

The Distributional Impacts of Climate Change across US Local Labor Markets

University of Oregon

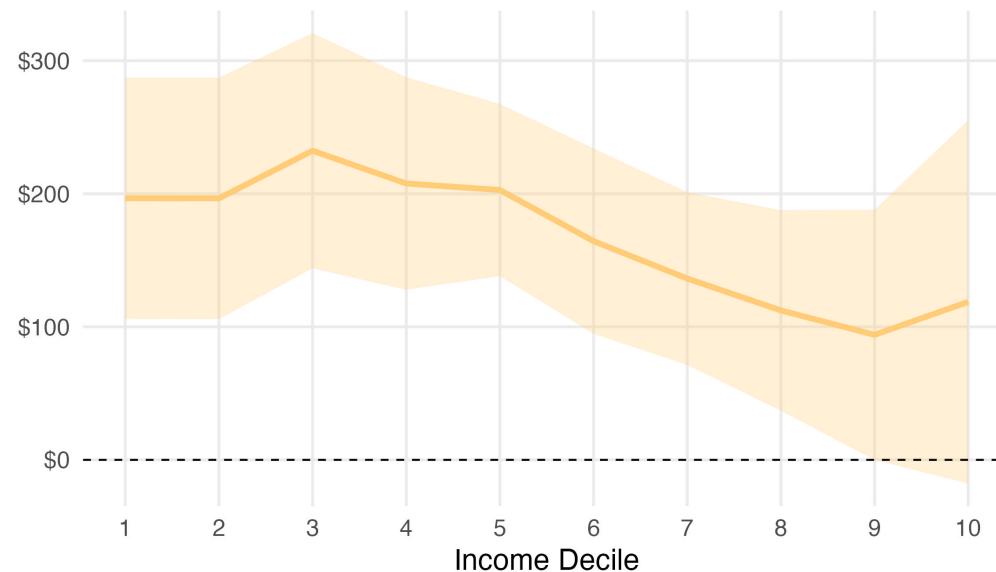
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July 3rd, 2023

Differential ability to adapt

Disadvantaged households are less able to adapt to **climate change**

- **Energy Justice** literature shows black HH's spend more on energy relative to observably similar white HH's

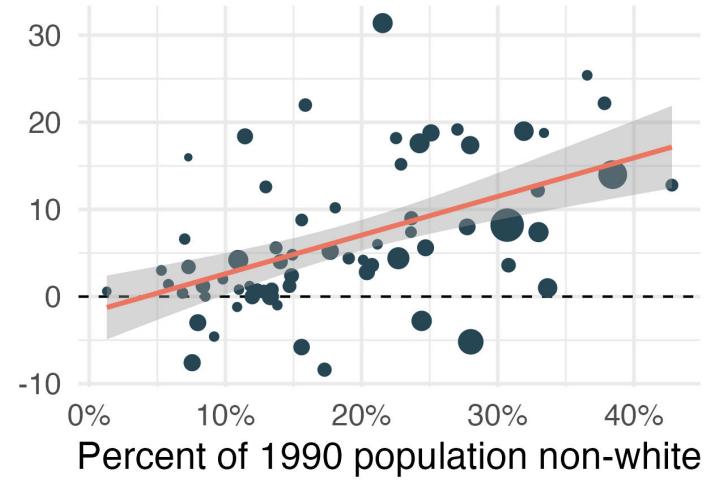
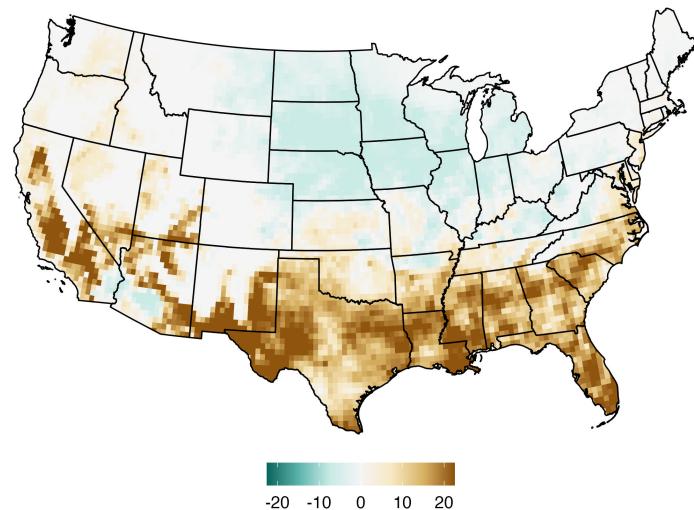
Conditional Black-White Energy Expenditure Gap



