

Exploring Disparities in Battery Electric Vehicle Affordability and Availability

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Addressing the “**innovation-needs paradox**”:

The people most likely to benefit from a technology
are often the last ones to adopt it.

Data: 44.8M vehicle listings from ~60k dealerships (marketcheck.com)
(2016 - 2021, inclusive)

New Vehicles

Type	CV	HEV	PHEV	BEV
Car	3,246,993	154,188	40,206	93,939
SUV	5,234,631	65,507	0	48,284

Used Vehicles

Type	CV	HEV	PHEV	BEV
Car	17,488,916	885,266	146,820	212,119
SUV	17,071,227	108,173	0	26,979

How accessible are BEVs?

Availability

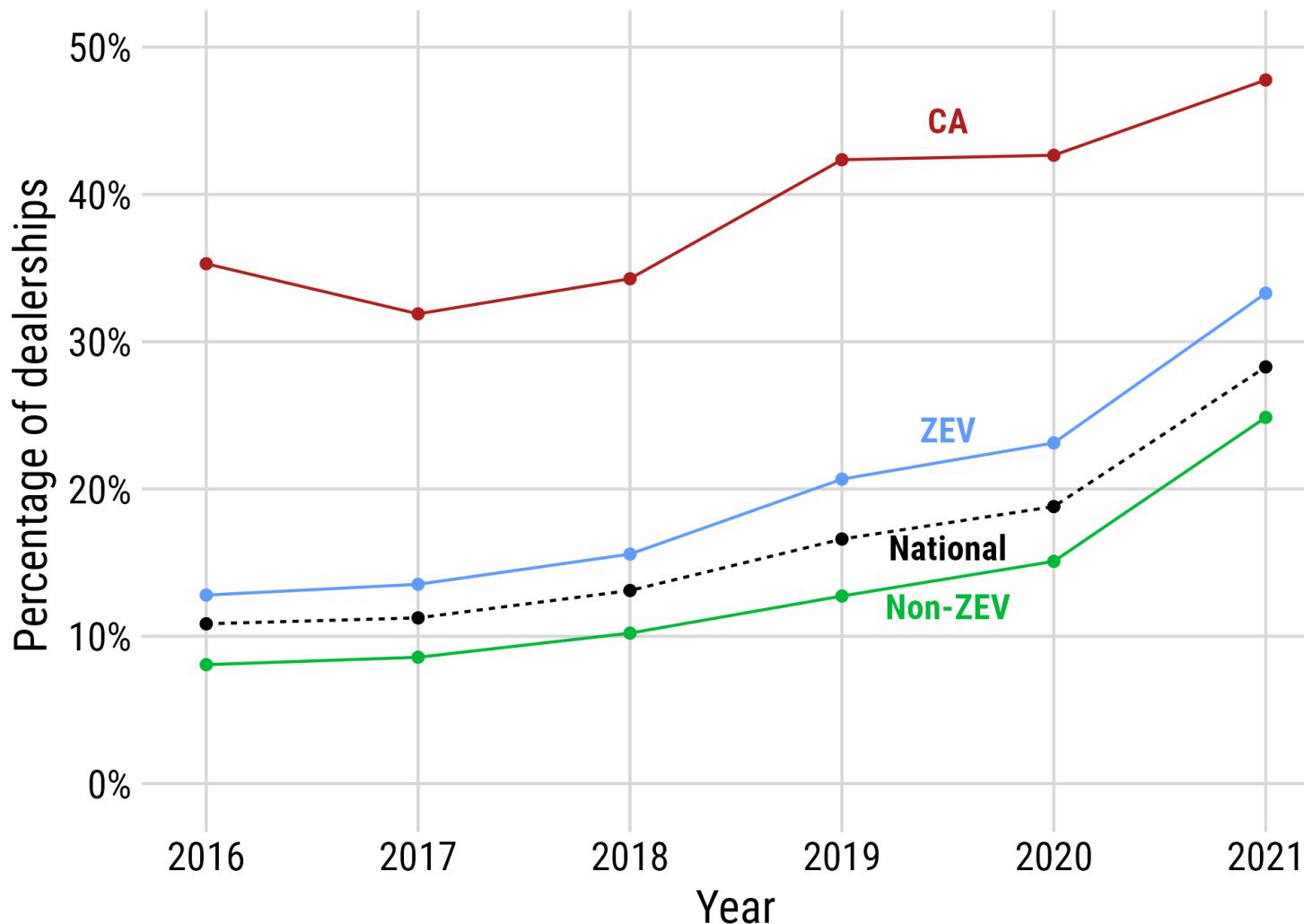
- 1) How many dealerships are carrying BEVs?
- 2) How hard is it to get to a BEV dealer?

Affordability

- 3) How affordable are BEVs?
- 4) How many people are eligible for the used PEV subsidy?

How many dealerships are carrying BEVs?

Percentage of dealerships with at least one BEV

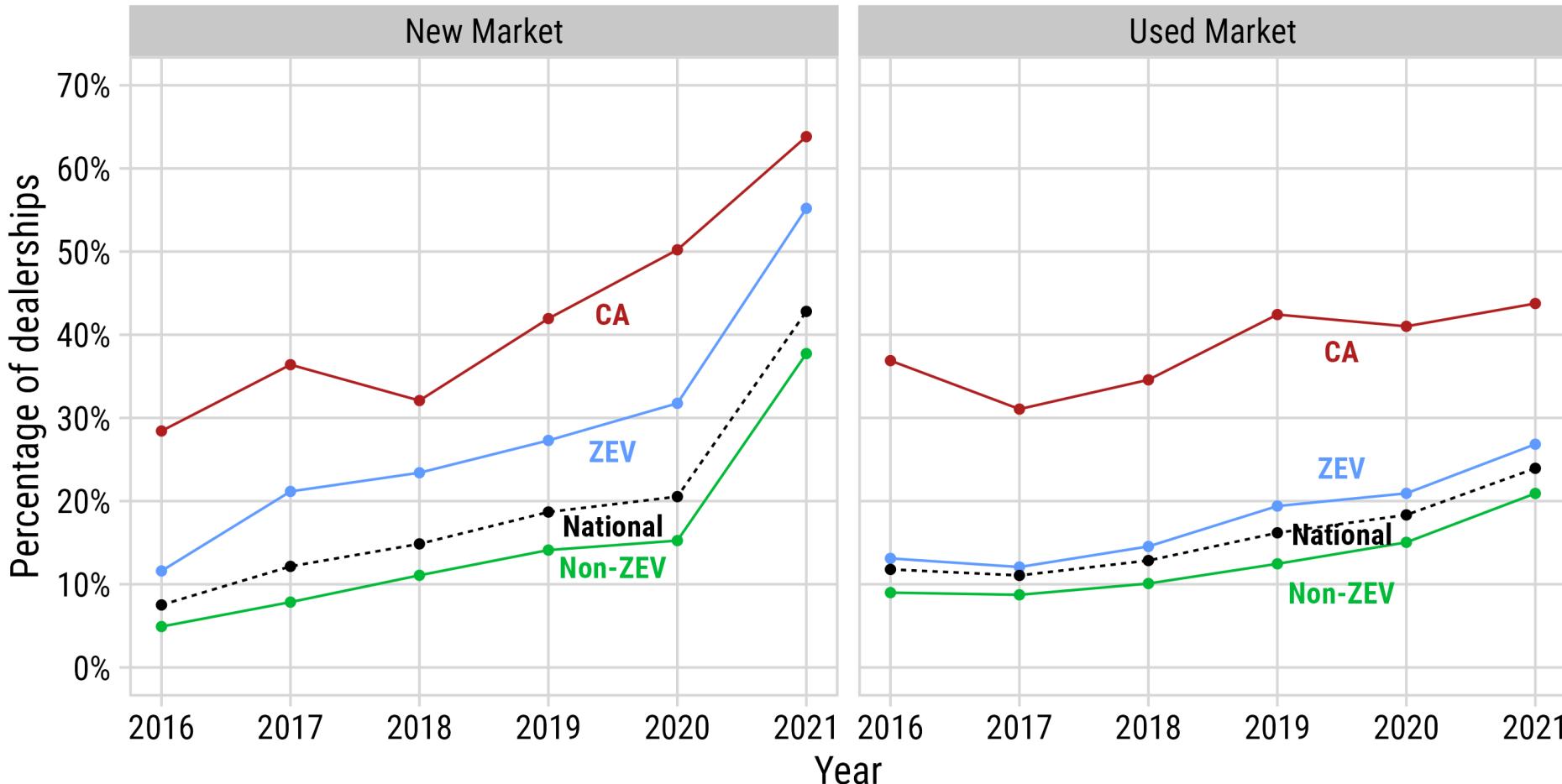


~1 in 3 dealers
carried a BEV in
2021 (nationally)

