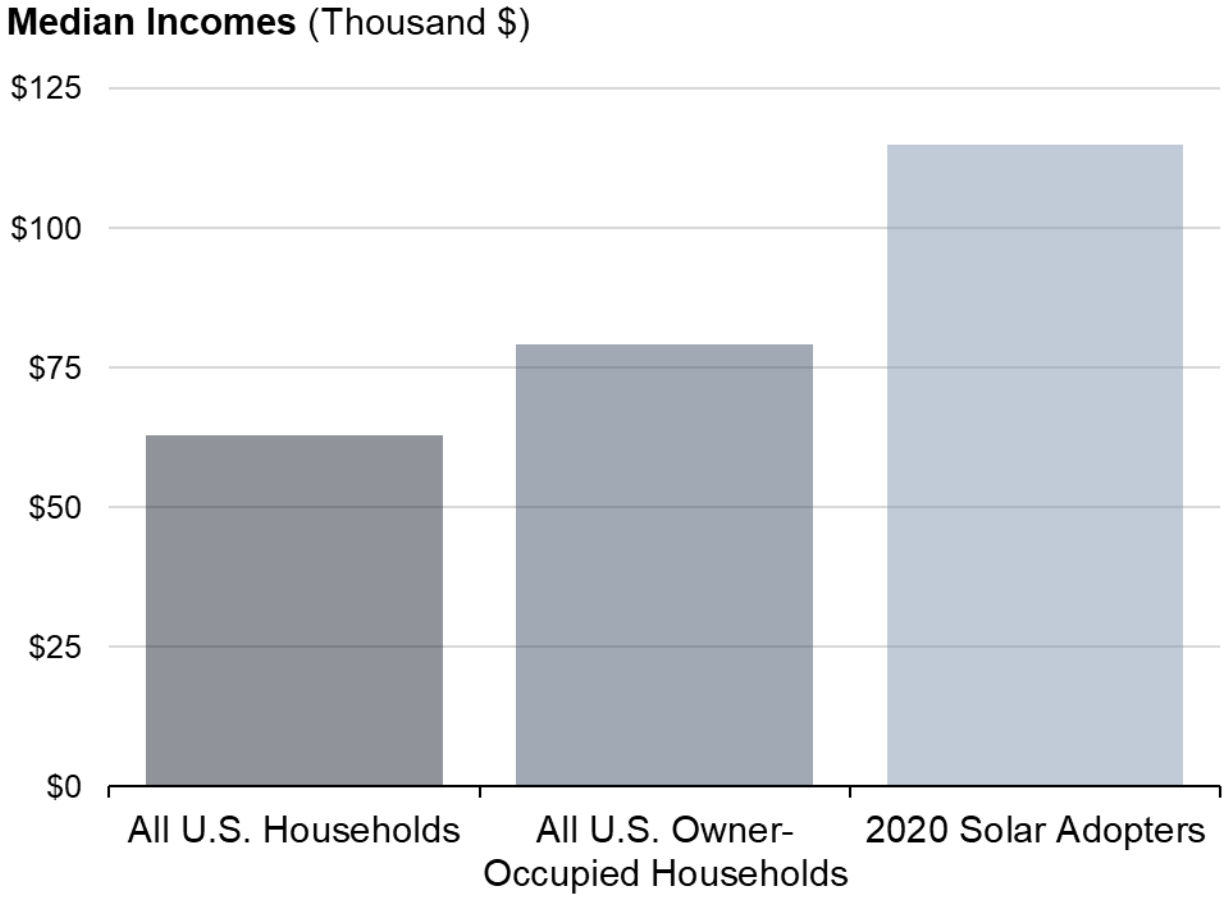
Solar-Adopter Income Distribution



* *Notes: Experian does not differentiate income estimates >$250k, thus all households above that level are aggregated, leading to the spike on the right-hand side of the distribution*

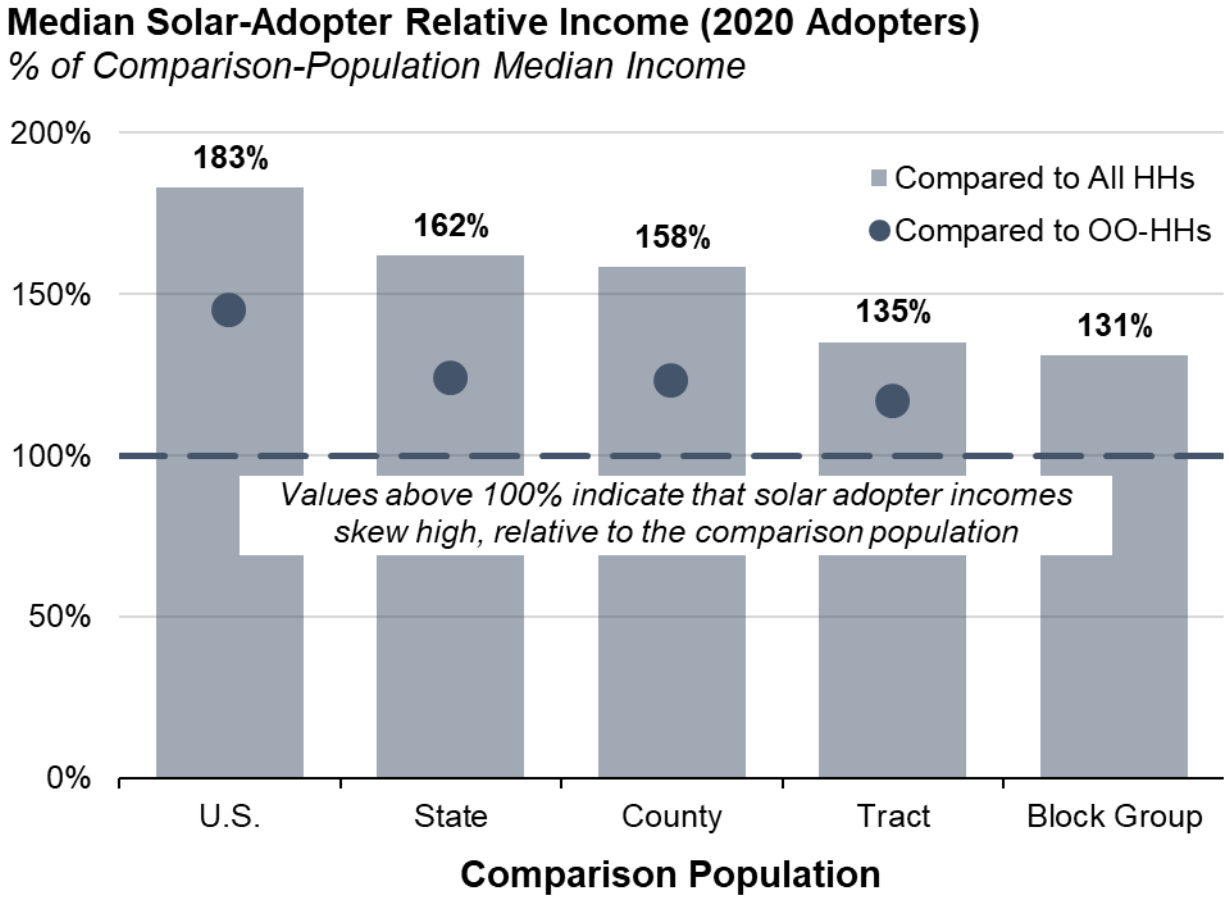
- Solar adopters span all household (HH) income levels, from less than $25k to more than $250k
- A large fraction of solar adopters in 2020 could be considered “middle income”: for example, roughly one-third (32%) have HH incomes in the $50-100k range
- 14% of adopters are below that range, while 54% are above it
- The distribution has a long upper tail, with 17% of adopters above $200k and 10% above $250k*

Solar-Adopter Incomes Compared to Total U.S. Population



- Solar-adopter incomes skew high relative to the population at large: median income of all U.S. HHs was $63k in 2020, compared to $115k for 2020 solar adopters
- Skew is less pronounced if comparing to only owner-occupied households (OO-HHs), who had a median income of $79k
  - Solar adopters in this study are almost entirely OO-HHs (due to owner-control of rooftop, owner/tenant split incentive)
- The skew relative to national median incomes is partly due to the fact that roughly half of solar adopters are in California, a relatively high-income state (though, as shown on later slides, all states exhibit some skew)

Solar-Adopter "Relative Income"



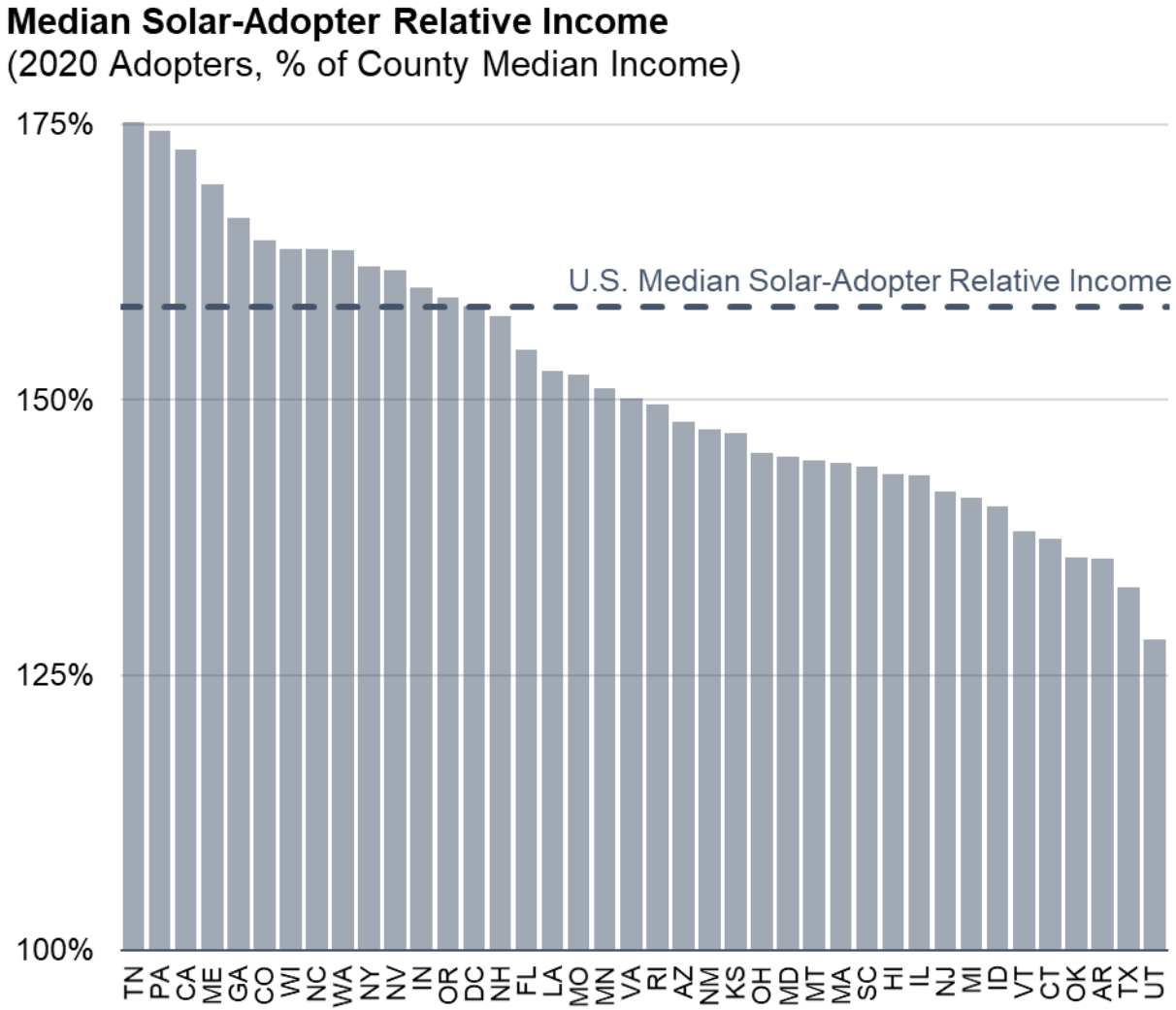
Notes: To calculate these values, we first calculate each solar adopter's household income as a percentage of the median household income for each comparison population, and then take the median of those percentage values across all solar adopters. At the block group level, median incomes are available only for all HHs, but not for OO-HHs.

Relative Income: Solar adopter HH income *as a percentage* of the median income across all HHs

- Solar-adopter incomes skew high, regardless of how broadly defined the comparison region
- The skew is smaller the more localized the comparison, as households with similar incomes tend to cluster together
- Across all scales, skews are much smaller when comparing to only OO-HHs (e.g., 123% when comparing to OO-HHs in the same county vs. 158% if comparing to all HHs)

Going forward, we use County Median Income across all HHs for calculating relative incomes

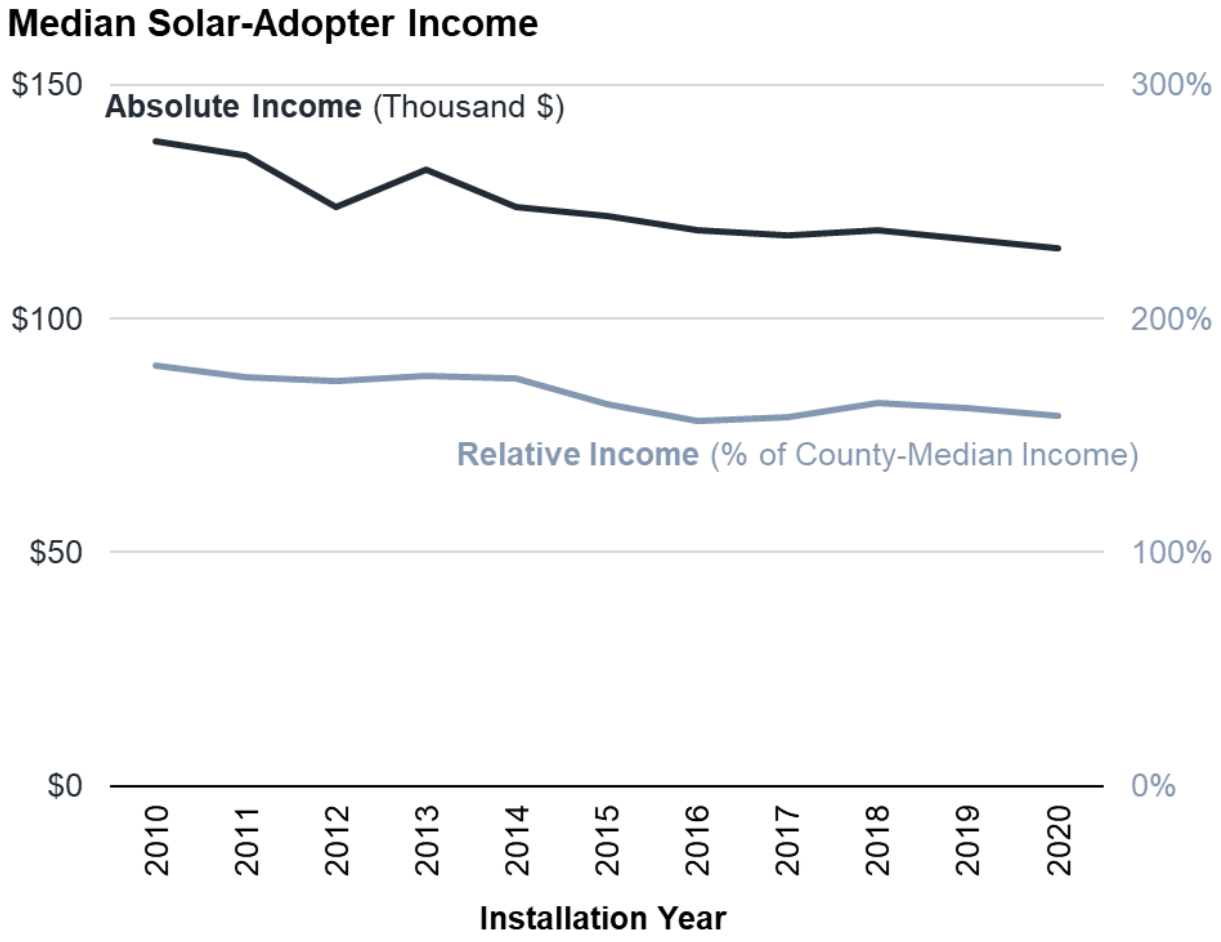
Solar-Adopter Income Trends across States



- Solar adopters in all states skew toward higher incomes, with median relative incomes (dots) ranging from 130-175% of the county median
- Skew in CA is relatively high (173%), pulling the national median up; most states are less skewed
- Varying degrees of income skew across states may reflect differences in:
  - Relative levels of solar market maturity
  - Solar policies, programs, financing availability
  - Broader socio-economic factors (income inequality, cost of living, educational levels, etc.)