- Additionally, low-income HH's have **larger barriers to migration**

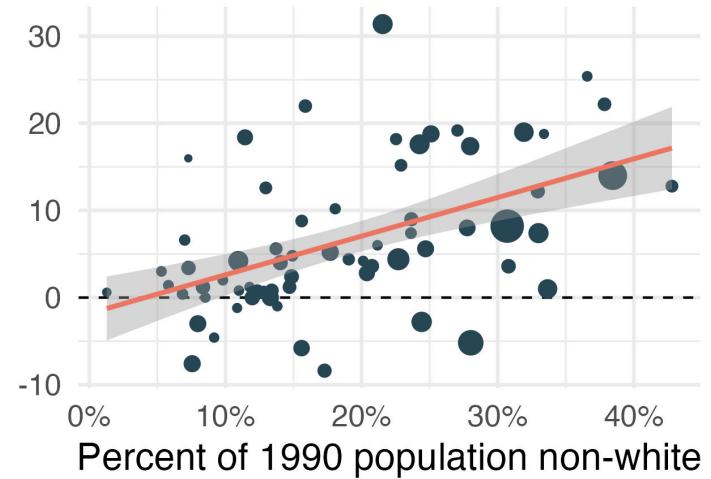
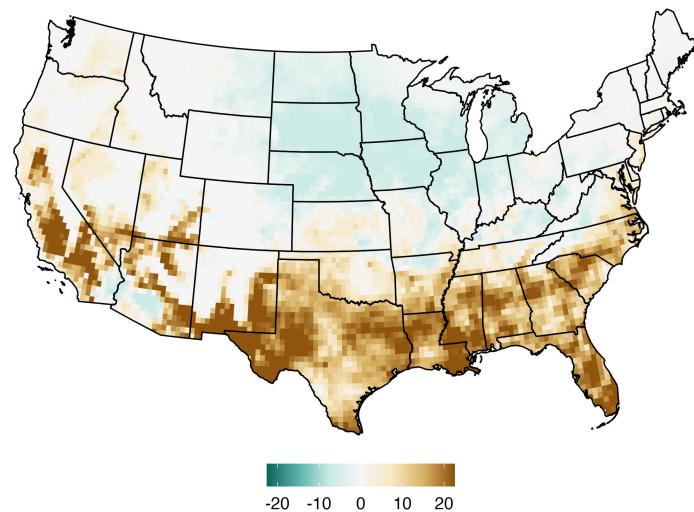
Disadvantaged HH's are more exposed

Change in **hot** days, 1990 to 2019



Disadvantaged HH's are more exposed

Change in **hot** days, 1990 to 2019



Q: What are equity implications of climate change given differential ability to adapt and differential exposure?

What we are going to do...

1. Create a **spatial equilibrium model** of US labor markets
 - Heterogeneous HH's choose **where to live** and **energy consumption**
 - Climate impacts energy demand and city's amenity value
2. Structurally **estimate the model**
 - Household data from the census and ACS
 - Historical climate data from PRISM
3. Simulate **counterfactual climate** scenarios
 - To-date, climate damages are **3x larger** for black vs white HH's
 - Black-white gap will **continue to grow** under emissions projections

Model Overview

(without equations!)

Main ingredients

Households choose **where to live** based on...