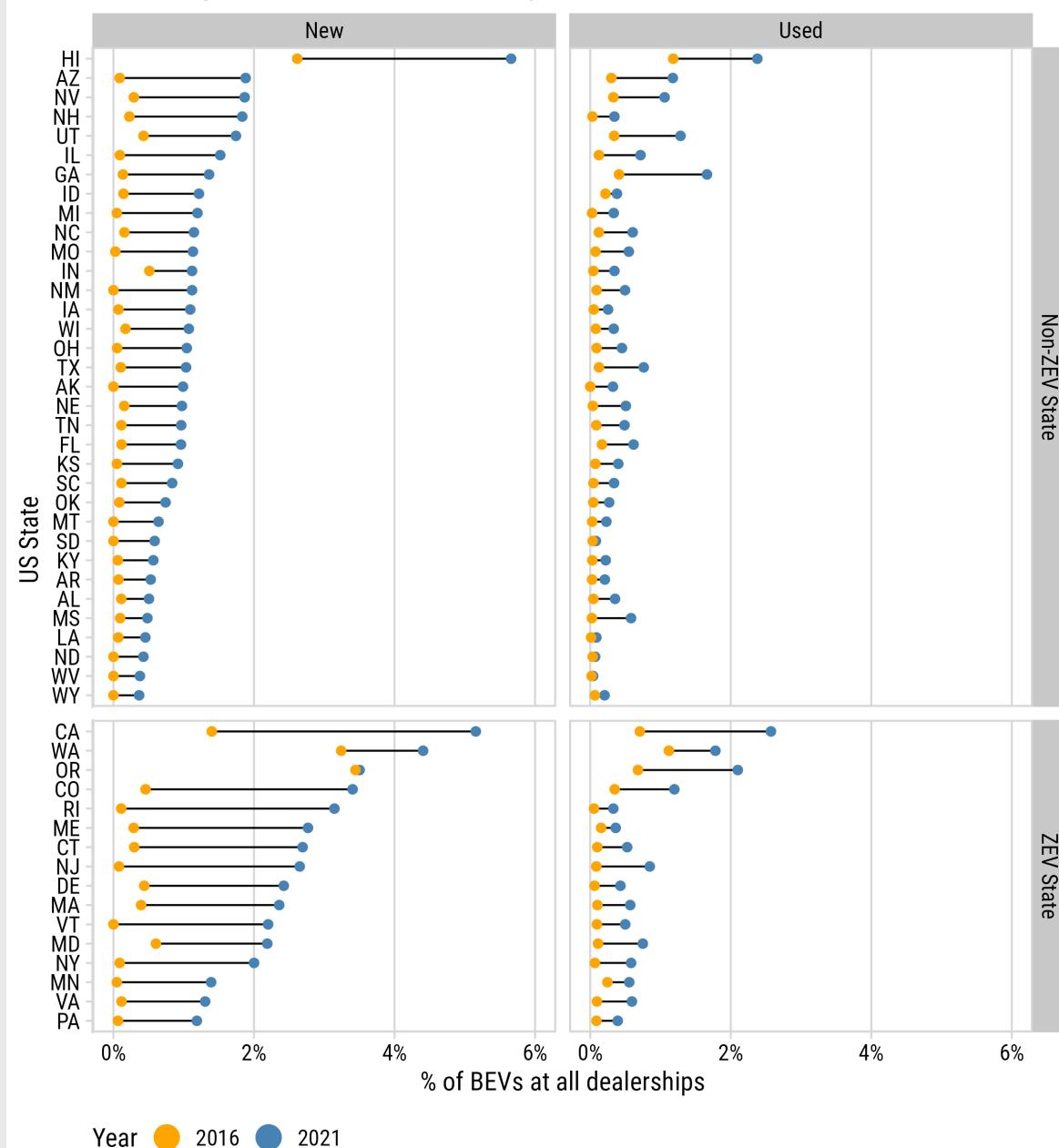
Up from
~1 in 10 in 2016

New BEV availability growing faster than Used

Percentage of dealerships with at least one BEV



Percentage of BEVs at Dealerships by State and Market



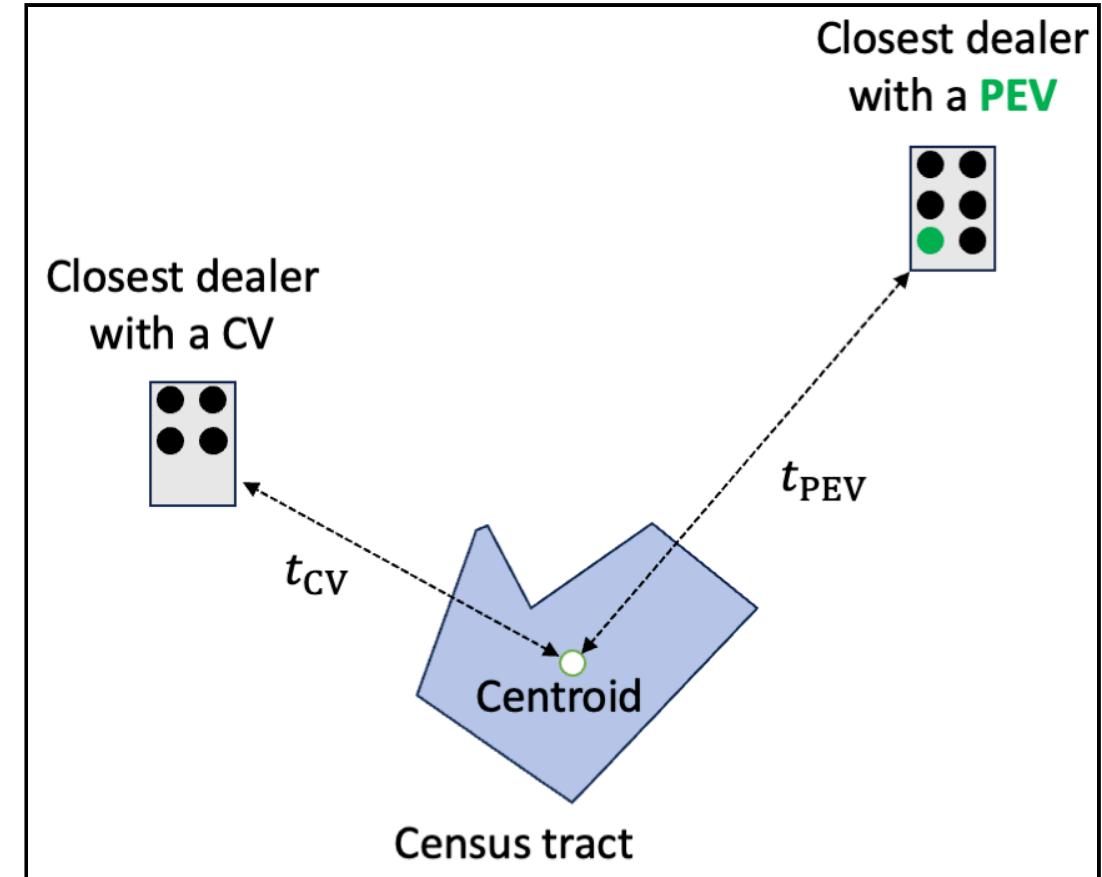
- BEV inventories still low at most dealerships
- Something of a "ZEV Effect" in new market
- Used market more diffuse

How hard is it to get to a BEV dealer?