See Darghouth et al. 2022 for analysis of local differences in income skew. See online data visualization tool for additional state-level data.

Solar-Adopter Income Trends over Time



** Notes: Incomes are based on the year 2021, regardless of when the PV system was installed, with no inflation adjustments.*

- Solar adoption has been slowly migrating toward less affluent households, on both an absolute (top line) and relative (bottom) basis
- Over the 2010-2020 period, median adopter incomes* fell from $138k to $115k, and from 180% to 158% of county-median income
- Long-term trends driven by falling PV prices, expanded financing options, LMI-focused programs, and general market maturation, among other factors
- Trends in relative income reflect a “deepening” of solar markets, as adoption increases among less affluent households in each market (defined here at the county level)
- Since 2016, trends in relative income are relatively flat, as solar markets have expanded into lower income states (see next slide)

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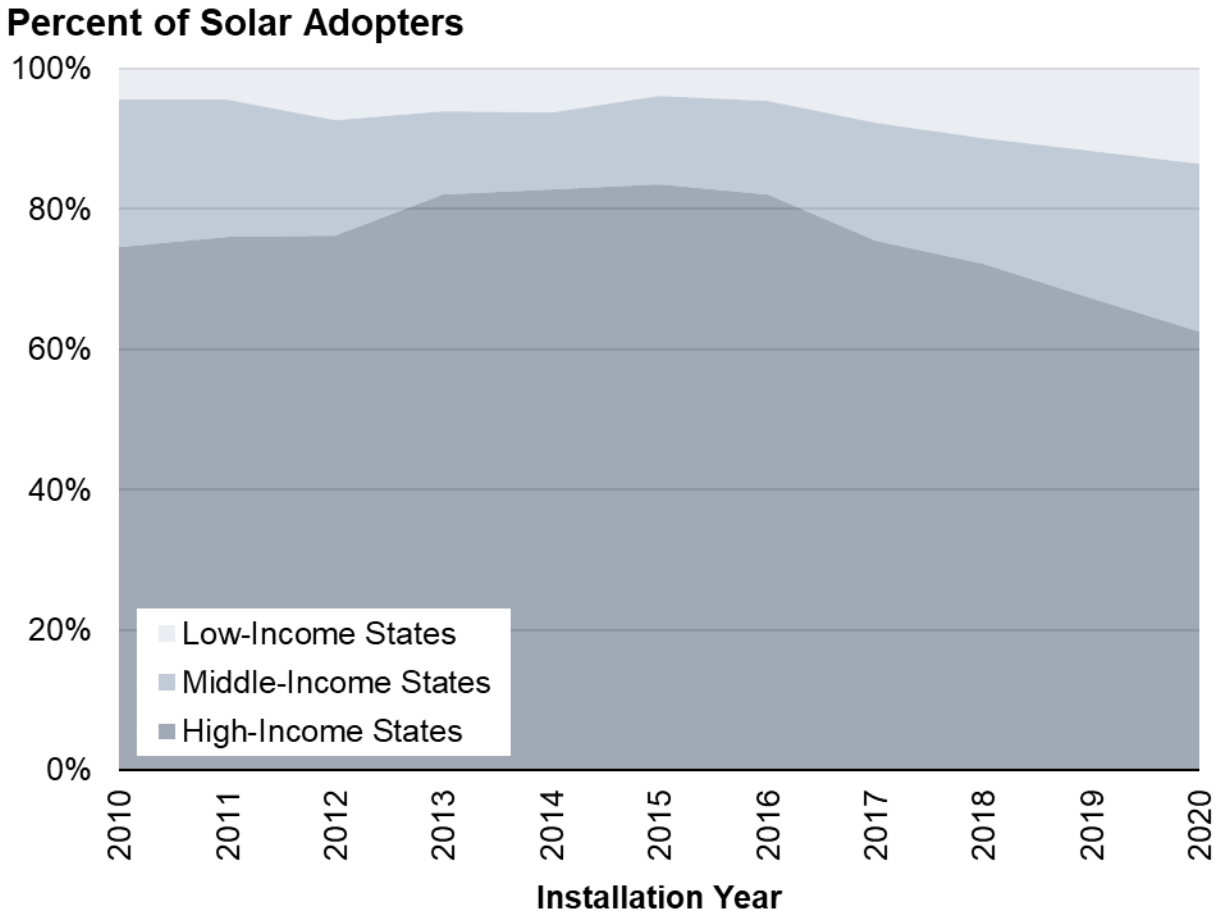
Solar Market Broadening Trends



- The U.S. market has been steadily broadening into low- and middle-income states* since 2016, reaching 14% and 24% of 2020 installs, respectively
- Roughly half of that growth is associated with TX and FL
- At the same time, annual installs in high-income states collectively dipped over this period
- To be sure, high-income states still comprise the bulk of the market (63% in 2020); for comparison, these states represent roughly one-third of the U.S. population

** Notes: States are grouped based on whether they fall into the lower, middle, or upper third of all states, in terms of median income of all households. Number of adopters by state is based on the estimated total market volume in each state.*

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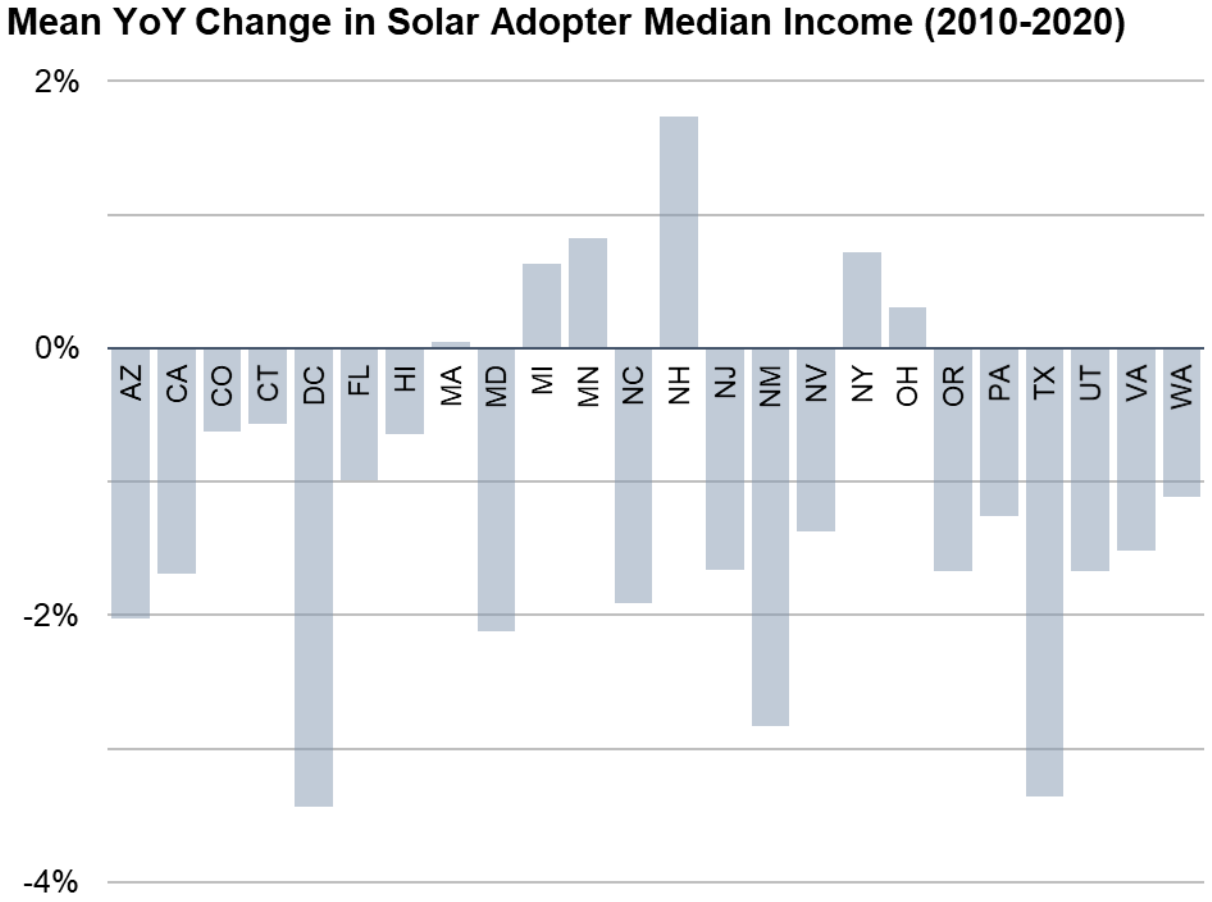
Solar-Adopter Income Trends over Time by State



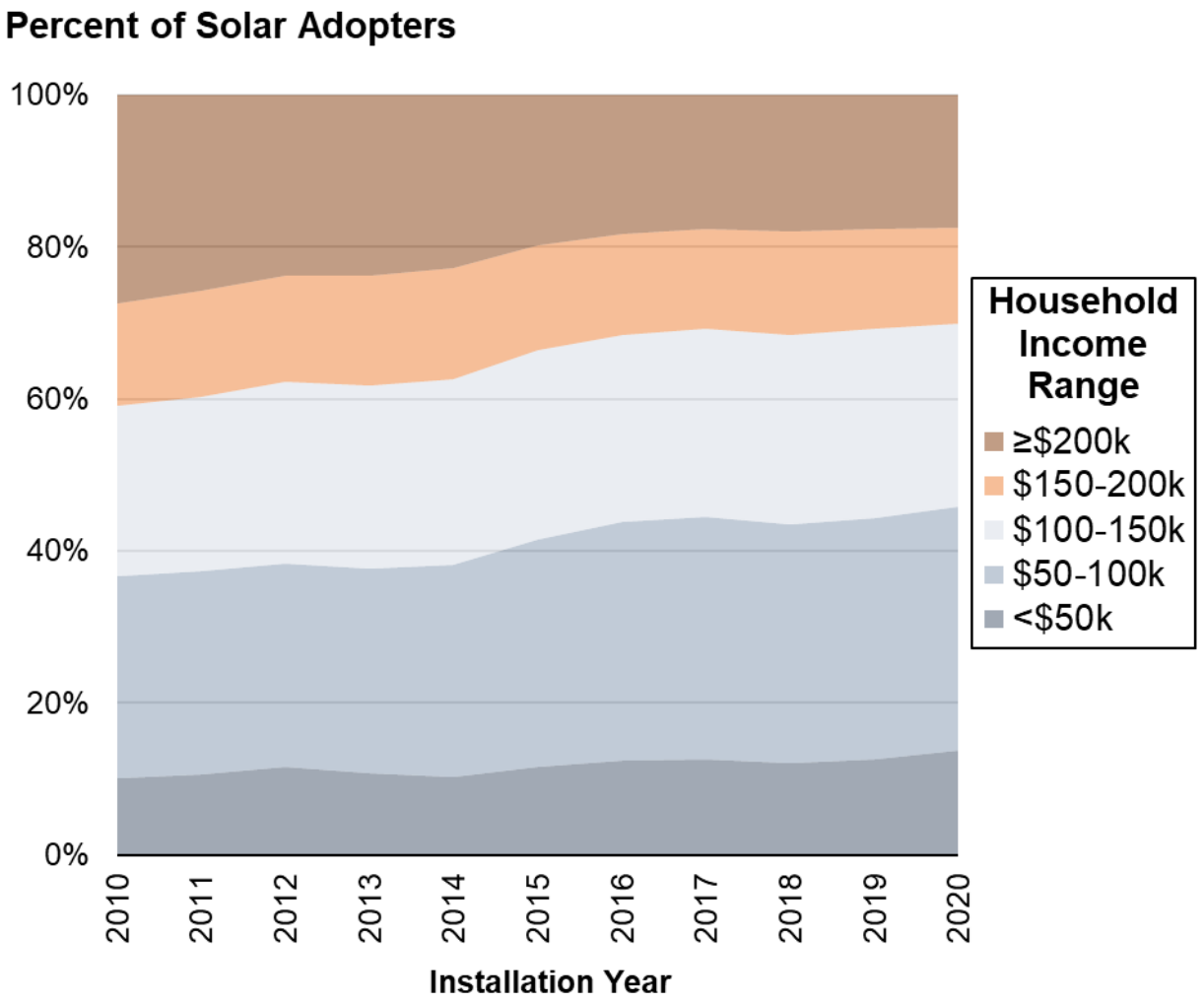
Notes: The values plotted here are the arithmetic average of the annual year-over-year (YoY) percentage change in median solar-adopter incomes in each state from 2010 to 2020