- Wages they could earn
- Rent they would have to pay
- Local amenities---includes both climate and non-climate factors
- Moving costs

Conditional on location, they choose **electricity, gas, and housing demand**

- They use housing, electricity, and gas to produce **comfort**
- The comfort production function is **affected by climate**
- Allow for heterogeneity in comfort production technology across demographic groups

Wages and rents **endogenously adjust** based on a city's population.

Key intuition

Suppose there are more hot days in the South...

- **Amenities in the South decrease** relative to other locations
- **More costly to produce comfort** as HH's use A/C more intensely

⇒ conditional on living in the South, utility has decreased.

- Some households **migrate**, equilibrium wages and rents adjust

Three mechanisms causing **unequal distribution**

For minority and low-income HH's...

1. **Comfort costs are higher**, use larger share of income for energy
2. **Moving costs are higher**, more difficult migrate to mitigate welfare loss
3. **Greater exposure to climate change** based on ex-ante location

Data and Estimation

Data and Estimation

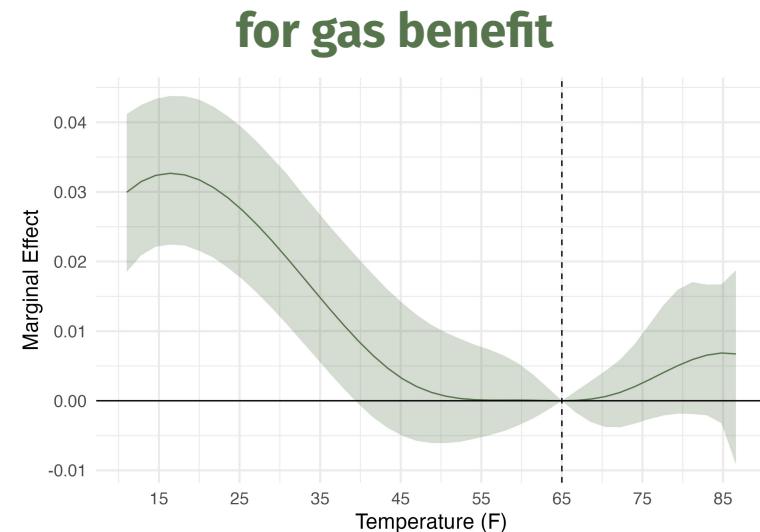
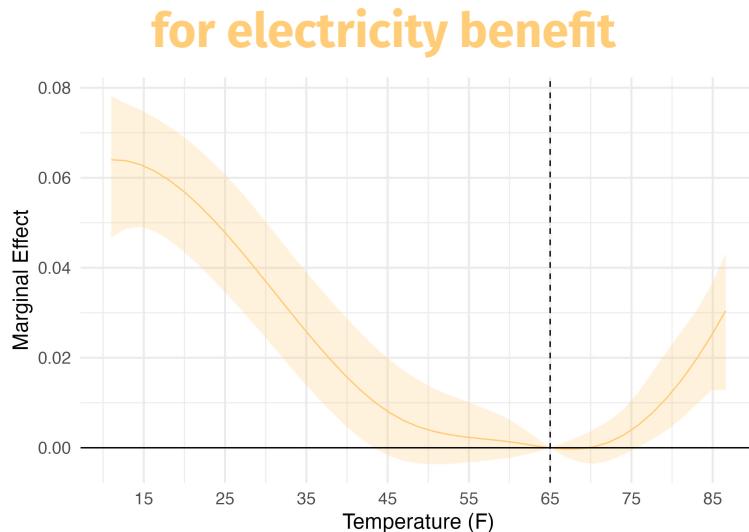
We structurally estimate the model using...