“Access burden”: additional travel time to see a BEV

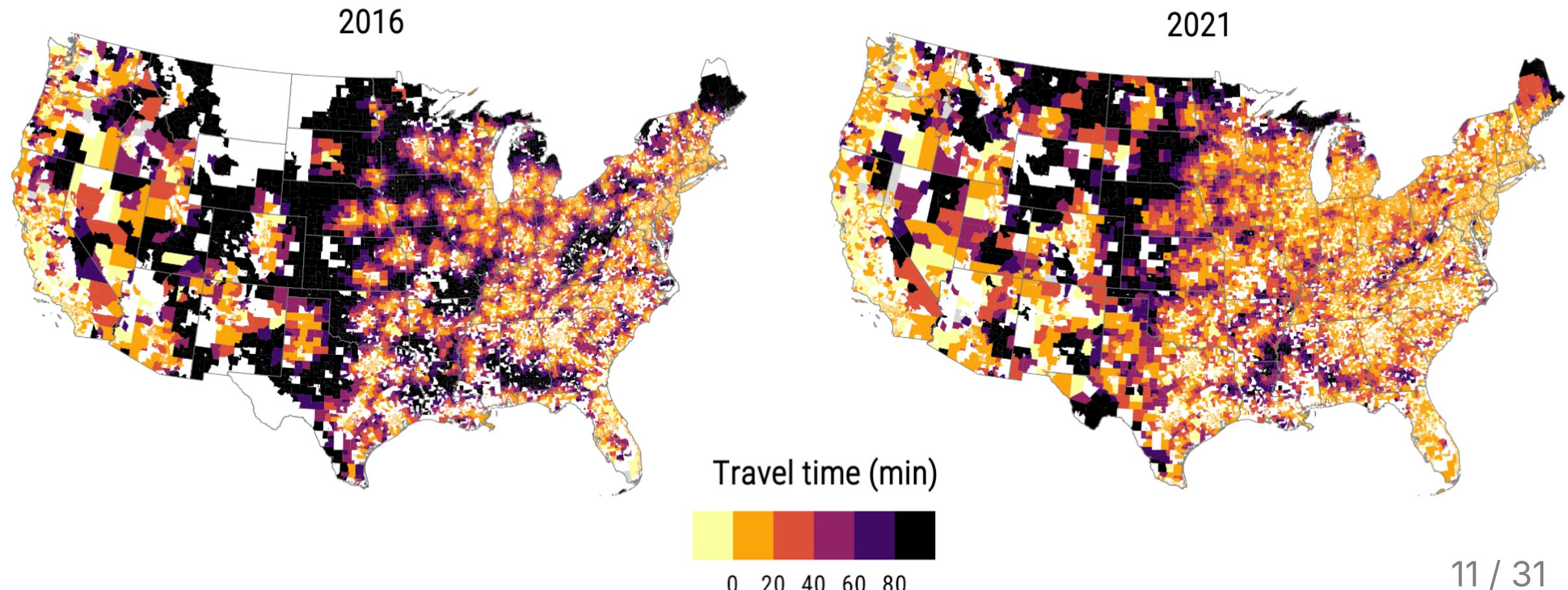
Access burden:

1. Find closest CV and BEV dealerships from census tract centroid.
2. Compute road travel time* to each dealership: t_{PEV} and t_{CV}
3. Compute “Burden” as difference in travel time: $b = t_{PEV} - t_{CV}$

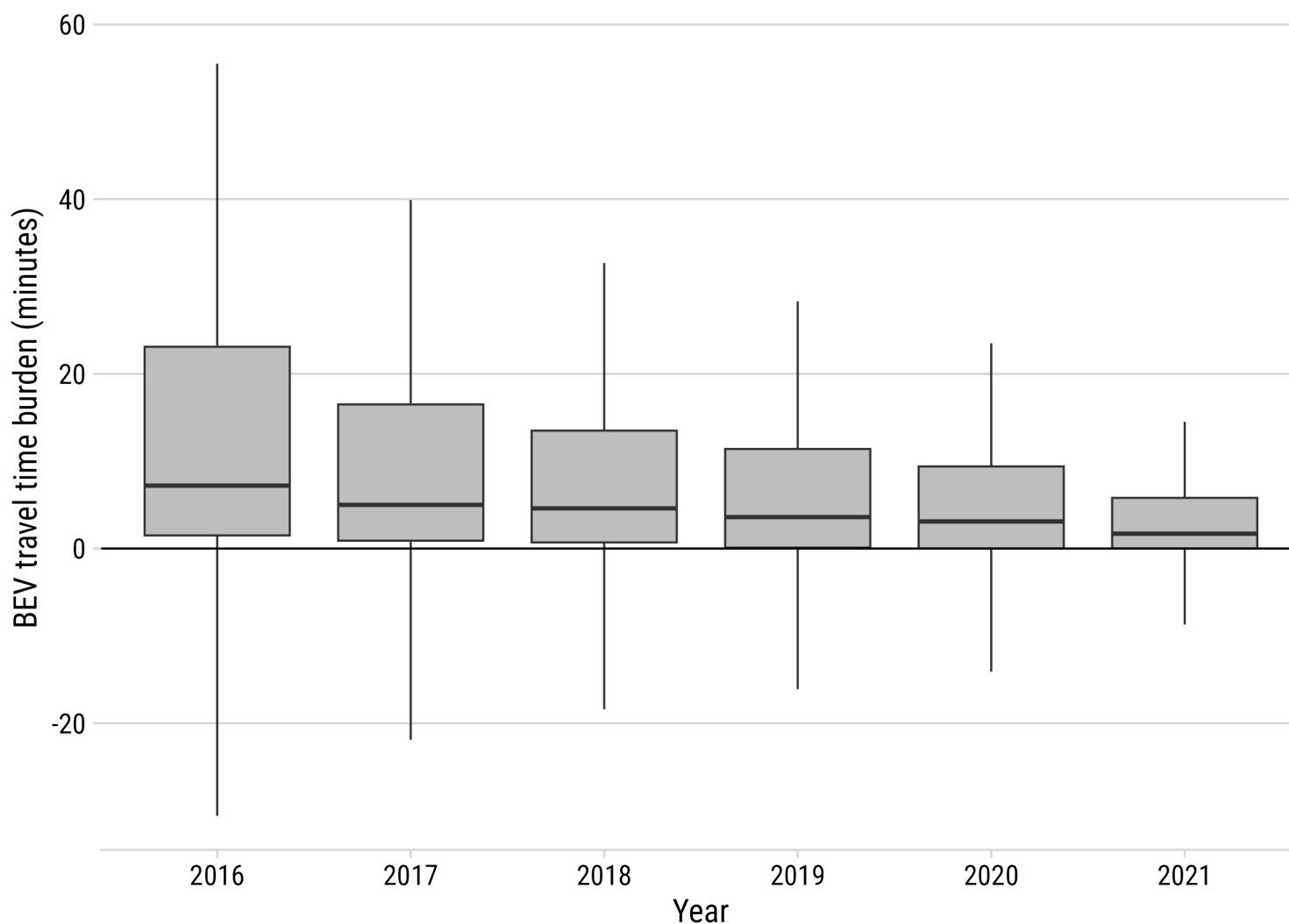


*Road travel times obtained using Open Street Road Map (OSRM)