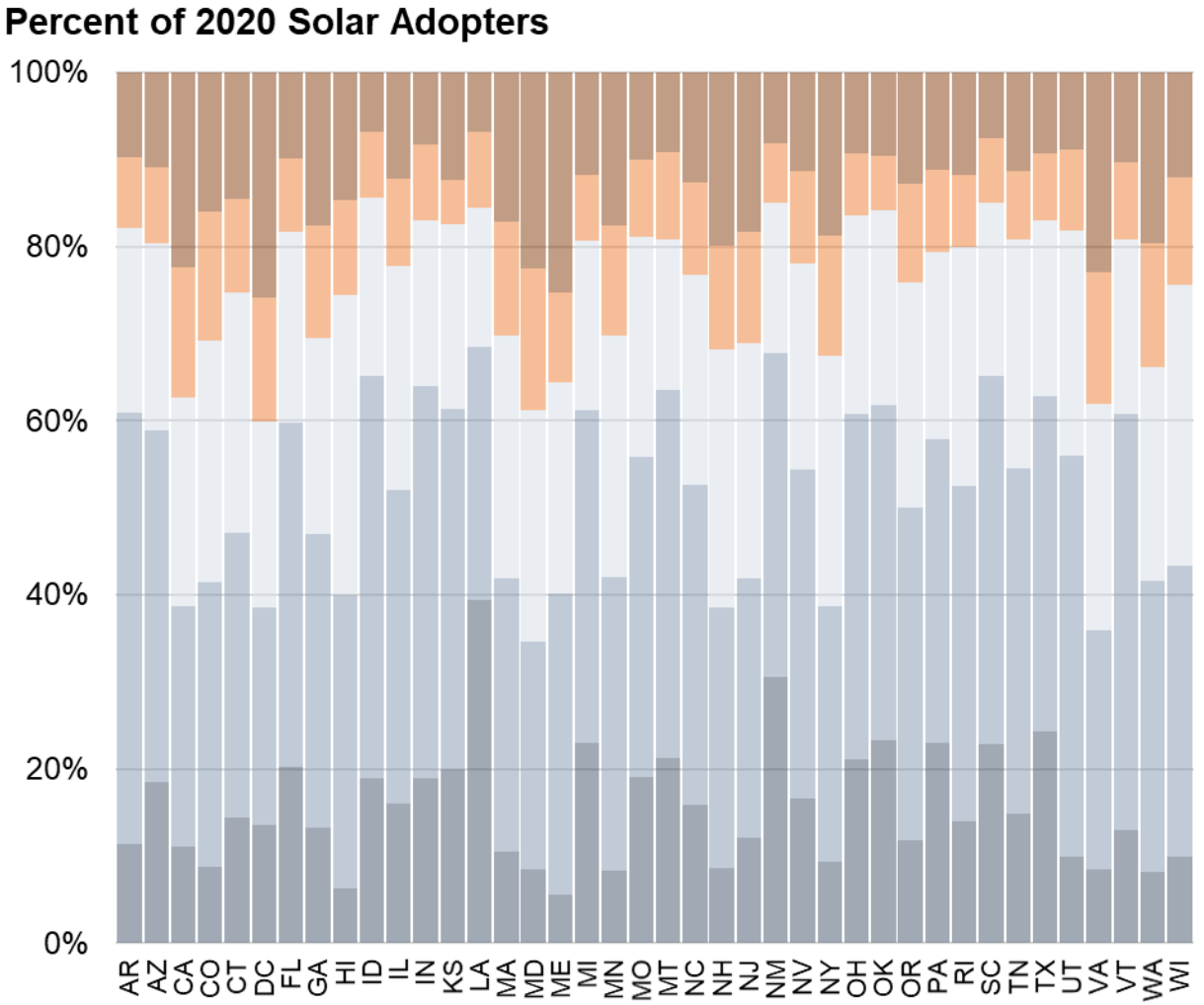
- Most states show declining solar-adopter incomes over time, with generally an average 1-2% drop per year over the 2010-2020 period
- Reflects some combination of both a broadening (i.e., a shift toward less affluent counties) and deepening of state solar markets
- A few states show the opposite trend, with solar-adopter incomes rising over time, often related to geographic shifts in the state market (e.g., in NY, reflects increased market share downstate around NYC)

Time series data and other state-level details are available through the online data visualization tool

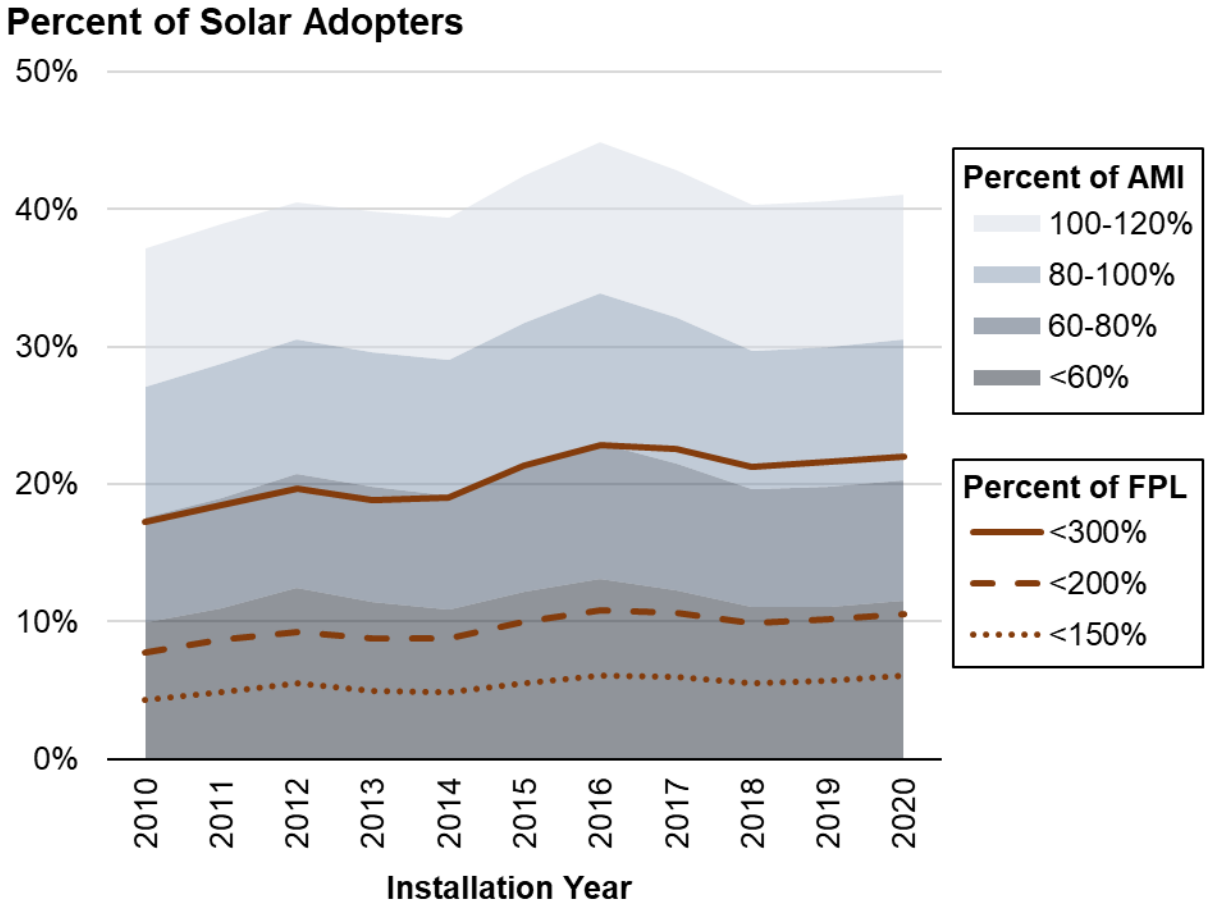
Solar-Adopter Income Distributions over Time and by State

Similar trends to median incomes, but highlighting the spread in adopter incomes





LMI Share of U.S. Solar Adopters over Time



Notes: "Area" refers to the applicable U.S. Census Core-Based Statistical Area or county (for rural areas). Both AMI and FPL vary by household size. For a family of three, the FPL for the contiguous 48 states was $21,720 in 2020.

Various income metrics and thresholds can be used to define "low-to-moderate income" (LMI):

- 150-200% of Federal Poverty Level (FPL) is common, especially in low-income federal programs
- 80% of Area Median Income (AMI) is also often used
- Higher thresholds (e.g., 120% of AMI, 300% of FPL) are sometimes used to include "moderate" income

- Regardless of how it is defined, LMI shares of U.S. solar adopters are trending up over time
- Across all U.S. solar adopters in 2020:
  - **AMI:** 20% were <80% of AMI, 41% were <120% of AMI
  - **FPL:** 6% were <150% of FPL, 22% were <300% of FPL
- AMI-based metrics account for the fact that adoption is concentrated in wealthier states

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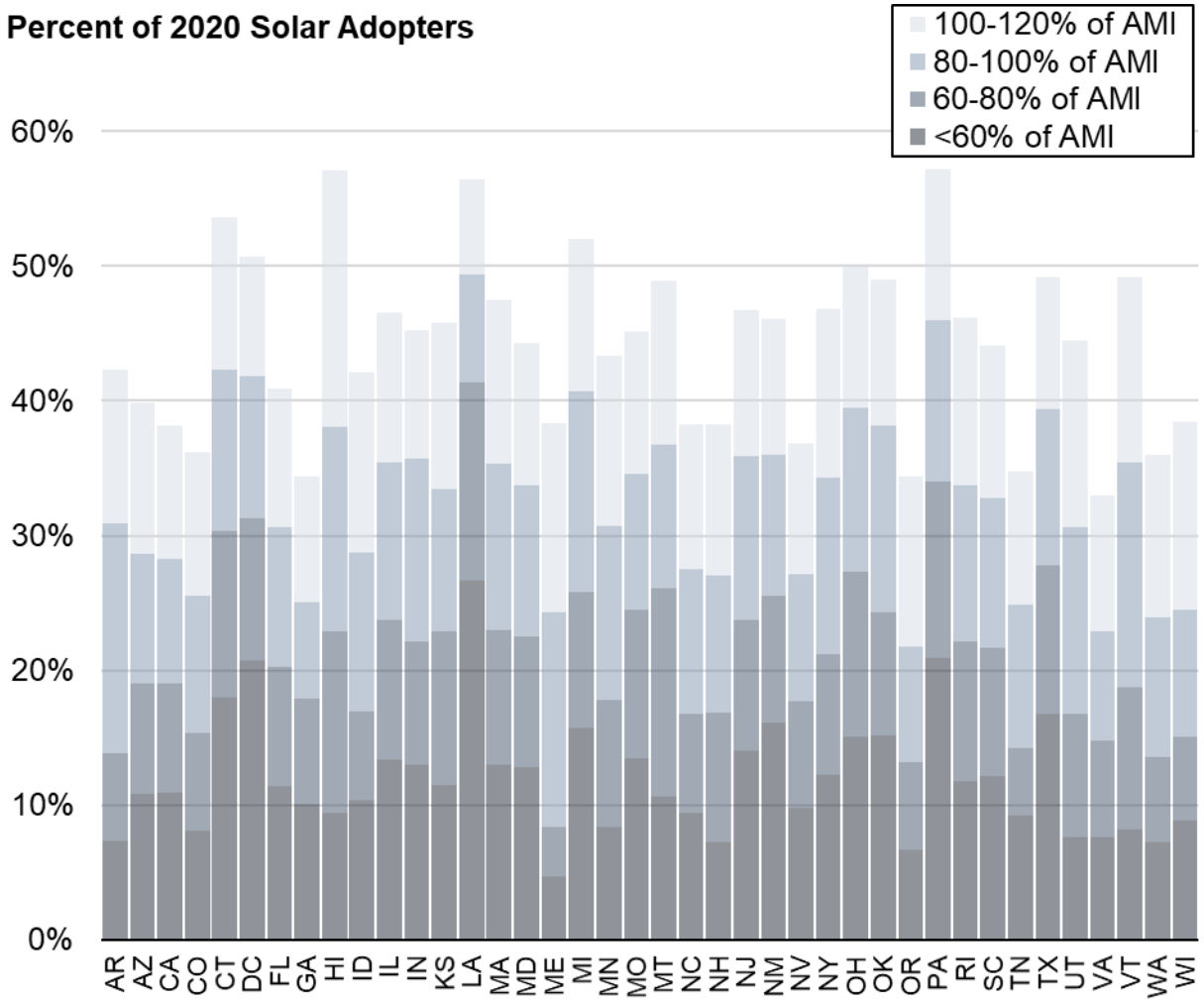
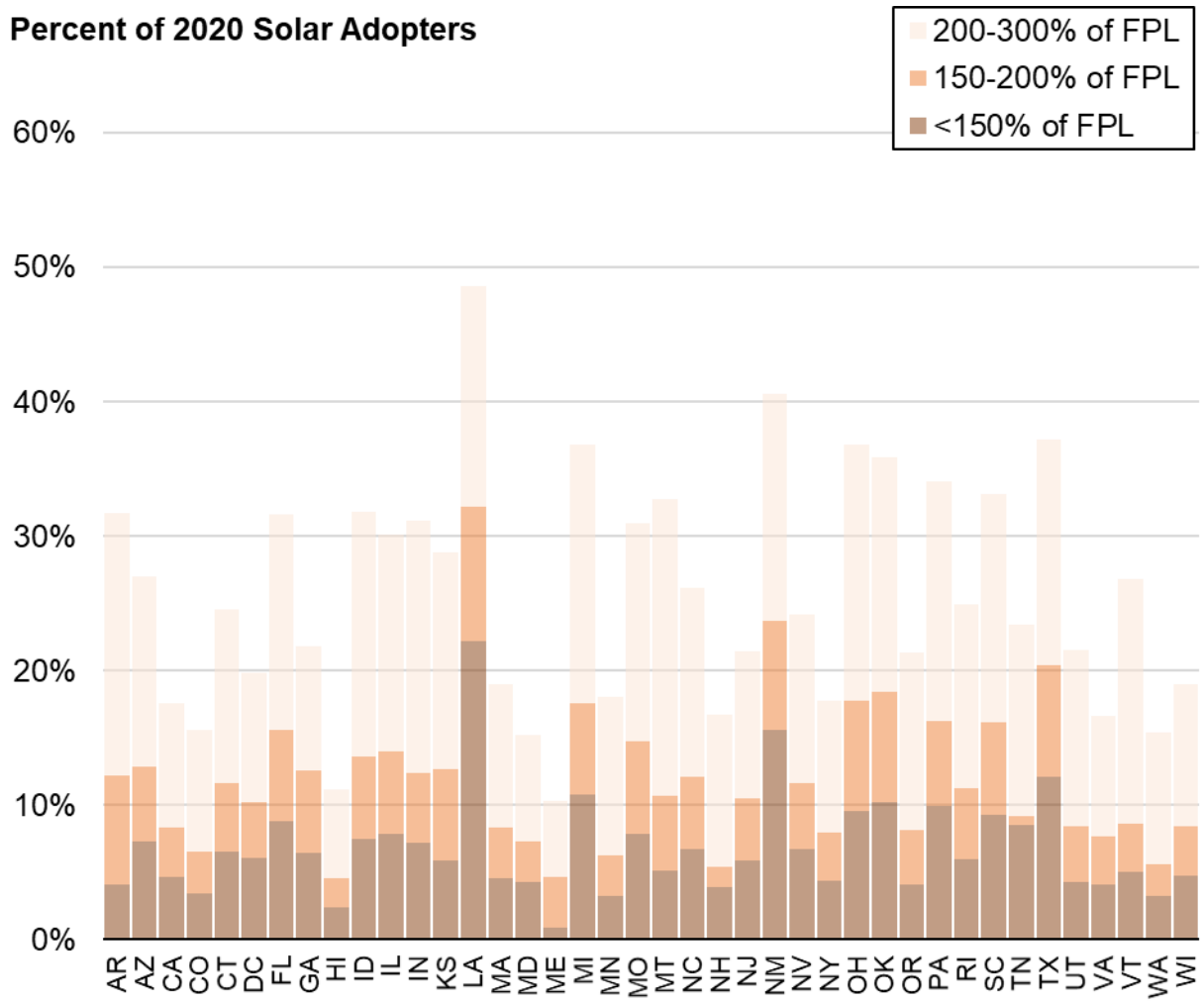
LMI Share of Solar Adopters by State