1. **Household Data:** Repeated cross sections of the 1990 and 2000 census and 2010 and 2019 5-year ACS
2. **Climate Data:** Daily temperature and precipitation on a 4km grid of continental US from PRISM
3. **Energy Prices:** Annual, state average residential electricity and gas prices from the EIA

Climate's effect on comfort production

Effect of an additional day at temperature

Relative to a day at 65 degrees

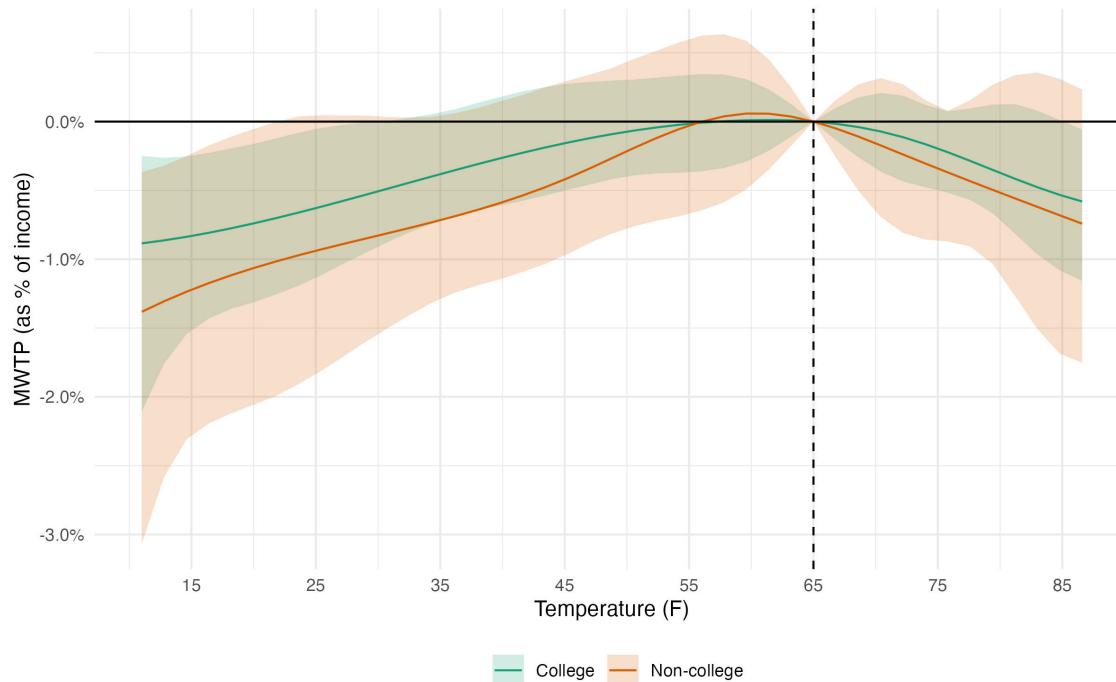


- Identification from random variation in weather
- Corresponds to marginal benefit of electricity or gas use