BEV access burden has improved over time, but large gaps remain

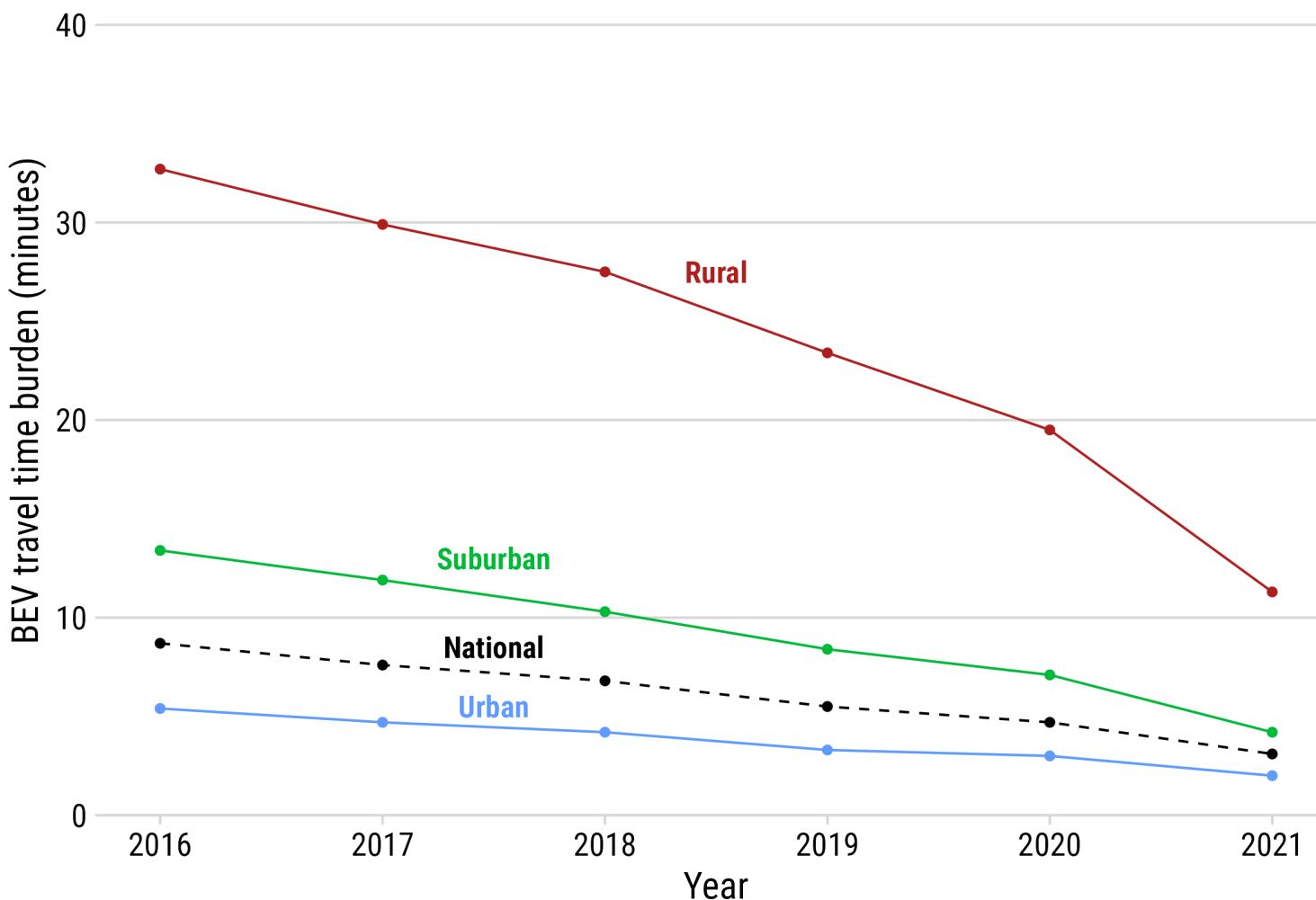


Distribution of BEV travel time burden accross US census tracts



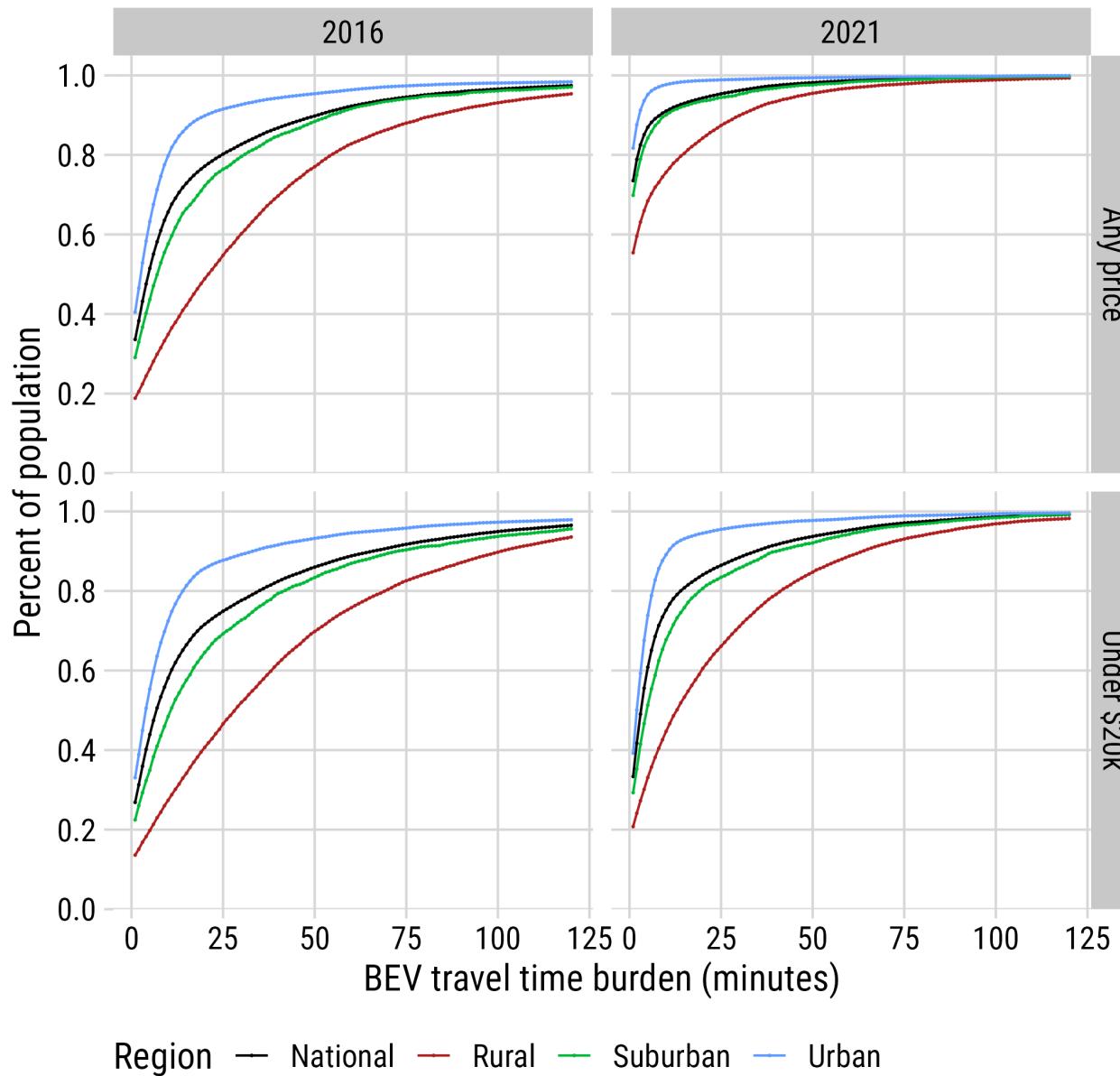
Nationally, BEV travel burden is declining, both in magnitude and variation.

Median BEV travel time burden by urban status



Largest disparities in BEV travel burden is in **rural** areas, but this is rapidly improving

Cumulative frequency plot (CFP) of BEV access burden



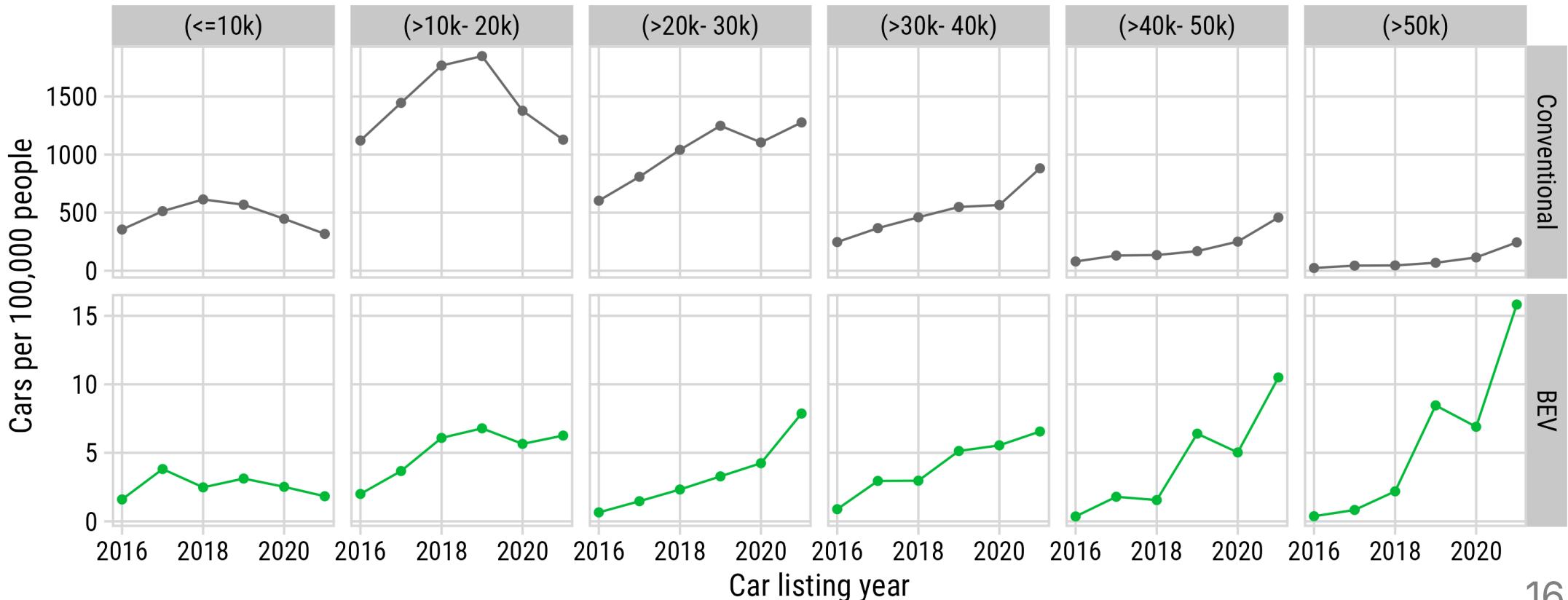
BEV travel burden still high
for **affordable** BEVs in
rural areas

How affordable are BEVs?