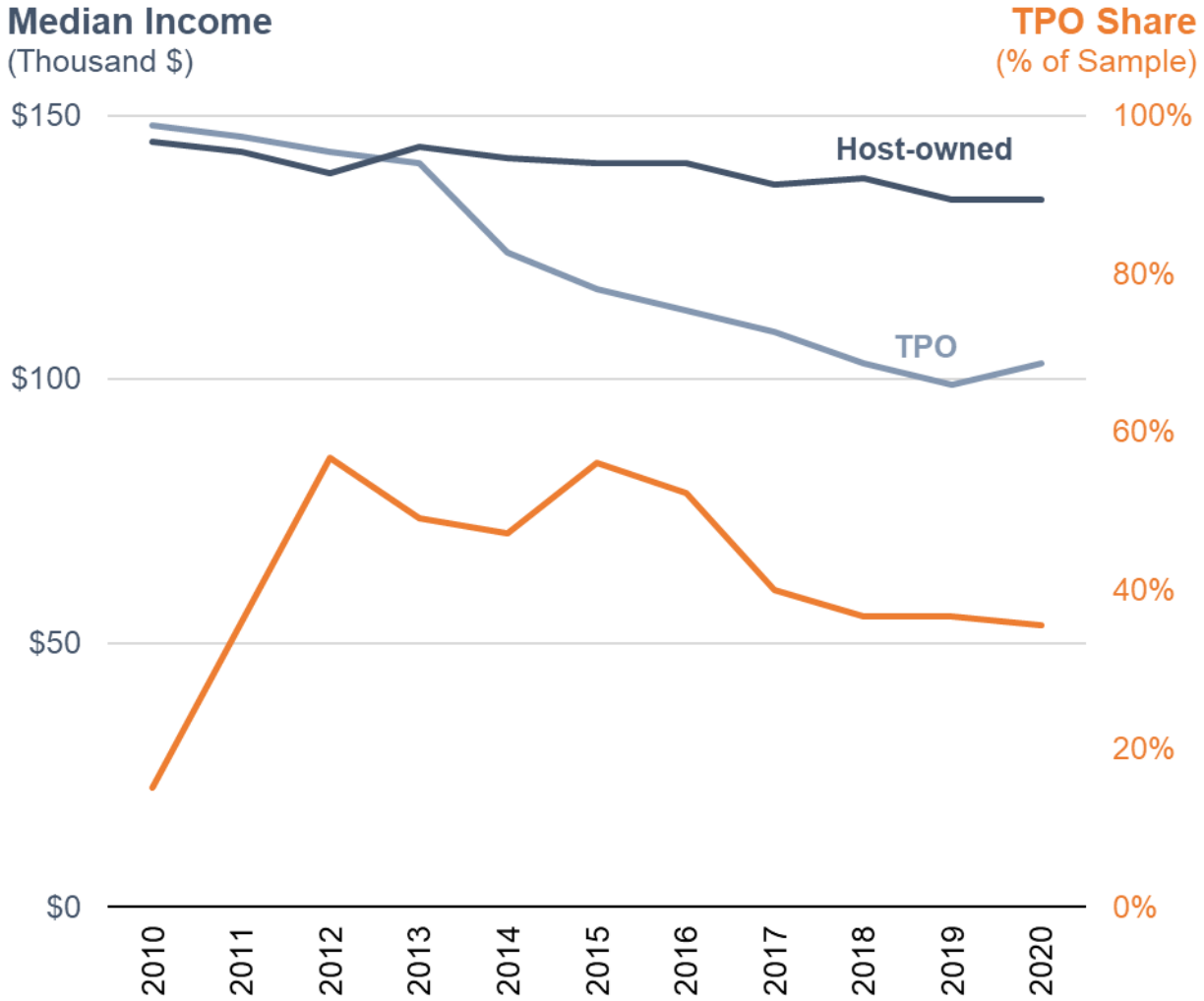




Solar-Adopter Income Trends by Segment

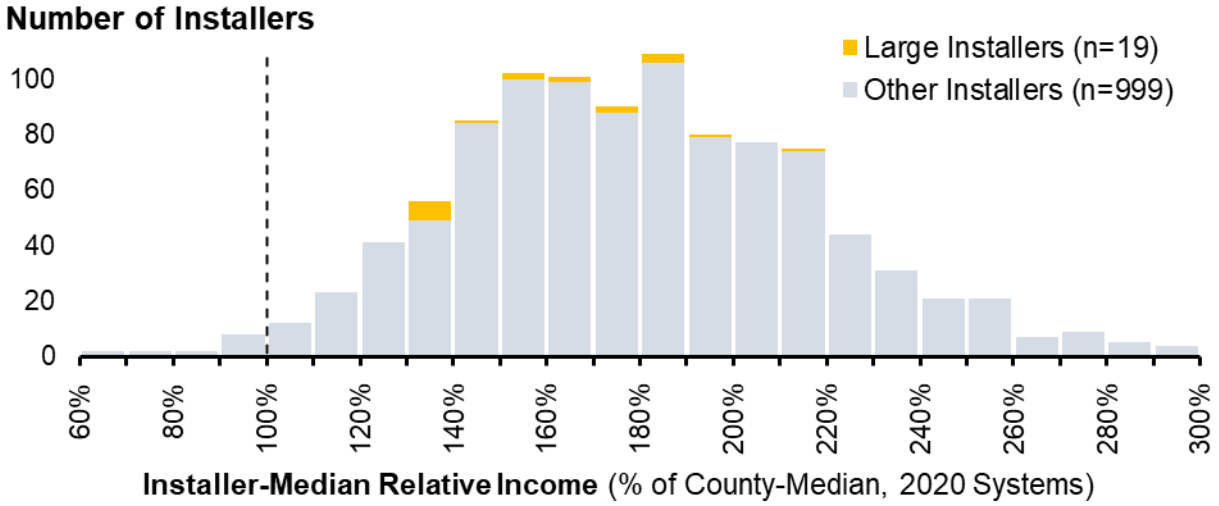
- Beyond looking at how solar-adopter incomes vary over time and geography, we can also evaluate differences by market segment
- Here, we focus on several segmentations:
  - Third-party vs. host-owned systems
  - System size by income level
  - Differences across solar installers
  - PV systems installed with battery storage vs. stand-alone PV systems
  - PV systems installed on multi-family vs. single-family homes
- Each comparison is based on the subset of the sample for which data on the relevant segmentation are available (see slide 45 for applicable sample sizes)
- Comparisons are made primarily in terms of relative incomes, though the same basic trends apply in terms of absolute income levels as well

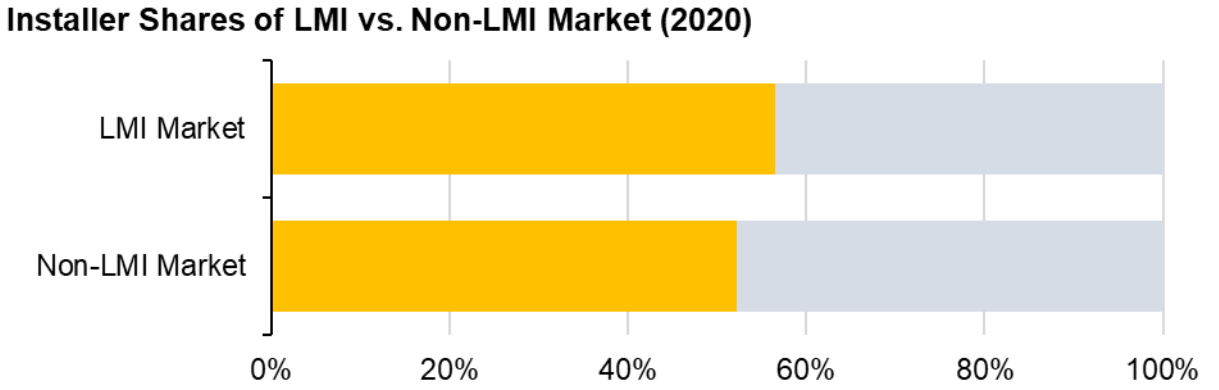
Third-Party vs. Host-Owned Systems



- Solar-adopter incomes for third-party owned (TPO) systems are presently lower, and have declined much more significantly over time, compared to host-owned systems
- O'Shaughnessy et al. (2021) found that TPO has driven adoption by lower income HHs, as opposed to simply attracting LMI HHs that would otherwise install host-owned systems
- Two implications:
  - The general trend toward lower income solar adopters can be partially attributed to expanded access to TPO
  - The decline in TPO market share since 2016 has potentially dampened the trend toward lower incomes, depending on the relative efficacy of loan financing in reaching less affluent households

Installer-Level Trends

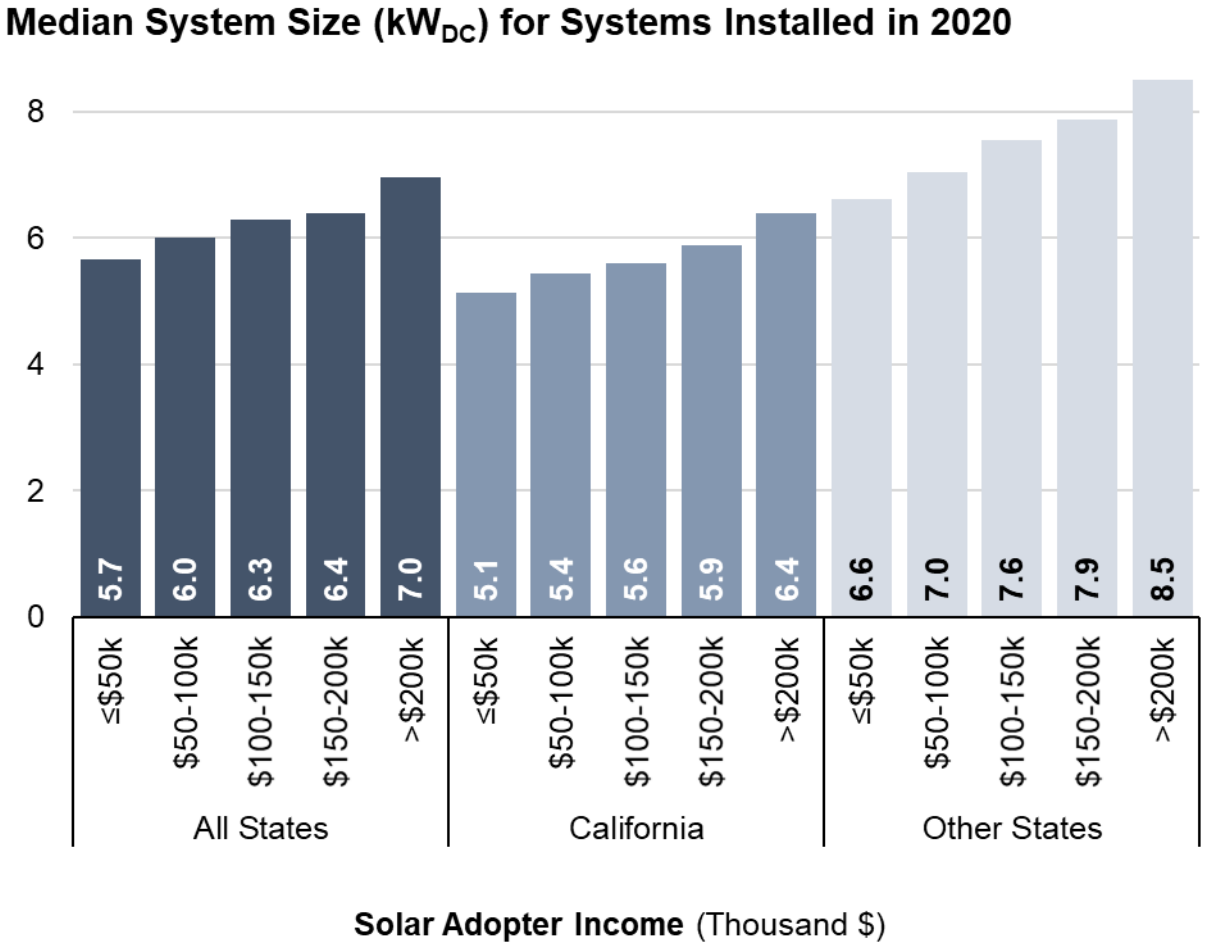




Notes: The histogram is based on installers with at least 10 systems installed in 2020. Large installers defined as those installing more than 1,000 systems in 2020. LMI market is defined as customers with household incomes less than 120% of AMI.

- Installers vary considerably in terms of their customers' income profile, though virtually all primarily serve customers with incomes higher than their county median (top figure)
- A small subset of installers primarily serve customers with relatively low incomes (to the left of the dashed line), in some cases as a core part of their business model
- Large installers* account for over half (57%) of all LMI systems installed in 2020 (bottom figure)
  - Roughly in line with their share of the non-LMI market
  - Large installers are slightly more likely to serve LMI customers than other installers, potentially due to greater prevalence of TPO offerings

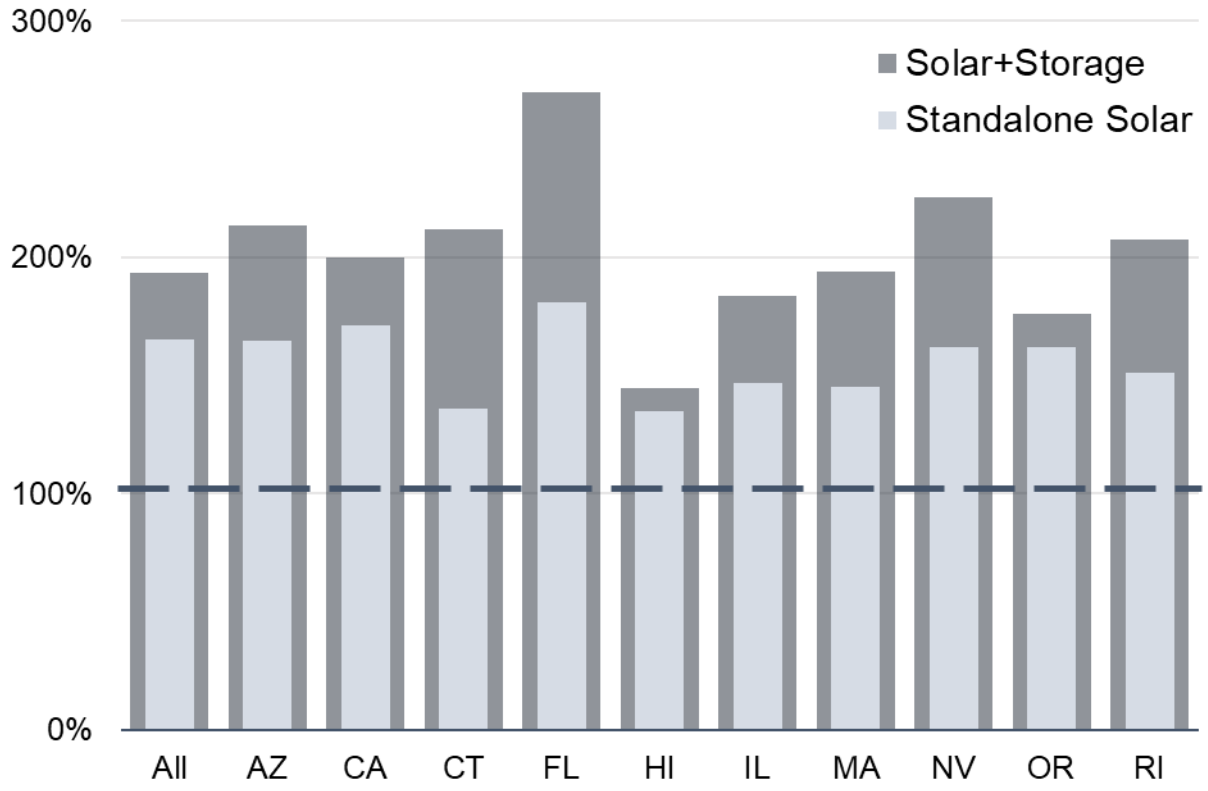
System Size by Income Level



- Higher income households install larger systems
- Across the sample, systems installed by the highest-income households were 23% larger than those of the lowest-income households, based on median system sizes
- California systems are relatively small; differences in system size across income levels are even more pronounced when we separate out California from other states
- Aside from the fact that larger systems cost more, higher-income households may also tend to have larger homes with larger roof area and/or higher electricity consumption

Paired Solar+Storage vs. Stand-alone Solar

Median Solar-Adopter Relative Income
(2020 Systems, % of County Median Income)



Notes: Figure includes states with at least 30 systems within each group. AZ and FL are included, but the data in this particular figure are based on a narrow subset of utilities and therefore may not be representative of the state as a whole.