Climate's effect on amenities

Effect of an additional day at temperature

Relative to a day at 65 degrees



Results

Effect of climate change to-date

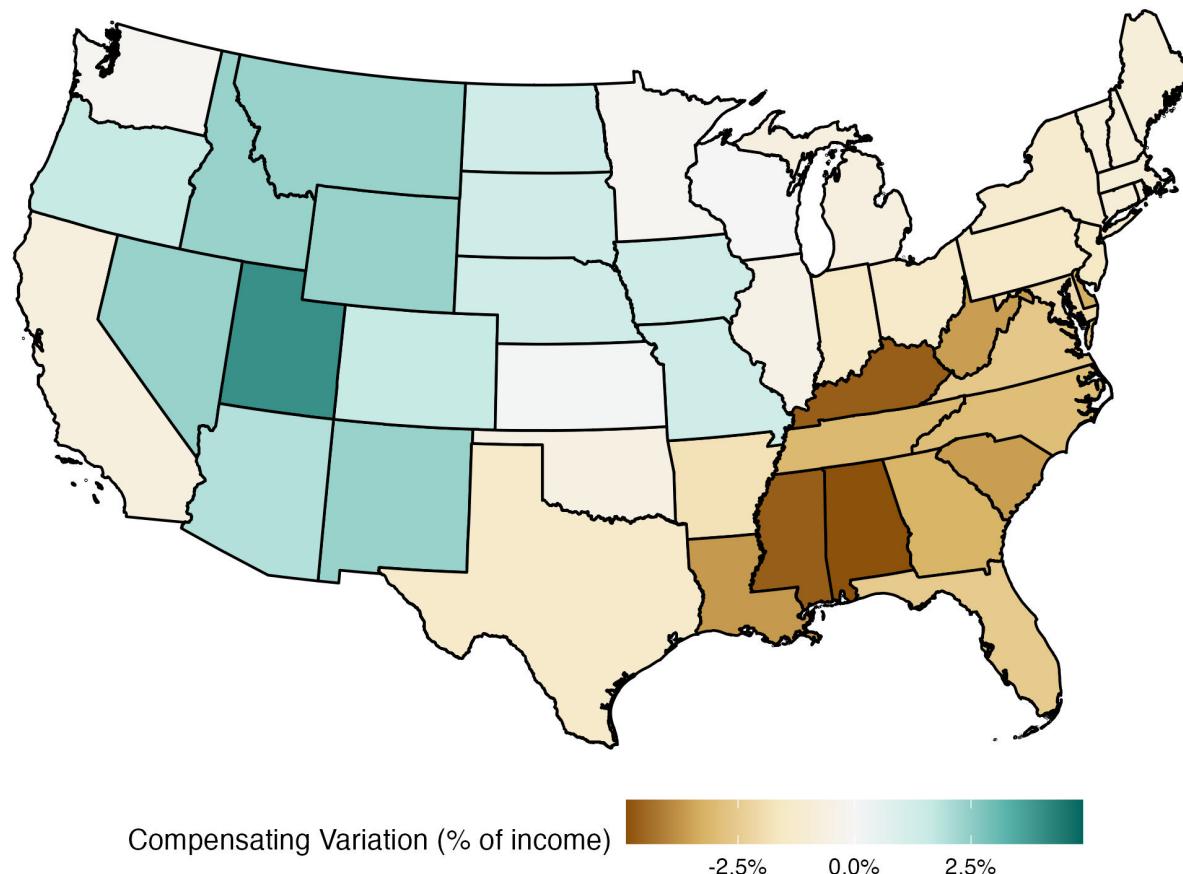
Compare present day climate with that of 1990



- Welfare loss for median black HH **3x larger** than median white HH
- This amounts to damages of \$1,200 vs \$400 (or 3% vs 1% of income)