Most BEV supply growth in higher-price segments (and overall supply still quite low)

U.S. vehicle availability by price bin

Cars per 100,000 people computed using both new and used vehicles combined



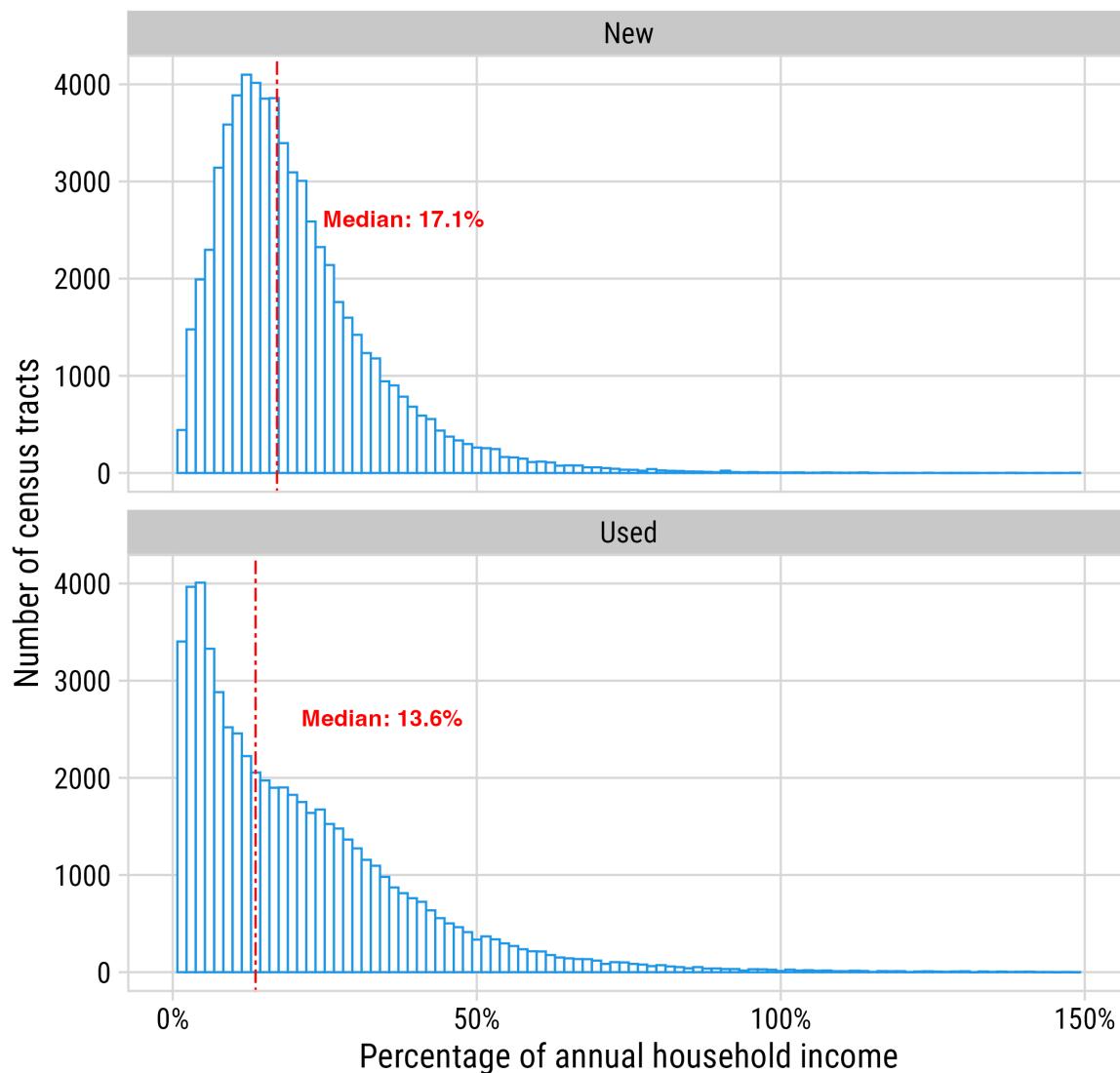
What is the median BEV (car) price premium over CVs?

For each census tract:

- Obtain all BEV & CV car listings in a 2-hour isochrone.
- Compute median prices for each: p_{BEV} & p_{CV}
- Compute median premium as difference: $p_{\text{premium}} = p_{\text{BEV}} - p_{\text{CV}}$
- Divide p_{premium} by median annual income of census tract

Median BEV price premium as % of median annual household income

Premium calculated as the difference in median prices between available CVs and BEVs divided by the median income for each census tract

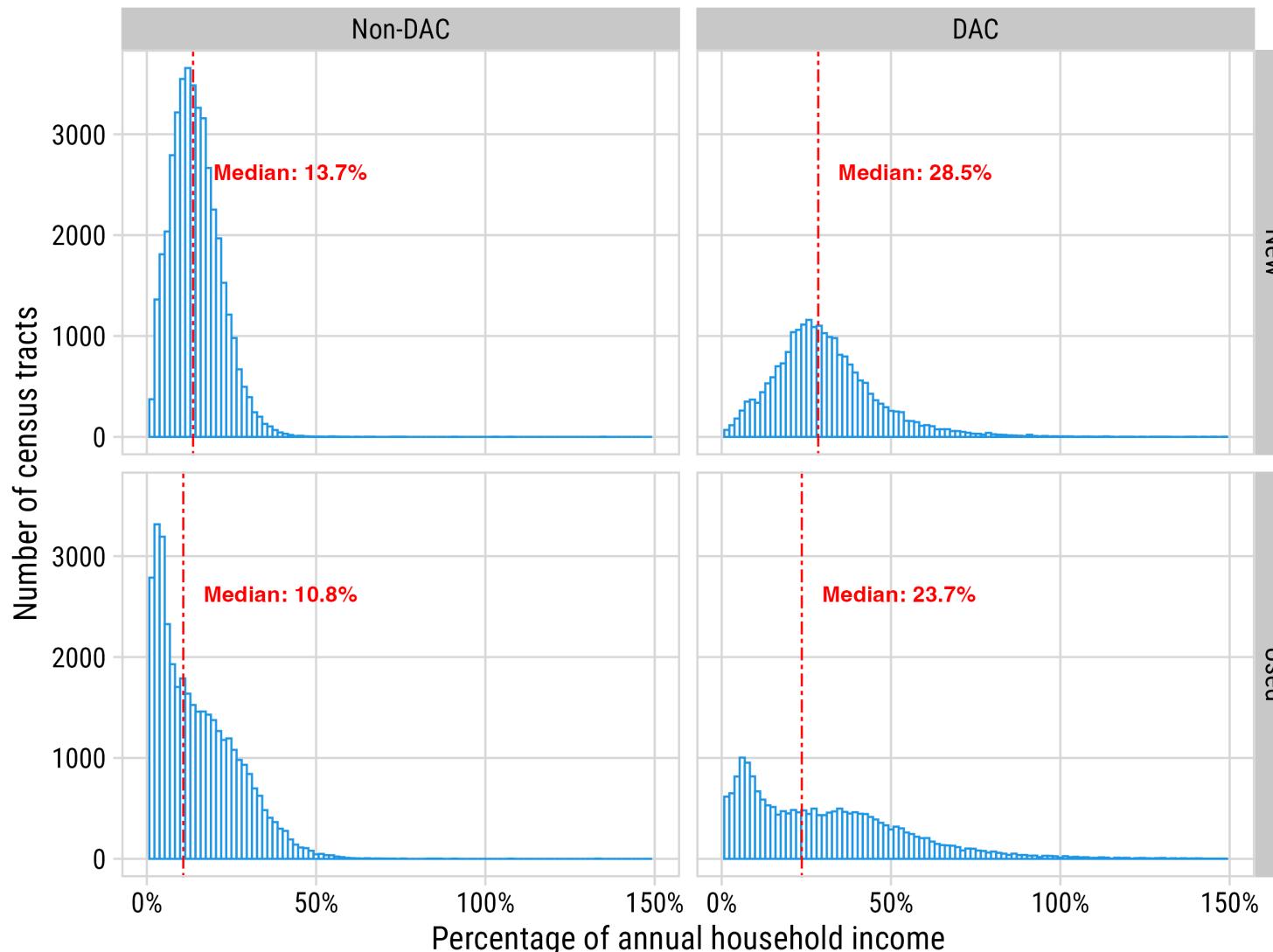


Median BEV price premium as % of annual household income:

- New: 17.1%
- Used: 13.6%

Median BEV price premium as % of median annual household income

Premium calculated as the difference in median prices between available CVs and BEVs divided by the median income for each census tract



BEV premium
much higher for
DACs:

- New: 28.5%
- Used: 23.7%

*Disadvantaged Communities (DACs) are defined by the U.S. Climate and Economic Justice Screening Tool Dataset (CEJST)

How many people are eligible
for the used PEV subsidy?

This is a hypothetical calculation

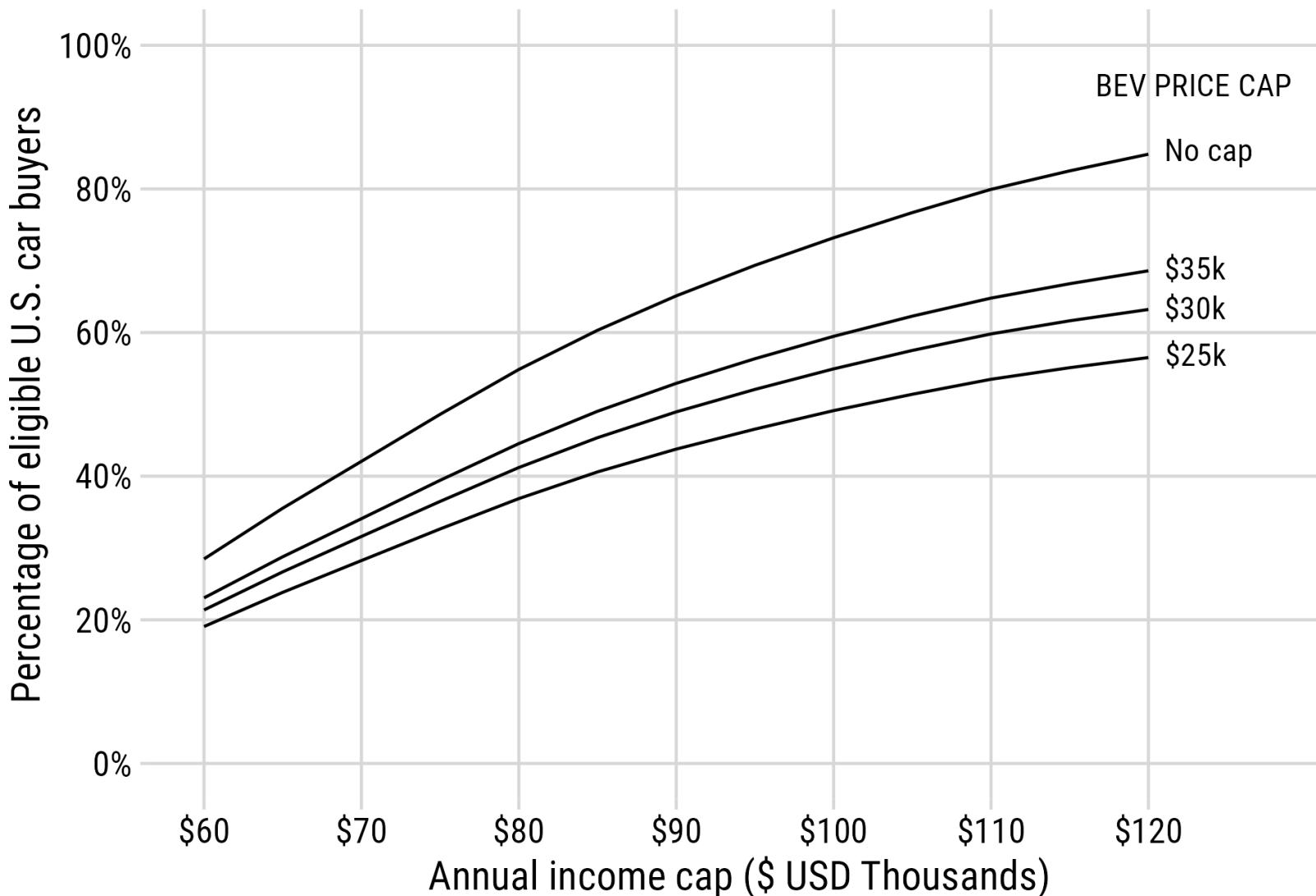
- Used BEV subsidy was not available until 2024

Some assumptions

- We use all BEV listings from 2016 to 2021 (inclusive).
- We filter for only BEVs 2 years of age (current policy)
- For each census tract, we count the population as "eligible" if:
 1. The median income is \leq the income cap.
 2. The median used BEV price is \leq price cap.

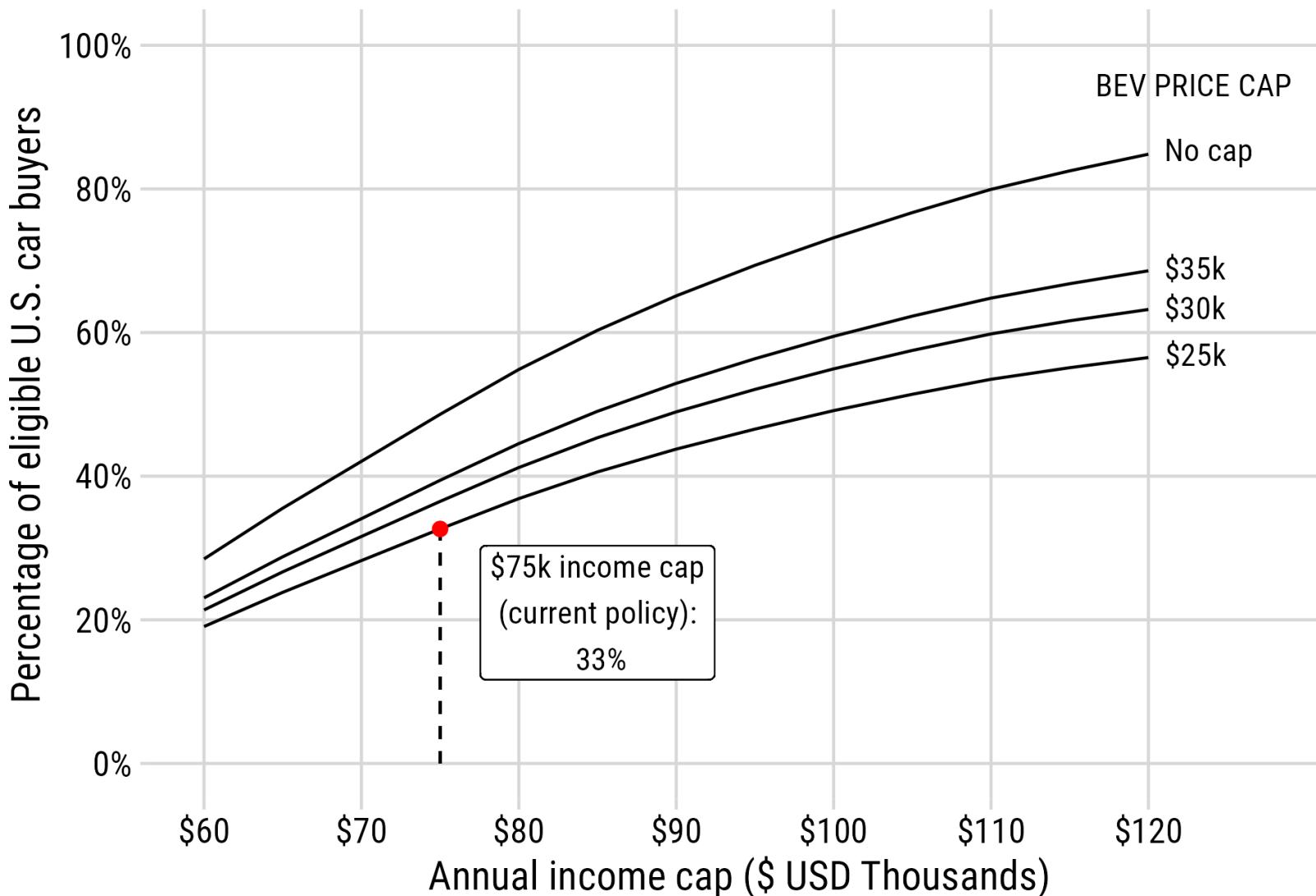
Sensitivity of used BEV subsidy eligibility to income and price caps