- Roughly 7% of PV systems in the 2020 sample were paired with storage
- Paired solar+storage adopters consistently have higher incomes than stand-alone solar adopters—as expected, given the additional cost of storage
- That income differential between adopters of paired vs. stand-alone PV is relatively narrow in CA and HI, the two states with the greatest uptake of residential storage
  - In CA, this may be partly due to storage rebates available for low-income customers
  - In HI, roughly 80% of all PV systems installed in 2020 were paired with storage

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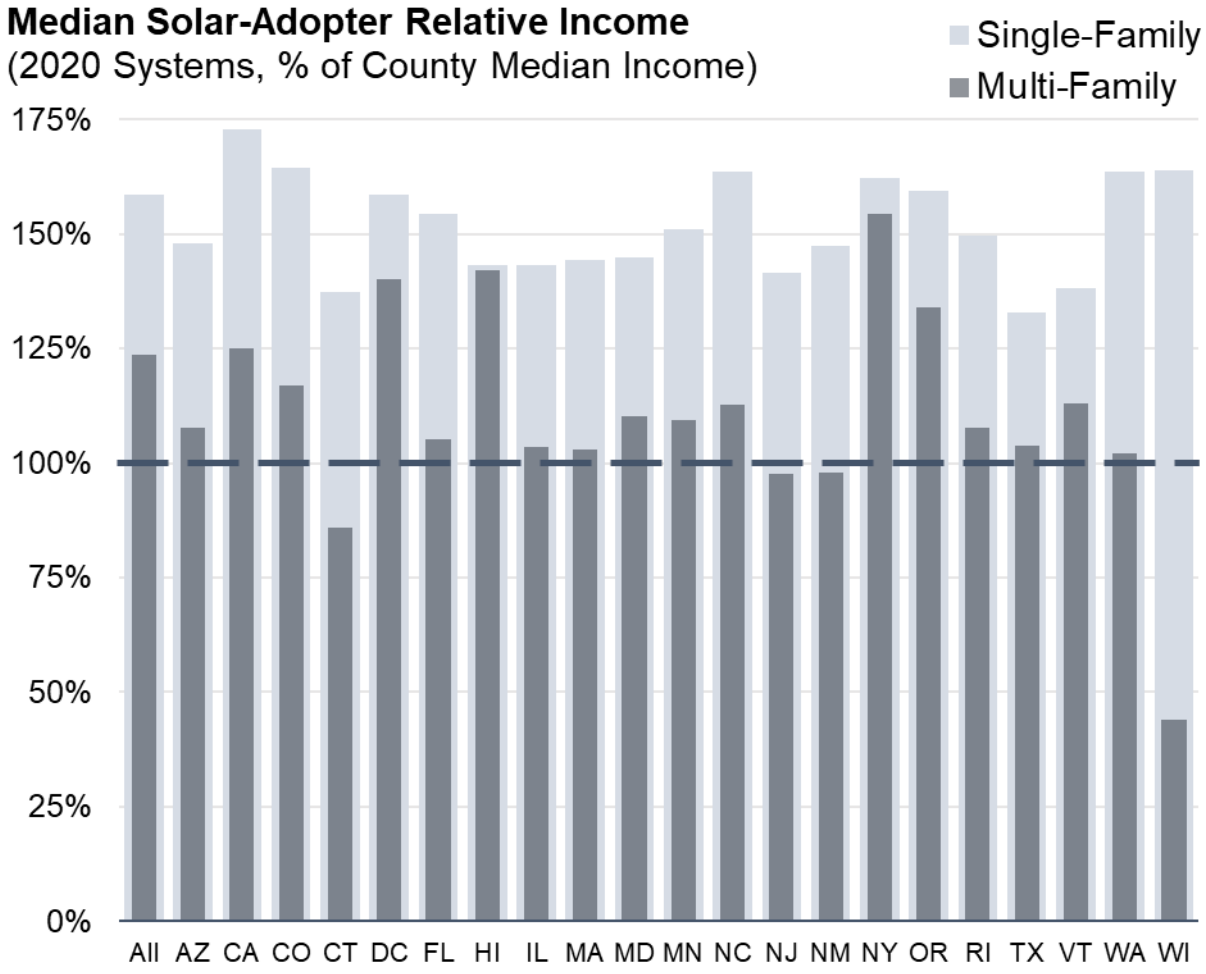
Multi-Family vs. Single-Family



Notes: Figure includes states with at least 30 systems within each group.

- Roughly 3% of all solar systems in the 2020 sample were installed on multi-family buildings
  - Most are owner-occupied; includes condos
- Multi-family solar adopter incomes are generally well below those of single-family adopters
- But multi-family solar adopters still generally skew high compared to the general population: nationally, they in 2020 had a median income equal to 124% of their county-median
- Data on participation in income-qualifying solar programs is incomplete, but suggests higher participation by multi-family than single-family households

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Other Socio-Economic Trends for Solar Adopters

Approach to Describing Other Socio-Economic Trends

Going beyond household income, we describe trends in other financial and socio-economic attributes of solar adopters*:

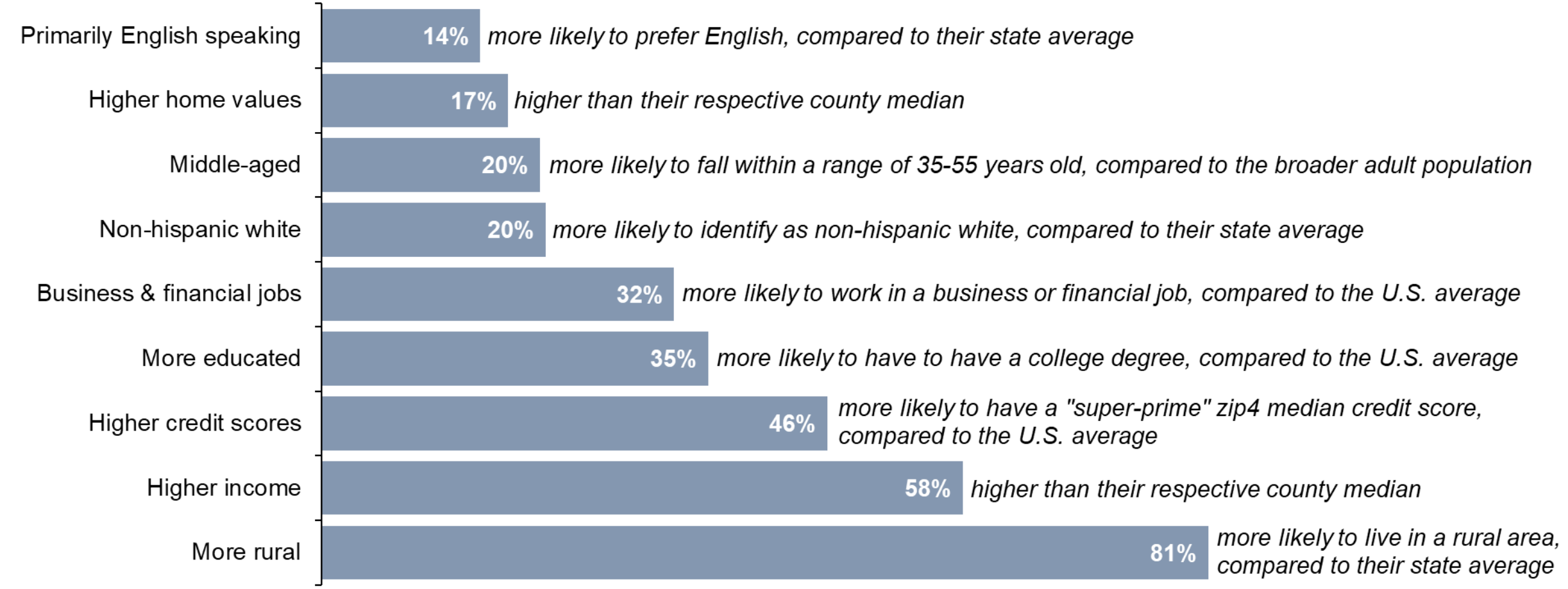
- Race and Ethnicity
- Language
- Rural vs. Urban
- Education Level
- Occupation
- Age
- Home Value
- Credit Scores

**Based in most cases on the primary householder; see slides 42-43 for definitions and sources*

- Some of the same basic trends emerge as with income:
  - Solar adopters differ from the broader US population, but those differences are diminishing over time
  - National trends reflect broad geographical patterns in solar adoption—most notably California's dominant share of the market
- Some of these attributes may correlate to income, contributing to parallel trends

Summary of Solar-Adopter Socio-Economic Attributes

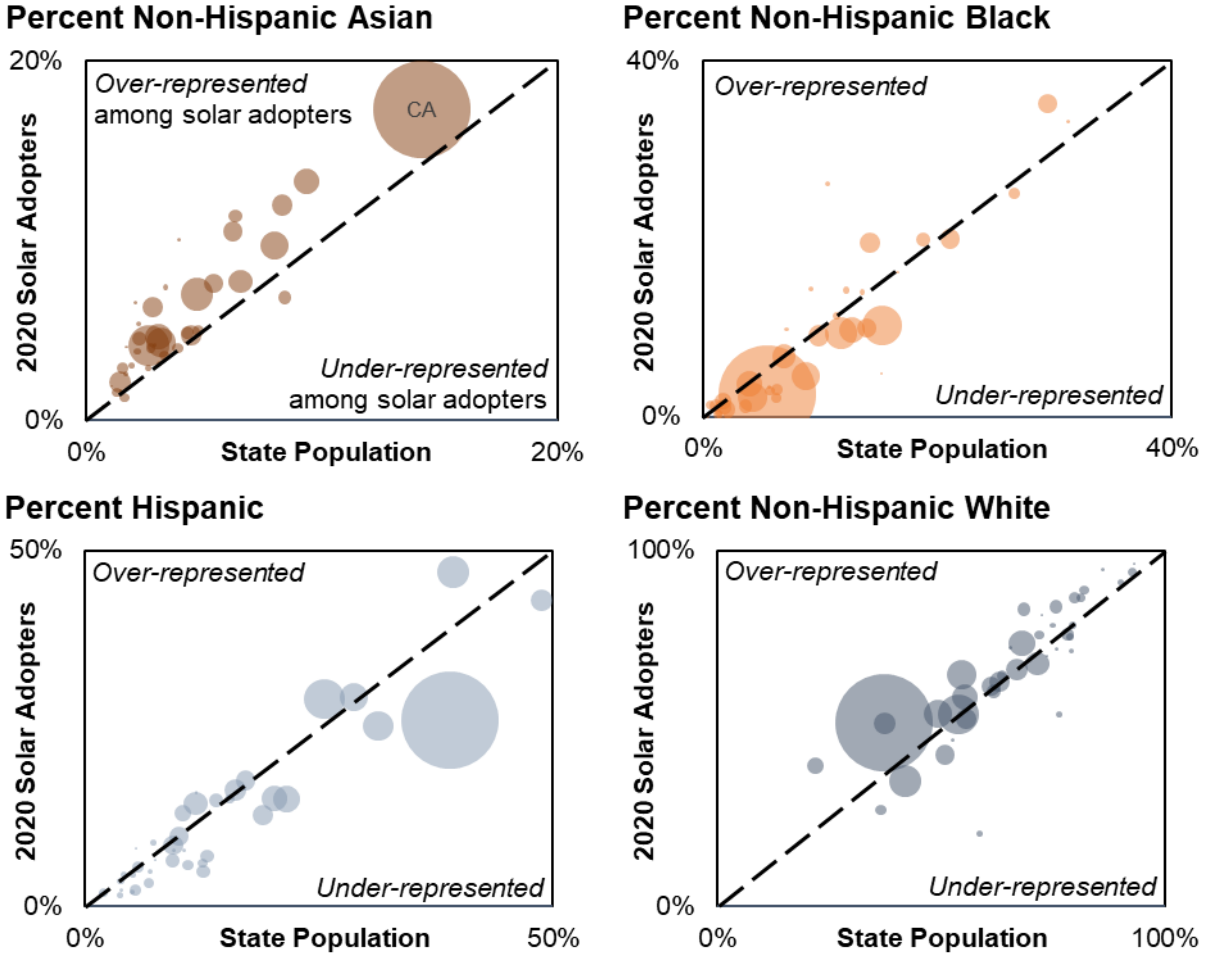
Compared to the General Population 2020 Solar Adopters Tend to Have or Be...



Context and additional details provided on the following slides

Race and Ethnicity

State-level comparisons: 2020 solar adopters vs. general population



Notes: Distributions for solar adopters are based on the primary householder.