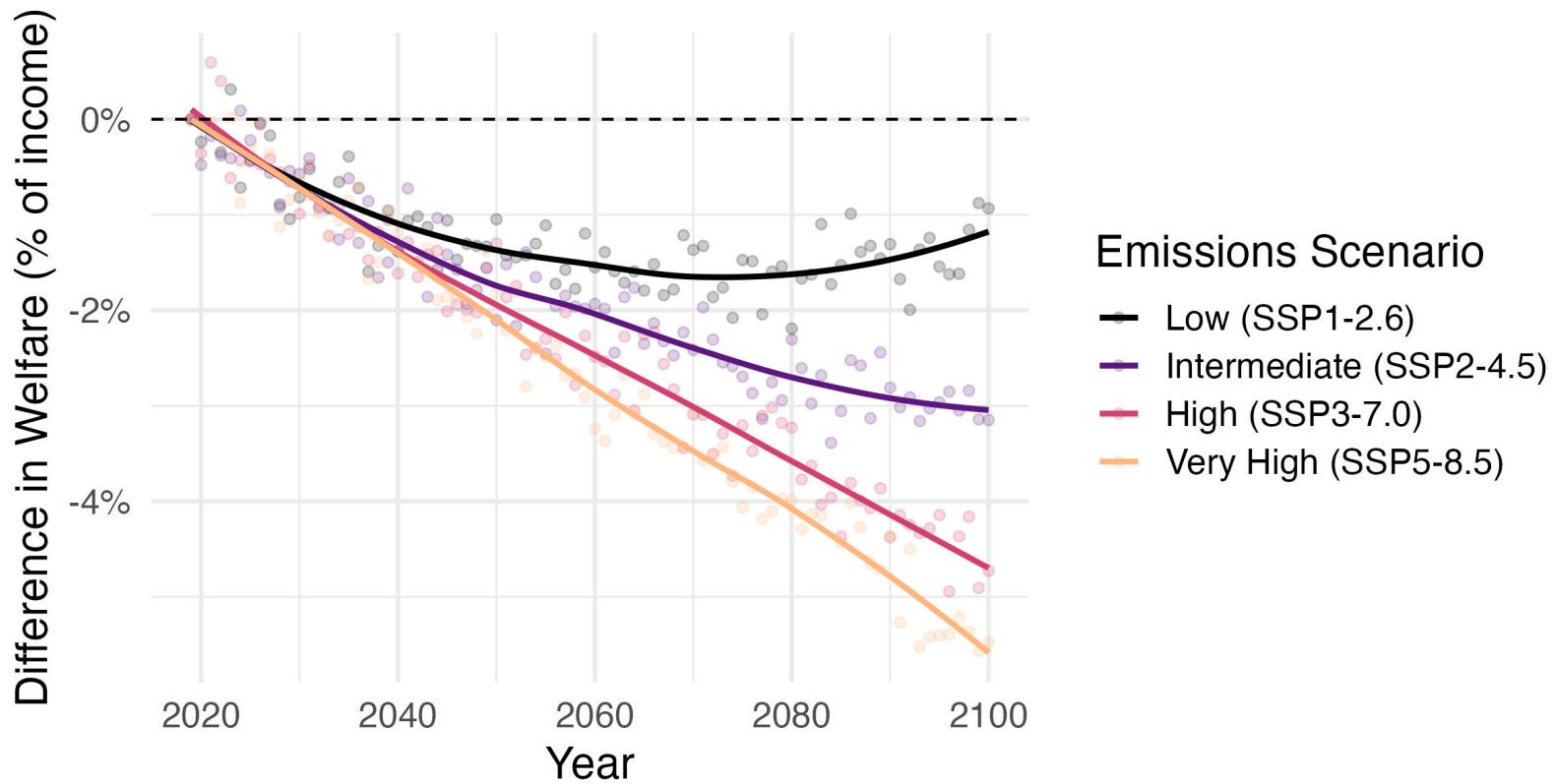
Spatial variation

Compensating Variation



Black-white gap grows with emissions

The **difference in welfare effects** of climate change between black and white HH's grows under future emissions scenarios.



Conclusions and next steps

Black HH have faced 3x larger climate damages to-date

- Ability to migrate reduces gap by 33% for white HH, only 14% for black
- Controlling for initial location reduces the gap by 25%

Next Steps

- What policies would be effective at **reducing the observed inequalities** in the impact of climate change?
- Account for natural disaster risk and other extreme weather events
- Endogenize electricity and gas prices to climate and energy demand

Thank you

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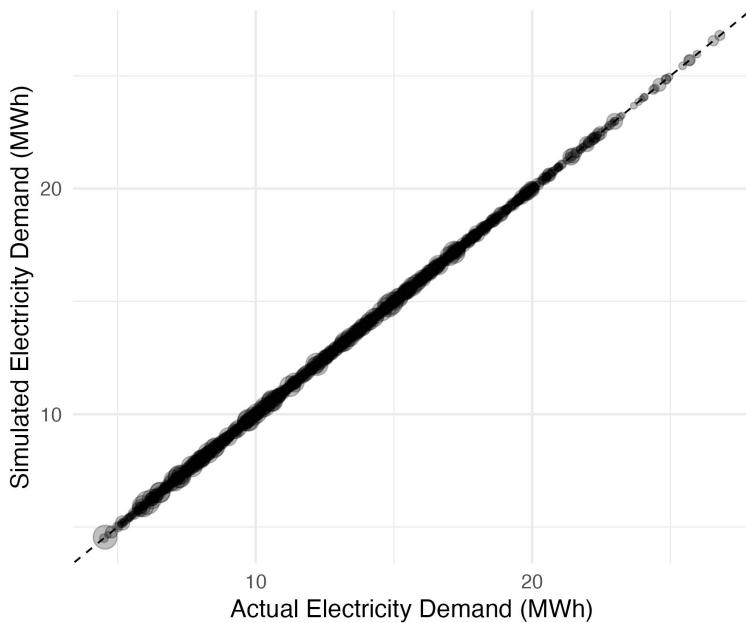
<https://www.emmettsaulnier.com/>