33% of Americans are eligible for the used BEV subsidy under current policies



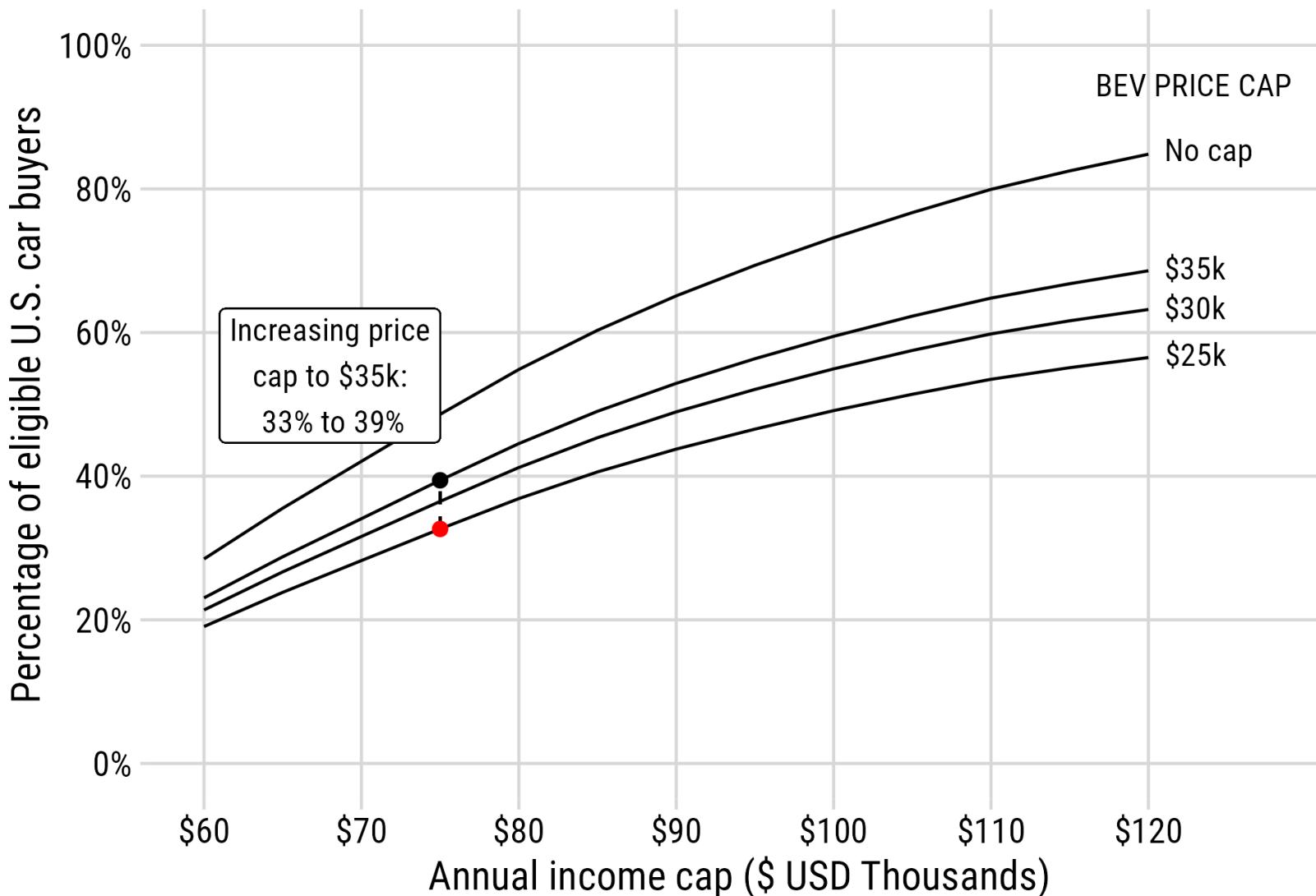
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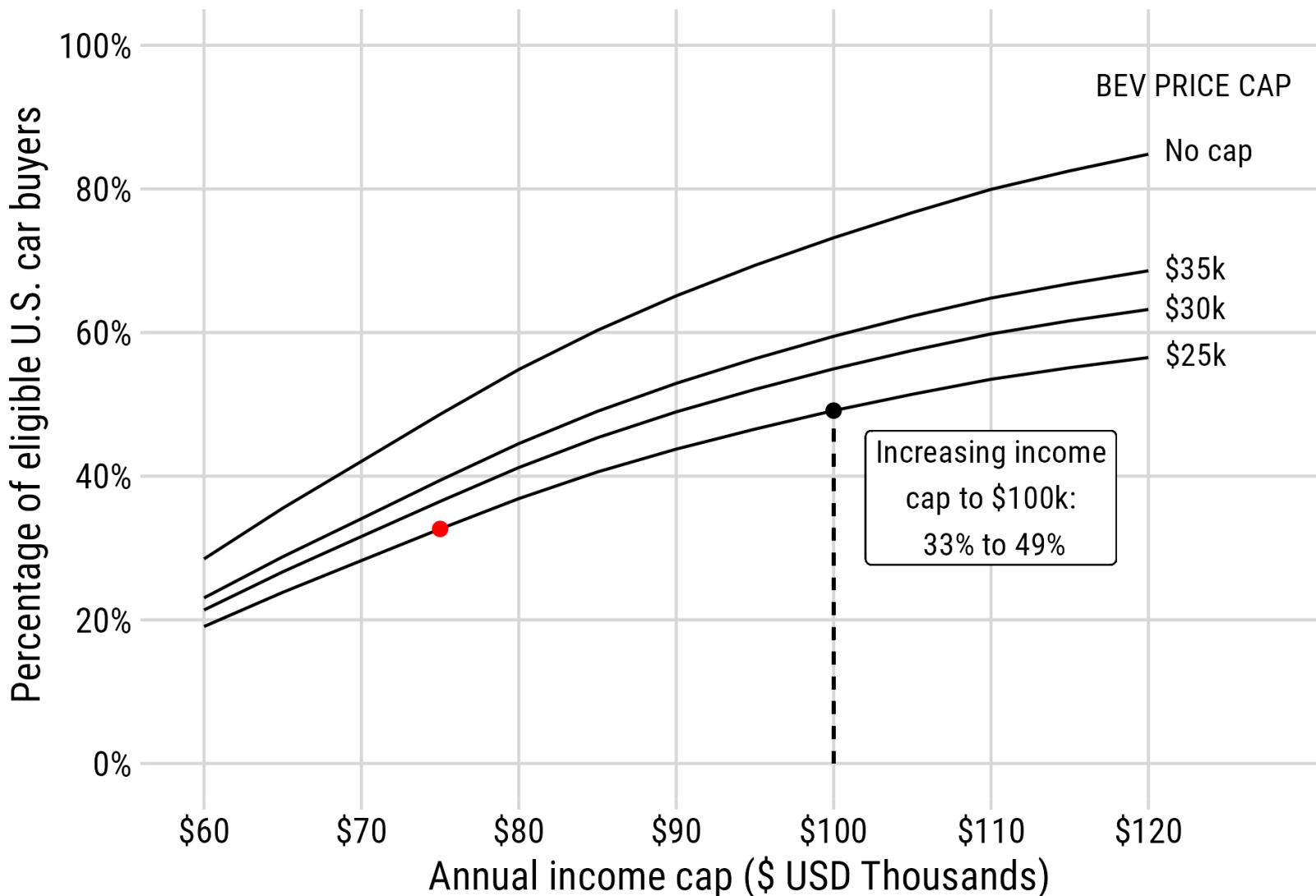
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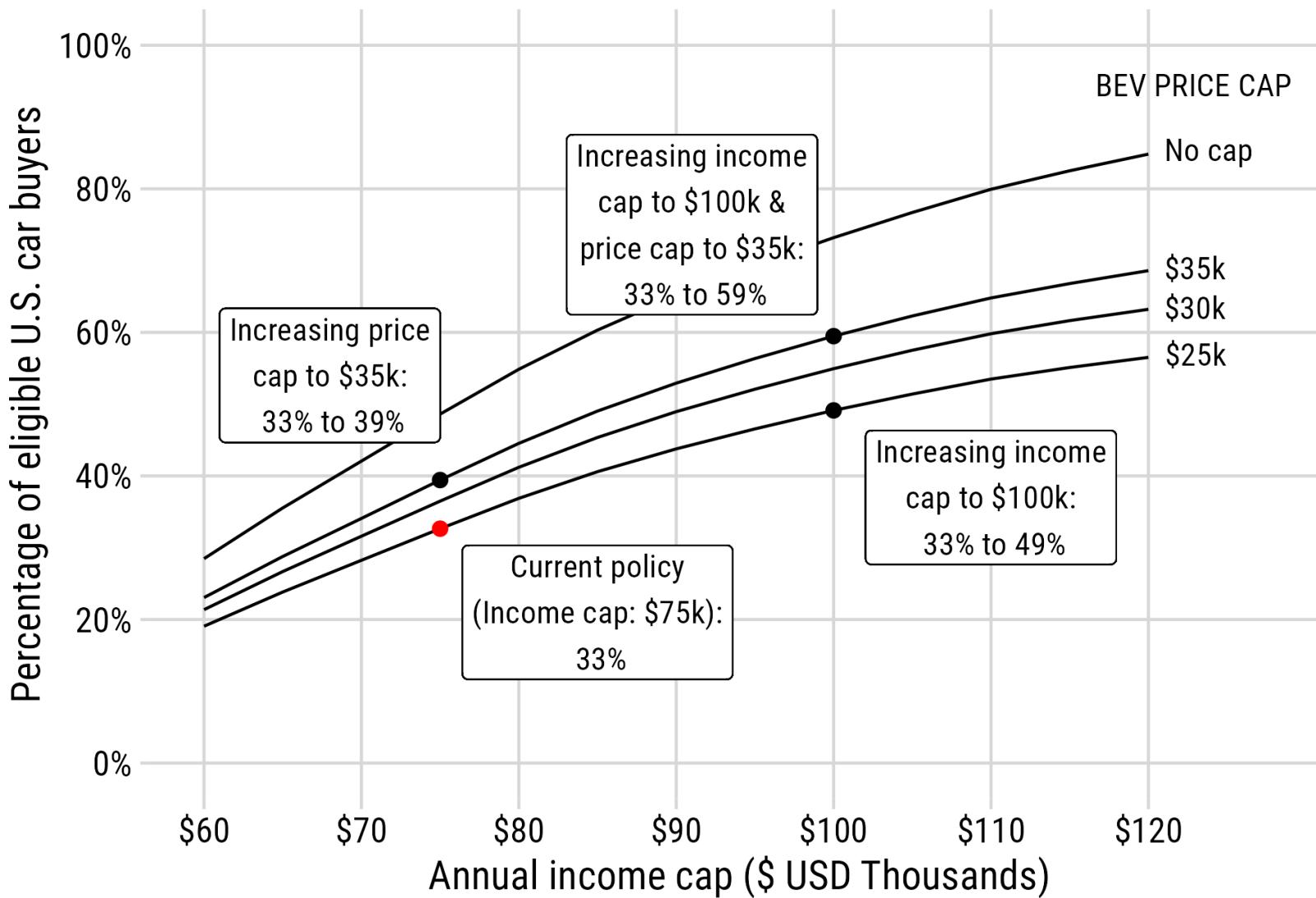
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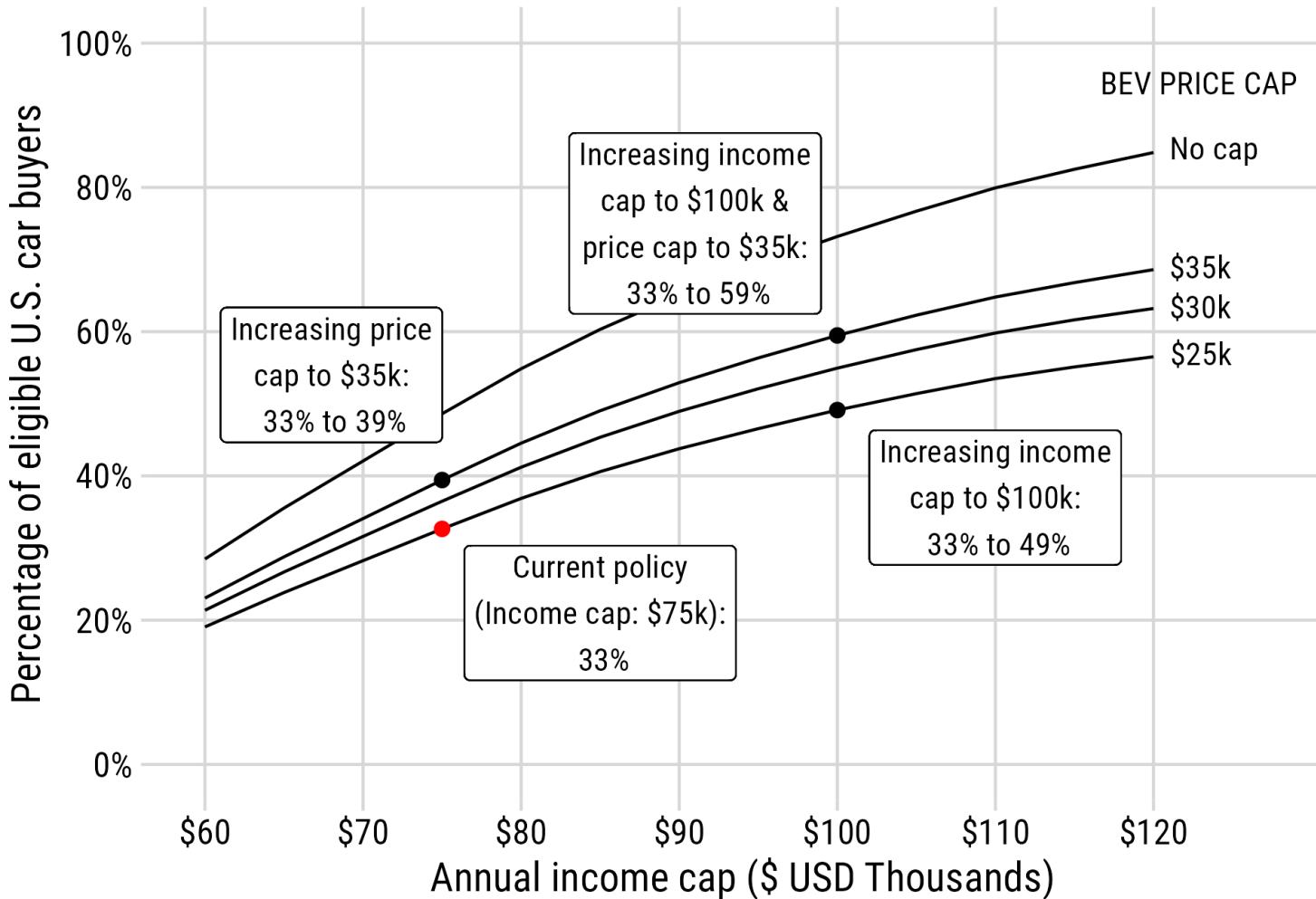
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Eligible population could increase from 1/3 to 2/3 if:

- Increase price cap: \$25k → \$35k
- Increase income cap: \$75k → \$100k

Thanks!

Slides:

<https://slides.jhelvy.com/2025-ev-policy-council/>

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Extra slides

Access burden is shrinking in magnitude and spatial variation

Distribution of BEV travel time burden accross US census tracts