- White and Asian households are generally *over-represented* among solar adopters, while Hispanic and Black households are *under-represented* relative to the general population in each state
- Each group differs both in the *consistency* and *degree* to which their representation among solar adopters skews from the state population
- The trends are most consistent for Asian households, which are over-represented among solar adopters in almost every state, whereas the trends for other groups are more mixed
- The degree of skew is strongest for Asian (over-represented) and Black (under-represented) households

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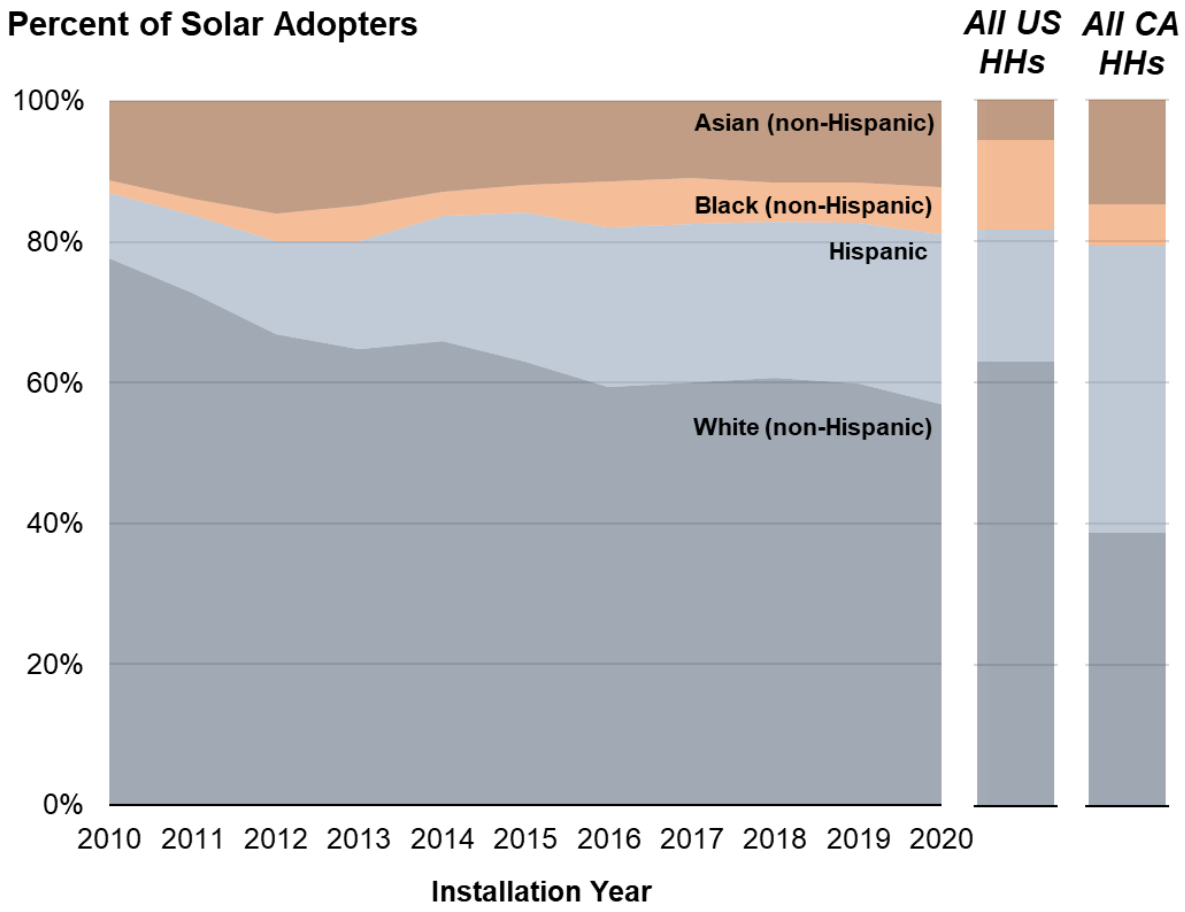
Race and Ethnicity:
National trends over time

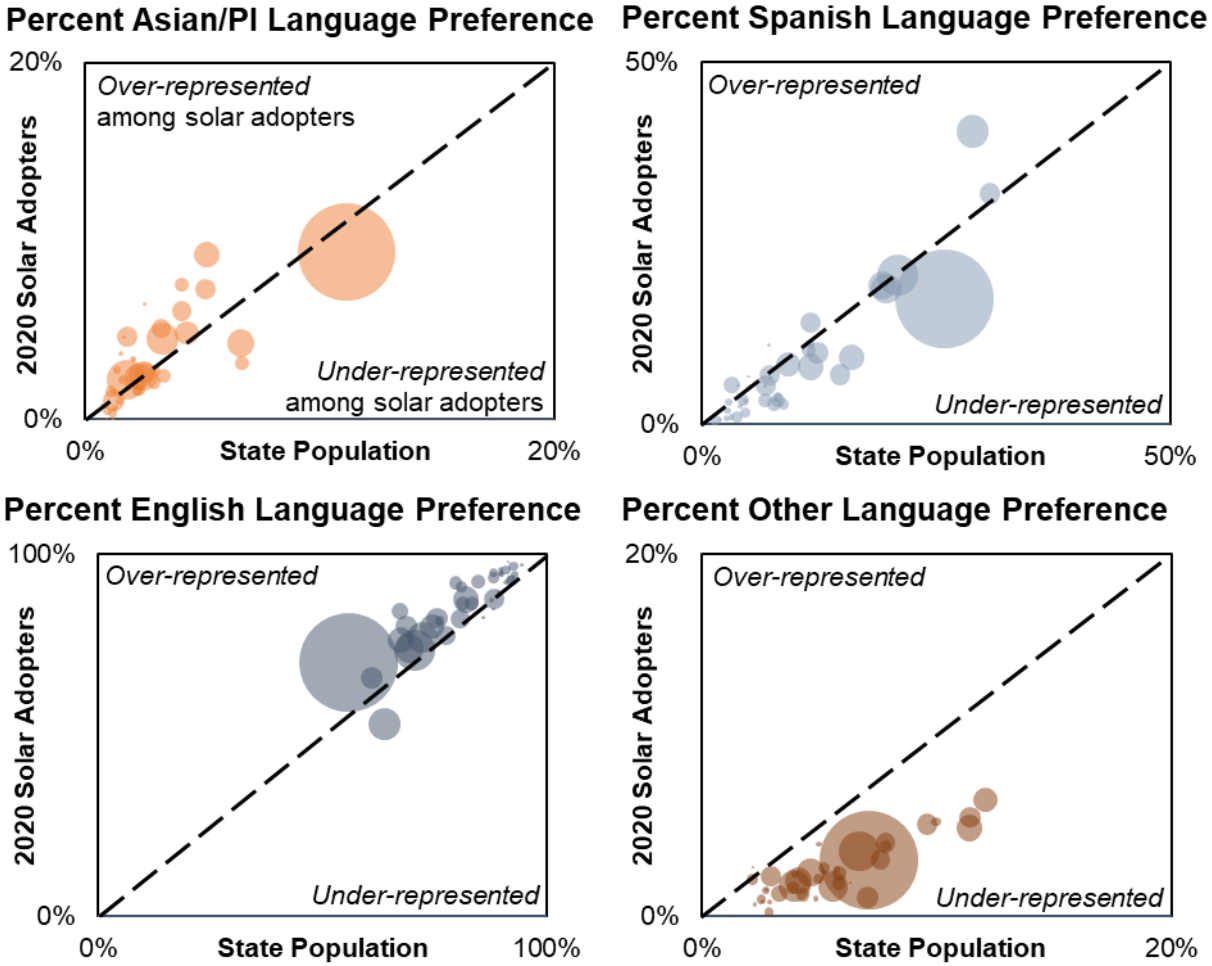


Notes: Distributions for solar adopters are based on the primary householder.

- Over time, the national distribution exhibits a declining share of White and increasing share of Hispanic households, as adoption broadens and deepens into Hispanic communities
- At the aggregate national level, solar adopters in 2020 were 12% Asian, 6% Black, 24% Hispanic, and 56% White
- Compared to the broader U.S. population, solar adopters have greater representation by Asian and Hispanic households, lower representation among Black households, and similar representation by White households
- The national distribution is heavily impacted by California, which has relatively large Hispanic and Asian populations

Language Preference

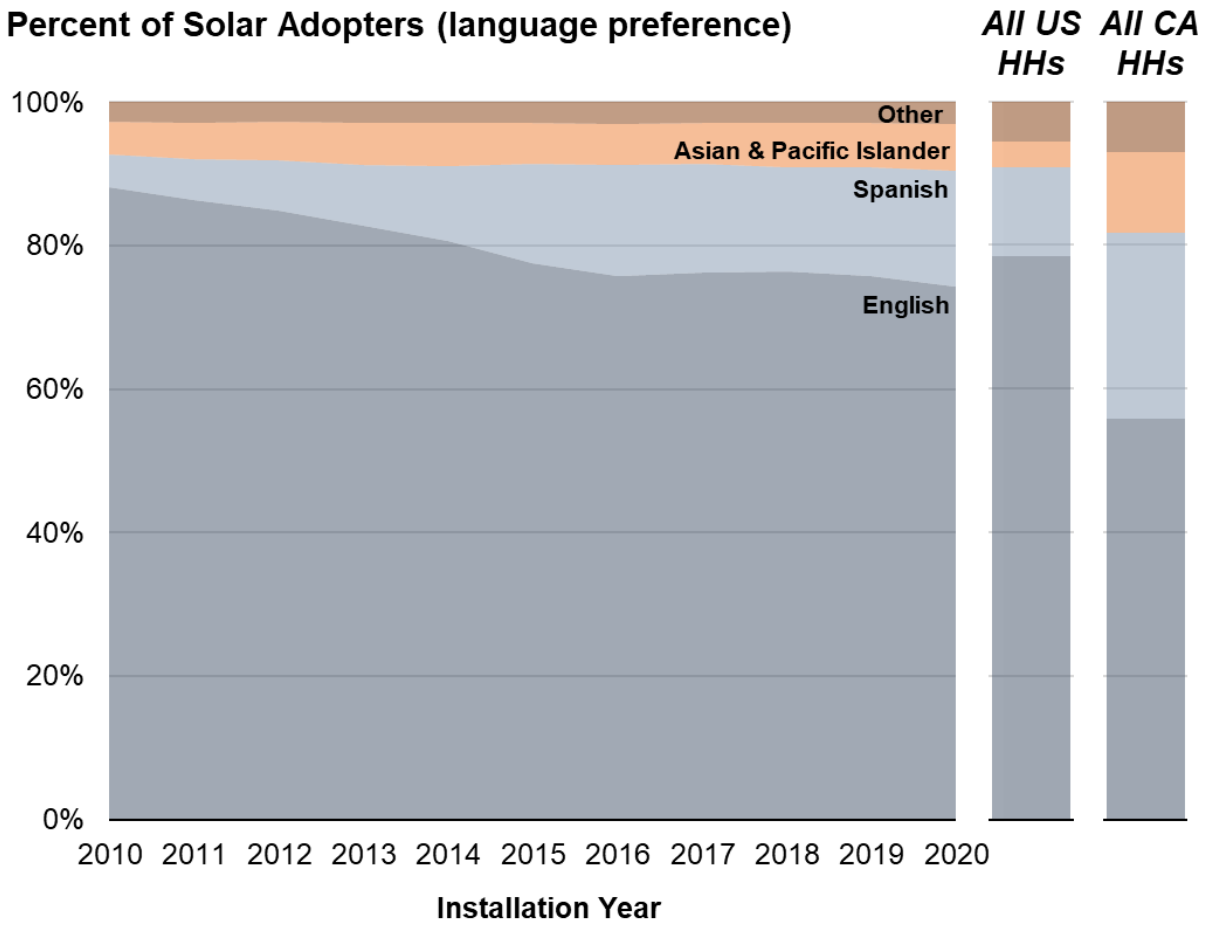
State-level comparisons: 2020 solar adopters vs. general population



Notes: Households are classified by the language preference of the "primary" householder. Language groupings are based on the ACS. "Other" includes "Other Indo-European".

- Households with English-language preference are over-represented among solar adopters, while Spanish-speaking are under-represented and Asian or Pacific Islander (PI) language preference show no consistent trend
- Comparing to the race/ethnicity trends show the additive effects of language preference
  - In particular, under-representation by Spanish-language preference households is much stronger than it is for Hispanic households
  - Similarly, while Asian ethnicities are consistently over-represented, the same cannot be said for households that predominantly speak Asian/PI languages

Language Preference:
National trends over time



Notes: Households are classified by the language preference of the "primary" householder. Language groupings are based on the ACS. "Other" includes "Other Indo-European".

- Mirroring the national trend in race/ethnicity, the trends here show an increasing share of households with Spanish-language preference and declining share of English-preference
- At the national level, the language preference of solar adopters in 2020 was 74% English, 16% Spanish, 6% Asian/PI, and 3% Other
- Compared to the broader U.S. population, solar adopters have greater representation by Asian/PI and Spanish-language households
- As with the earlier national trends, the distribution is heavily impacted by California, which has relatively large Spanish and Asian/PI language populations

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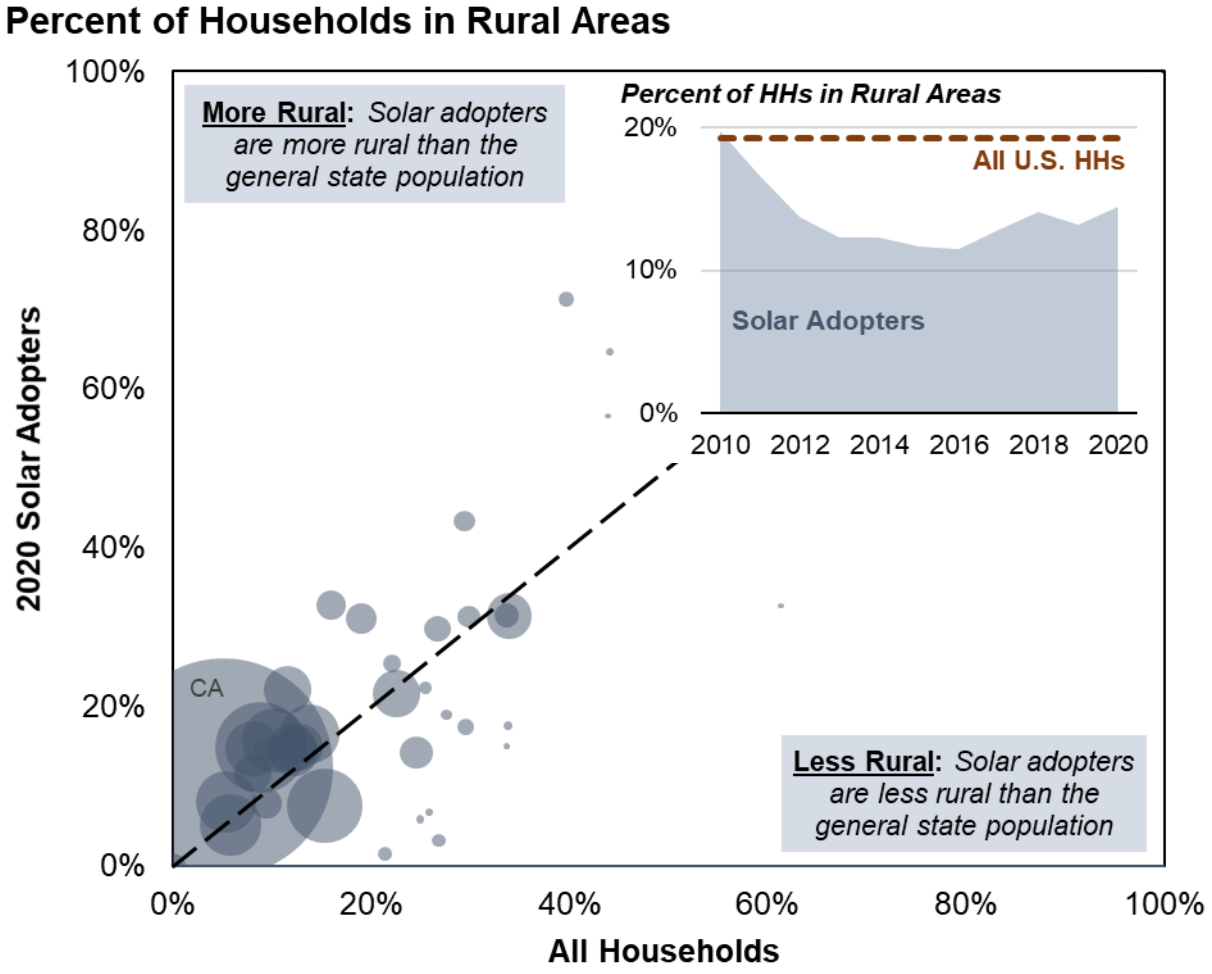
Rural vs. Urban

State comparisons and national trends over time



Notes: Urban/rural classification is based on the 2010 US Census definitions, which rely on population density and land use, among other factors.