Appendix

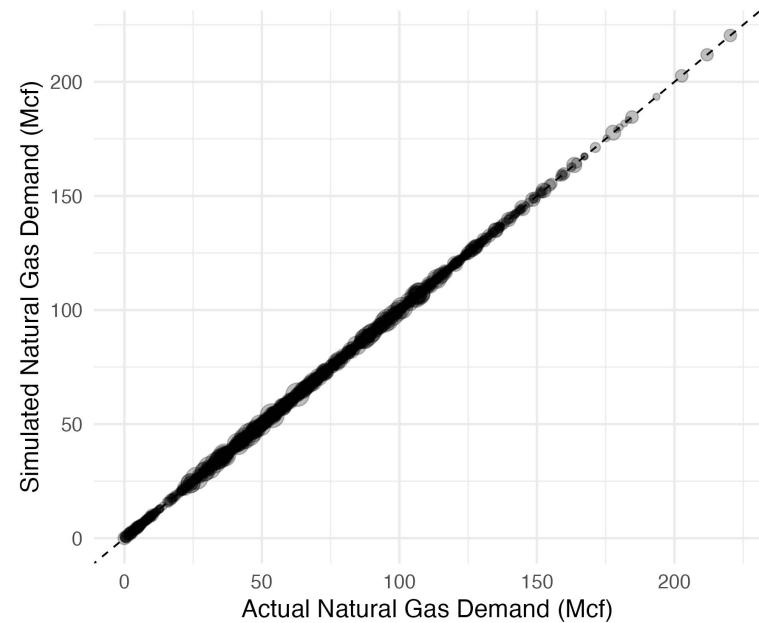
GE simulation model fit

The simulation matches actual data under the baseline (factual) climate

Electricity Demand



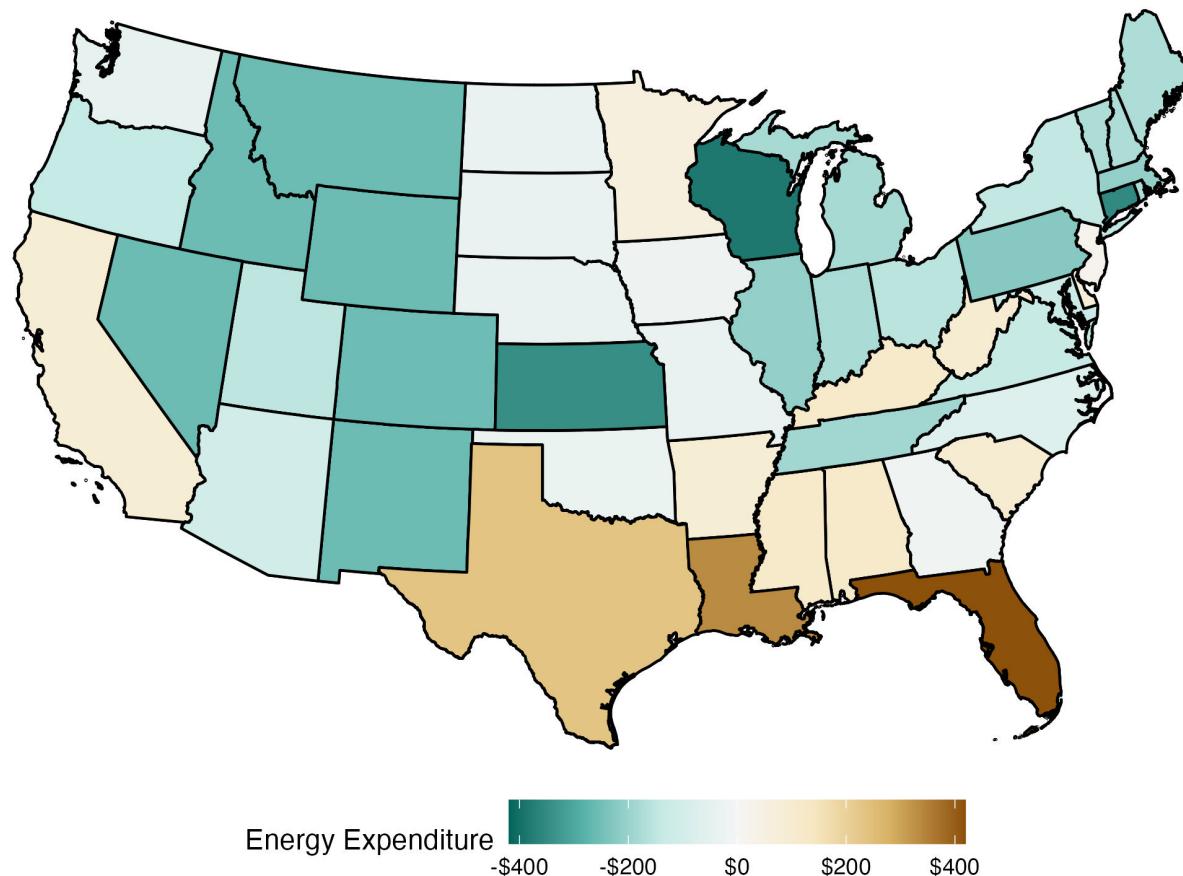
Gas Demand



More model fit plots

Spatial variation