- At the state level (bubble plot), solar adopters may be either more rural (22 states, above the diagonal line) or less rural (18 states, below the line) than the general state population
- Across states, solar adoption is heavily concentrated in less rural states: most notably California (where 5% of the population is rural, compared to 19% nationally)
- As a result, solar adopters at the national level (see insert) were less rural in 2020 (14% of adopters) than the general U.S. population
- National trends over time are mixed: the rural proportion of solar adopters declined from 2010, but has been increasing in recent years as adoption picks up in more-rural states

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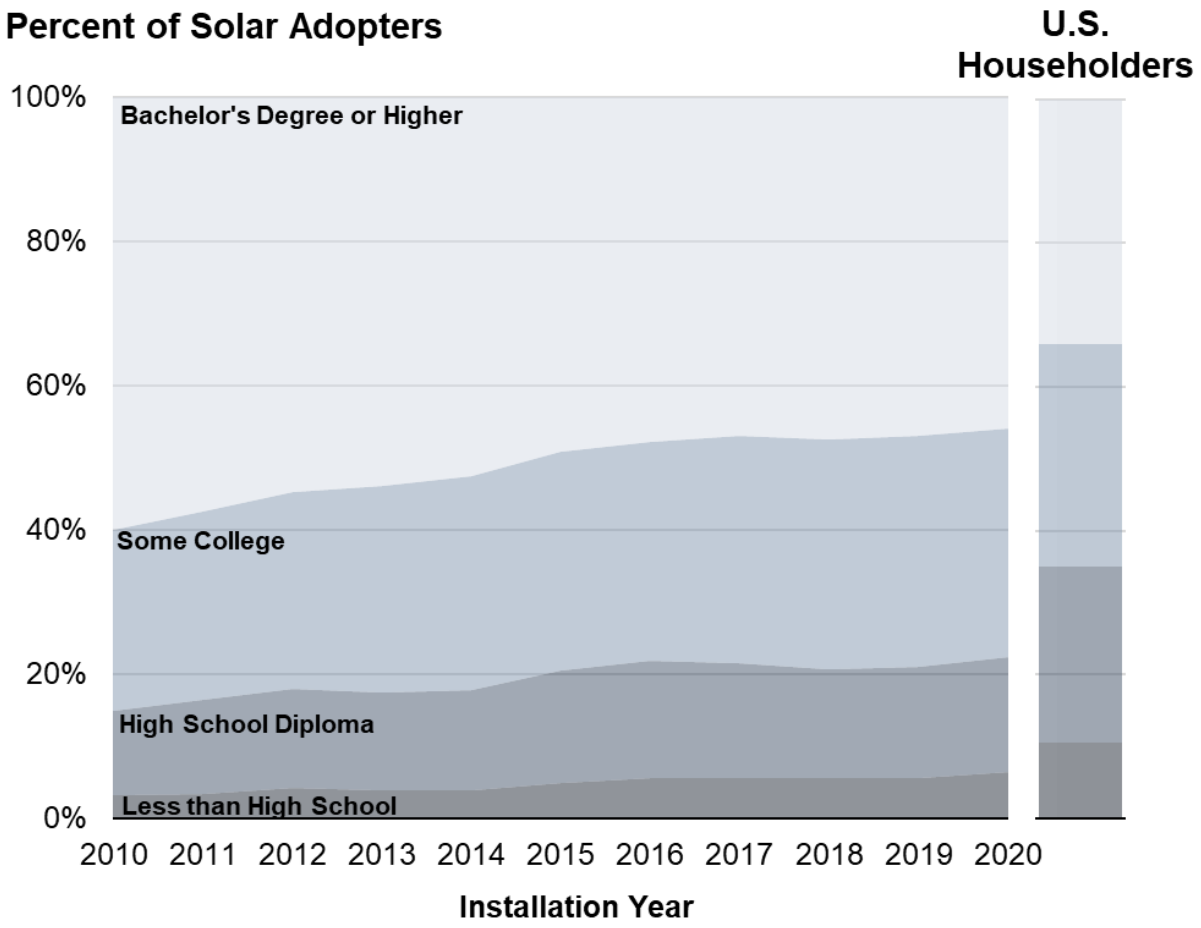
Education Level



Notes: Education level for each solar adopter is based on the highest known education level among adult household members, and for the U.S. population is based on the education level of householders.

- Almost half (46%) of all solar adopters in 2020 had a bachelor's degree or higher, while 22% had a high school diploma or less, and the remainder in between
- Solar-adopter educational levels are generally higher than the population at large, where 34% have at least a bachelors degree and 35% have no more than a high school diploma
- That skew has diminished somewhat over time: in 2010, 60% of solar adopters had a bachelors degree, while 15% had no more than a high school diploma
- As with income, the trends in educational levels have flattened in recent years

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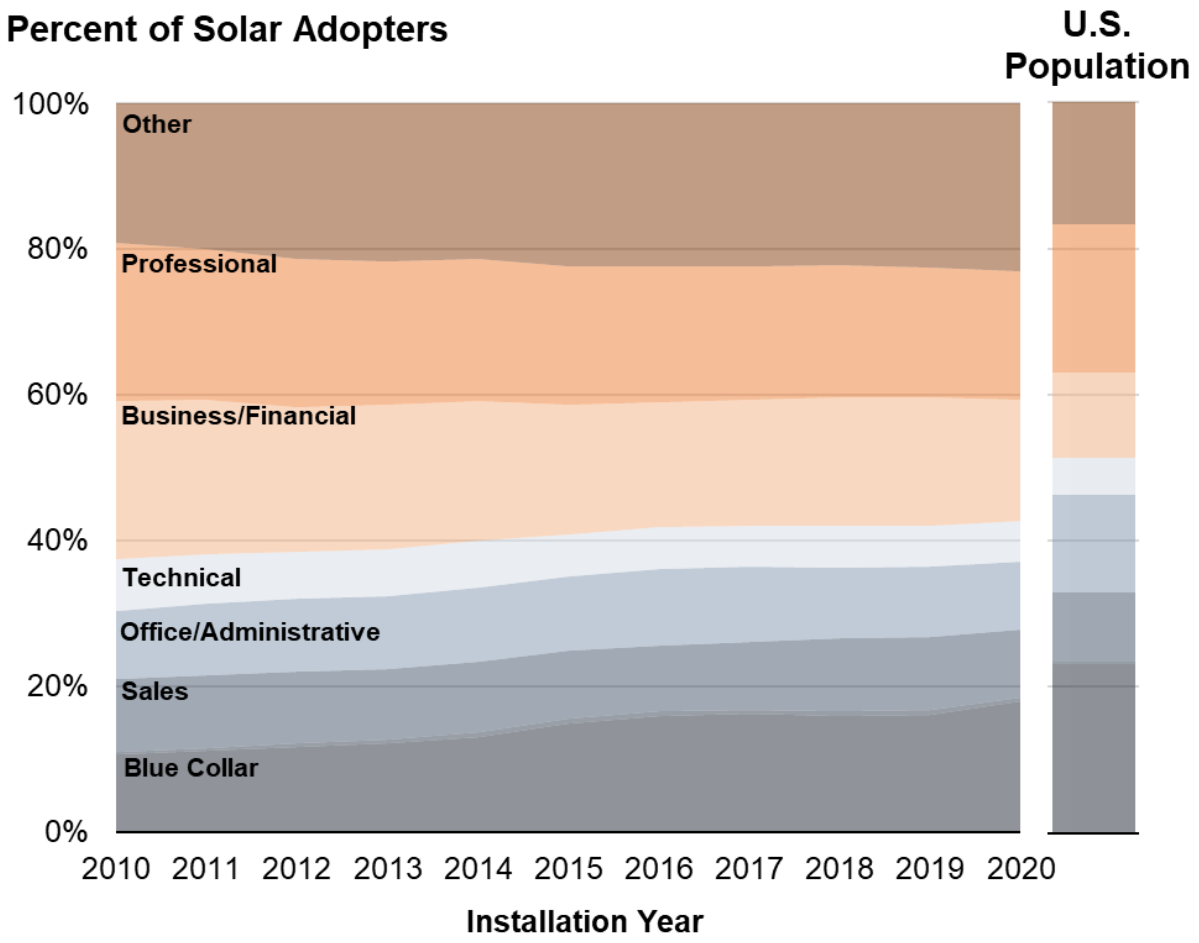
Occupation



Notes: Occupation statistics for solar adopters are based on all adult household members. Statistics for U.S. population are based on data from the U.S. Bureau of Labor Statistics, consolidated and mapped on to the Experian's occupational categories.

- Similar shares of 2020 solar adopters came from professional, business & financial, and blue-collar occupational categories, as well as the catch-all "other" category
- Compared to the broader U.S. population, solar adopters are over-represented by business & financial occupations and under-represented by blue collar occupations
- However, that skew has diminished greatly over time, as blue collar occupations comprise increasingly larger shares of new adopters (18% in 2020 vs. 11% in 2010)

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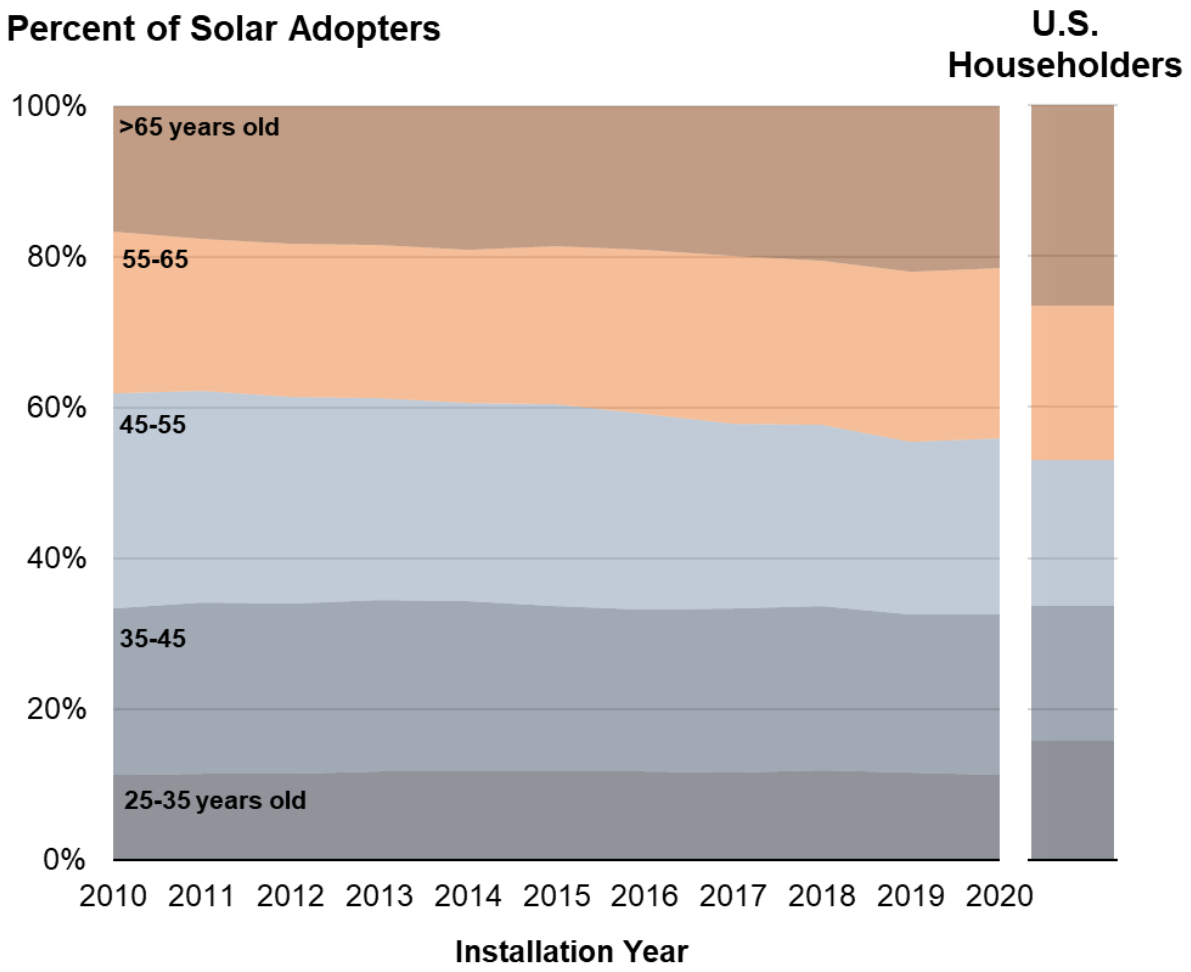
Age



Notes: Ages for solar adopters are based on the primary household member, adjusted to reflect age at the time of adoption, and for the U.S. population are based on the householder.

- Solar adopters are under-represented among the youngest (25-35) and oldest (65+) age groups
- For the youngest group, this likely reflects lower home ownership rates and incomes
- The most notable shift over time has been an increasing share of solar adopters within the oldest age group (65+), which remains under-represented, but less so than before
- The trend among the older group (mostly retirees) is consistent with growing technology acceptance (less perceived risk), and greater availability of financing (key for individuals on fixed-incomes)

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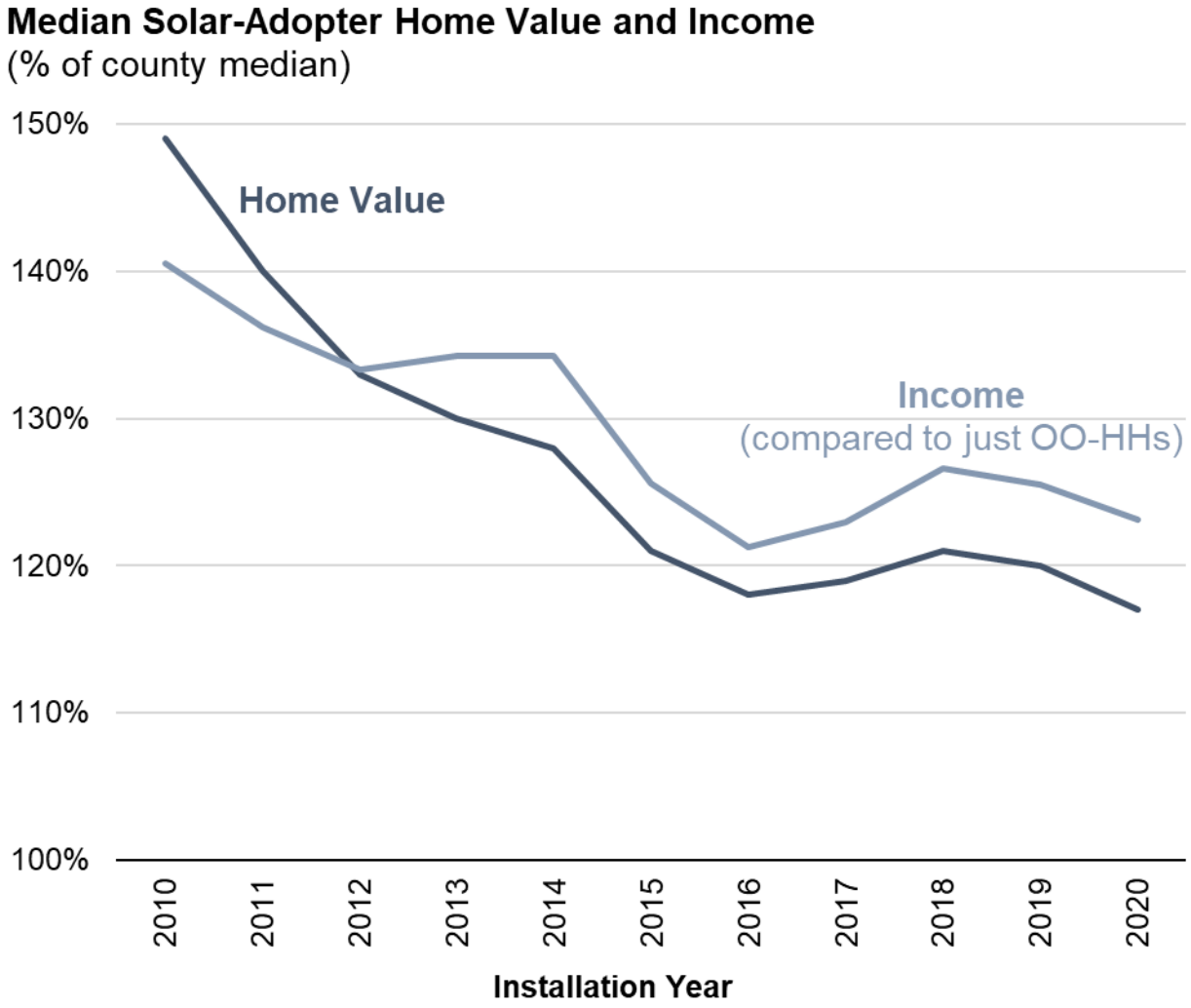
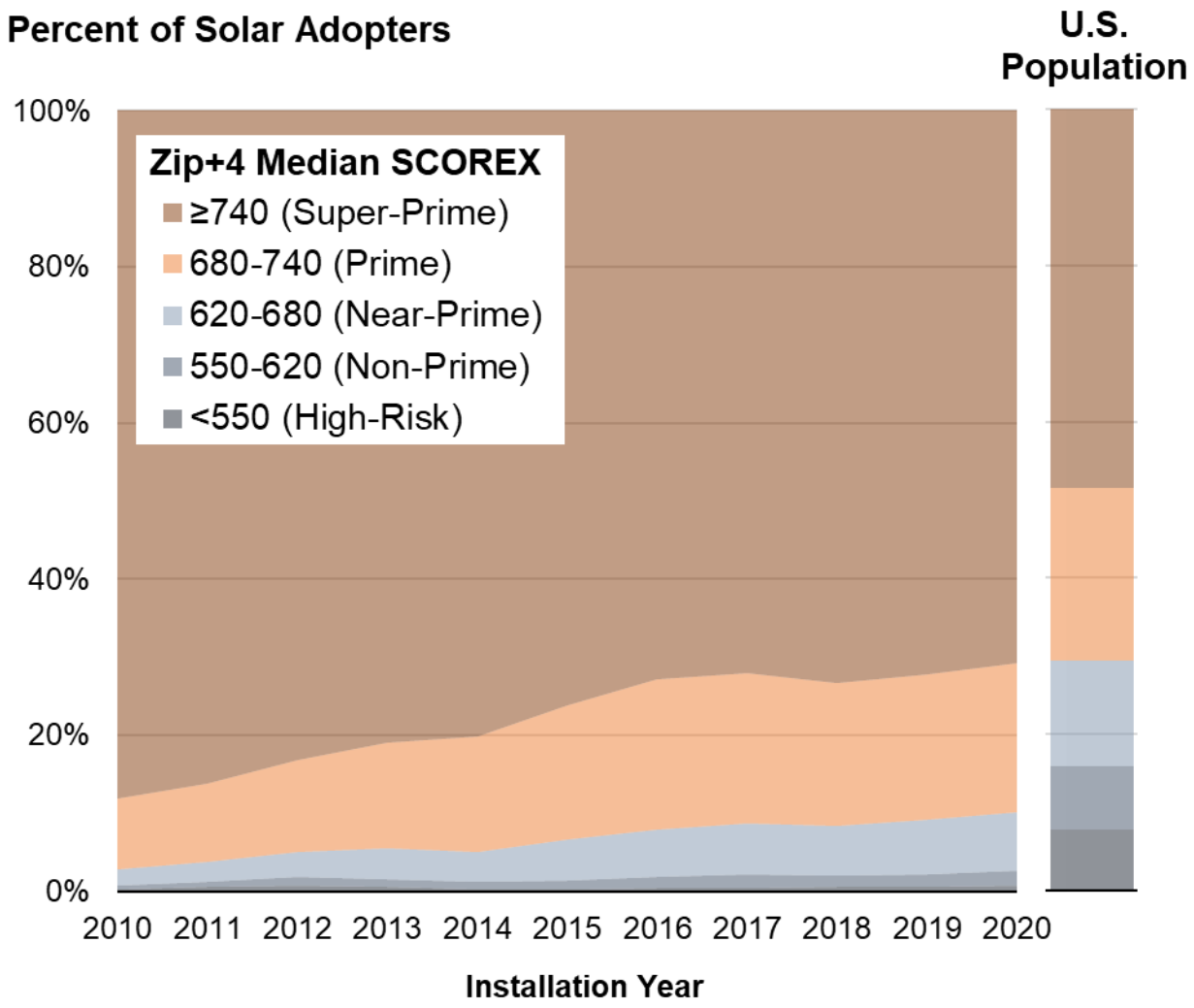
Home Value



- Home value provides a measure of household *wealth*, as distinct from income—albeit only for households that own their home
- Solar-adopter home value data are expressed as a percentage of the respective county median, in a similar vein to our relative income metric
- Solar-adopter home values are generally higher than others in the same county, but that skew has declined substantially over time (from 149% of county-median in 2010 to 117% in 2020)
- The trend closely tracks solar-adopter relative incomes, when based on county-median incomes for owner-occupied households
- A more comprehensive metric of wealth is needed to fully assess how solar adopters compare to the broader population, which includes renters

Credit Scores



- Due to privacy issues, credit score data consist of median values for all individuals in each solar adopter's zip+4, rather than individual or HH-level scores
- Solar adopters skew toward higher credit-score zip+4s, with a disproportionately large share of Super-Prime and virtually none with credit scores in the lower two groups—no doubt highly related to home ownership
- The skew has diminished over time as solar adopters in areas within the middle tiers (Prime and Near-Prime) have comprised a larger share

Conclusions

Conclusions

- Solar adopters are heterogeneous in terms of their income and demographics
- Solar adopters diverge from the general U.S. population in many ways, skewing, for example, toward higher income and non-Hispanic White households
- Data for 2020 show that these differences are continuing to diminish over time, as a result of both a broadening and deepening of the U.S. residential solar market
- Differences between solar adopters and the general population vary considerably across states, in some cases suggestive of policy-related factors
- Trends in the report point to a variety of issues that could warrant deeper analysis, including basic questions about what is driving the observed temporal trends and differences across regions, as well as a variety of narrower questions (e.g., about peer effects, the distinct effect of language preferences, prevalence of loan financing among LMI households, etc.)

Appendix

Key Experian Data Elements Used in this Analysis

- **Estimated Household Income**: The total estimated income for a living unit, incorporating several highly predictive individual and household level variables. The income estimation is determined using multiple statistical methodologies to predict the income estimate for the living unit.
- **Dwelling Type:** Each household is assigned a dwelling type code based on United States Postal Service (USPS) information; could be either Single Family Dwelling Units, Multi-Family, Marginal Multi Family, P.O. Boxes, or Unknown.
- **Household Size:** The total number of people on the record, includes count for children, adults.
- **Race/Ethnicity and Language:** Based on a comprehensive predictive name analysis process which identifies ethnic origin, probable religion, and the language preference of individuals.
- **Individual Education:** Compiled from self-reported surveys, derived based on occupational information, or calculated through the application of predictive models.
- **Occupation Group:** Compiled from self-reported surveys, derived from state licensing agencies, or calculated through the application of predictive models.
- **Date of Birth/Combined Adult Age:** Date of Birth is acquired from public and proprietary files. These sources provide, at a minimum, the year of birth. The birth month is provided where available. Estimated ages are acquired from proprietary data sources and Experian models which estimate the adult age.
- **Estimated Current Home Value:** Predicts the current home value. Integrates market-specific data sources that include the most current, complete and relevant home value information available. In addition to public record data, such as deed data, the model will consider all available market information including recent sales and property listings.
- **SCOREX PLUS** : Predicts the likelihood of future serious delinquencies on any type of account. Due to limitations related to the Federal Fair Credit Reporting Act, data provided for each address represent the corresponding Census block medians, rather than the credit score of the specific individual or household.

Key Public Data Elements Used in this Analysis

- **U.S. Census American Community Survey 5-Year Data (2015-2019):**
  - Median household income in the past 12 months (Table B25119);
  - Median household income (B19013);
  - Tenure by household income (Table B25118);
  - Hispanic or Latino origin by race – population (Table B03002);
  - Household Language by Household Limited English Speaking Status (C16002);
  - Educational attainment by householder (Table B25013);
  - Age of householder (Table B25007)
- **U.S. Census 2010** Urban-rural classification: Rural, urban, and urban cluster populations by state; and definition by latitude/longitude for classification of solar adopters
- **Bureau of Labor and Statistics:** Occupational Employment Statistics Survey, May 2020

State Sample Sizes: *TTS=Tracking the Sun, BZ=BuildZoom, Ohm=Ohm Analytics;*

Market Coverage based on comparison to Wood Mackenzie's Solar Market Insight report

State	All Years					2020 Installations				
	TTS	Ohm	BZ	Total	Market Coverage	TTS	Ohm	BZ	Total	Market Coverage
AK	0	0	1	1	0%	0	0	0	0	0%
AL	0	17	2	19	15%	0	17	0	17	100%
AR	86	114	70	270	11%	0	114	9	123	11%
AZ	16,445	46,229	37,363	100,037	58%	3,099	11,340	2,146	16,585	72%
CA	1,083,180	31,161	75,193	1,189,534	95%	132,316	31,157	12,889	176,362	100%
CO	0	25,815	38,697	64,512	79%	0	8,031	4,904	12,935	100%
CT	41,951	151	1,922	44,024	87%	7,854	151	321	8,326	96%
DC	6,651	635	432	7,718	91%	1,480	635	181	2,296	100%
DE	0	7	1,135	1,142	17%	0	7	13	20	4%
FL	5,125	23,928	48,575	77,628	93%	1,377	11,198	17,294	29,869	100%
GA	0	107	346	453	28%	0	107	173	280	44%
HI	0	9,720	48,428	58,148	67%	0	3,004	2,072	5,076	84%
IA	0	8	311	319	8%	0	8	53	61	6%
ID	0	1,379	3,642	5,021	62%	0	1,379	358	1,737	91%
IL	15,497	1,450	393	17,340	73%	5,409	1,450	298	7,157	56%
IN	0	467	407	874	24%	0	302	182	484	46%
KS	0	248	353	601	52%	0	66	170	236	51%
KY	0	212	121	333	26%	0	59	26	85	19%
LA	0	383	10,248	10,631	49%	0	378	245	623	45%
MA	96,718	1,002	2,652	100,372	93%	8,859	1,002	700	10,561	100%
MD	0	36,924	18,915	55,839	76%	0	6,516	803	7,319	100%
ME	0	107	0	107	4%	0	107	0	107	13%
MI	0	221	1,786	2,007	20%	0	219	354	573	19%
MN	1,070	1,838	3,541	6,449	88%	0	1,838	646	2,484	100%
MO	0	1,987	1,227	3,214	30%	0	698	286	984	51%
MS	0	18	0	18	5%	0	16	0	16	18%

State	All Years					2020 Installations				
	TTS	BZ	Ohm	Total	Market Coverage	TTS	BZ	Ohm	Total	Market Coverage
MT	0	721	465	1,186	60%	0	237	35	272	82%
NC	17,345	2,609	1,406	21,360	93%	4,412	2,609	591	7,612	100%
ND	0	1	9	10	42%	0	1	1	2	67%
NE	0	8	149	157	39%	0	8	26	34	30%
NH	6,761	20	10	6,791	72%	750	20	2	772	73%
NJ	120,149	934	234	121,317	94%	11,388	932	6	12,326	82%
NM	25,012	2,805	1,408	29,225	91%	4,956	2,802	776	8,534	100%
NV	62,123	1,541	2,690	66,354	99%	12,876	1,540	245	14,661	100%
NY	76,367	1,176	2,700	80,243	60%	6,585	1,174	92	7,851	60%
OH	2,123	536	1,207	3,866	52%	43	536	344	923	47%
OK	0	342	89	431	28%	0	250	54	304	40%
OR	18,070	813	3,763	22,646	94%	1,580	813	1,144	3,537	100%
PA	5,582	379	2,673	8,634	26%	0	379	273	652	11%
RI	8,124	264	2	8,390	95%	1,447	264	2	1,713	92%
SC	0	11,645	3,278	14,923	67%	0	1,833	535	2,368	86%
SD	0	1	2	3	7%	0	1	0	1	6%
TN	0	98	281	379	22%	0	98	43	141	99%
TX	1,421	27,438	35,716	64,575	64%	59	10,758	8,630	19,447	56%
UT	13,980	1,797	5,160	20,937	45%	879	1,792	719	3,390	41%
VA	0	2,077	4,567	6,644	43%	0	2,077	1,543	3,620	60%
VT	3,459	1,630	6	5,095	50%	0	1,630	1	1,631	100%
WA	7,006	3,578	6,625	17,209	64%	0	2,749	656	3,405	100%
WI	4,993	110	275	5,378	79%	1,487	110	91	1,688	84%
WV	0	6	0	6	2%	0	6	0	6	4%
WY	0	5	59	64	6%	0	5	25	30	7%
U.S.	1,639,238	244,662	368,534	2,252,434	82%	206,856	112,423	59,957	379,236	86%

Sample Sizes by Analysis Element

Vary depending on data availability and unit of observation

Analysis Element	Unit of Observation	Sample Size	
		2020	All Years
Income (single-family)	Household	379,227	2,252,375
TPO vs. host-owned	Household	196,427	1,484,105
Installer name	Household	244,619	n/a
With or without storage	Household	178,632	n/a
Multi- vs. single-family	Household	389,273	n/a
Race/Ethnicity	Household	189,262	1,124,632
Language	Household	189,262	1,124,632
Urban vs. Rural	Individuals	1,143,299	7,301,967
Education	Household	379,227	2,252,375
Occupation	Individuals	914,636	5,872,301
Age	Household	230,674	1,512,862
Home Value	Household	323,095	1,917,945
Credit Score	Household	379,235	2,252,411

General Notes:

- With the exception of the multi- vs. single-family comparison, all other elements of the analysis are based only on single-family solar adopters
- The unit of observation for most analysis elements is the household, but for several elements (occupation and urban vs. rural), data for the overall U.S. population are available only at the individual level. In those cases, solar adopters summary statistics are based on all individuals in each household in order to allow for comparison to the U.S. population.
- Analysis elements related to TPO, installer name, and battery storage are based almost entirely on solar adopter addresses from Tracking the Sun
- Race/ethnicity and Language data were obtained for a random subset of the full sample, to economize data costs

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