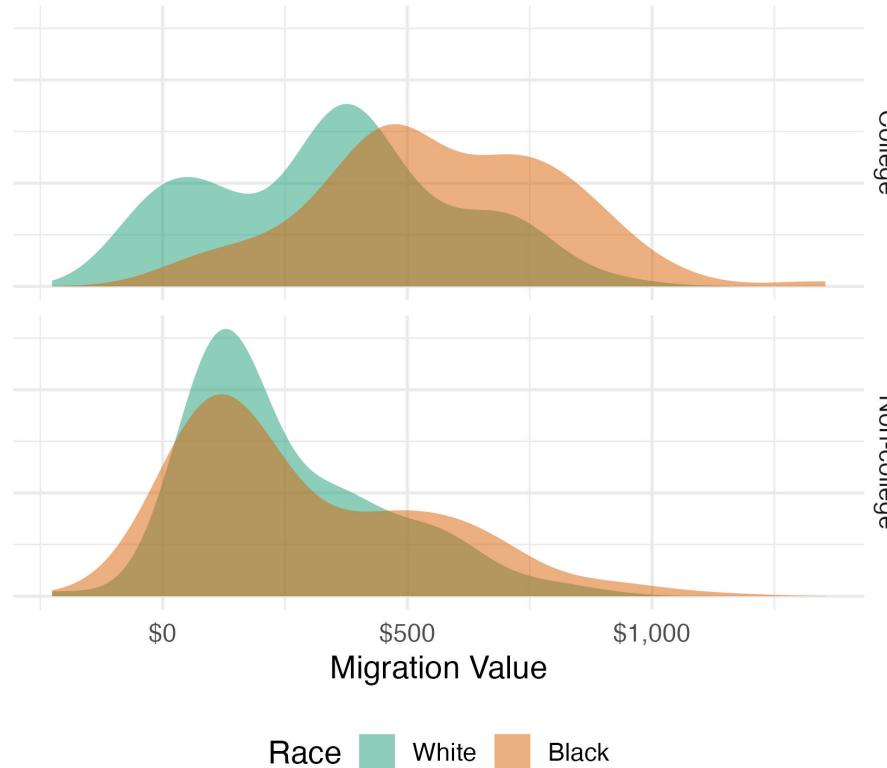
Energy Price



Different effects of warming in hot vs cold states

Migration reduces welfare loss

We **fix locations** and take the difference between that and GE welfare.



Migration reduces welfare loss by **34%** for white and **14%** for black HHs.