

# Buy High, Sell Higher? A Descriptive and Time-series Analysis of Housing Affordability by Generation in Ohio

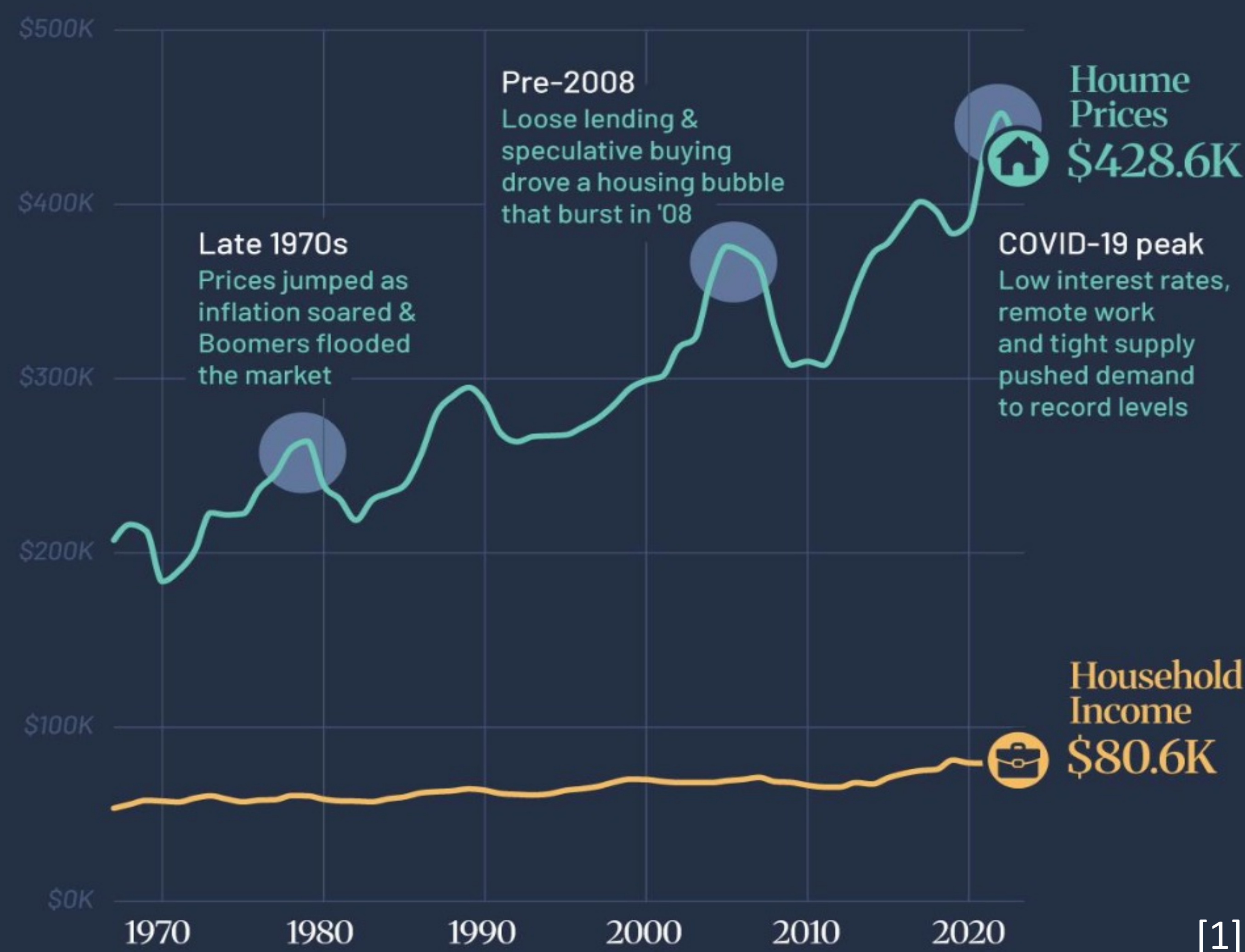
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## Research Question

How has housing affordability changes across Ohio cities from 2005-2023, and what role did financing conditions after 2014 play in shaping access to homeownership? Did affordability changes differ across cities with different income levels and population sizes?

## U.S. Home Prices vs. Household Income

Median values, in 2023 dollars, inflation-adjusted



## Data

- Panel dataset of Ohio cities from 2005–2023, restricted to cities with population above 10,000.
- Zillow ZHVI provides monthly housing price estimates.
- ACS (1-year and 5-year estimates) provides median income, rent, and housing characteristics
- FRED provides macroeconomic controls including 30-year mortgage rates and CPI inflation.
- Sample limited to cities with consistent ACS coverage across years to ensure comparability over time.

## Methods

- Mortgage estimate:

$$M = P(1 - d) * \frac{r(1 + r)^n}{(1 + r)^n - 1}$$

- Testing change across year groups:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

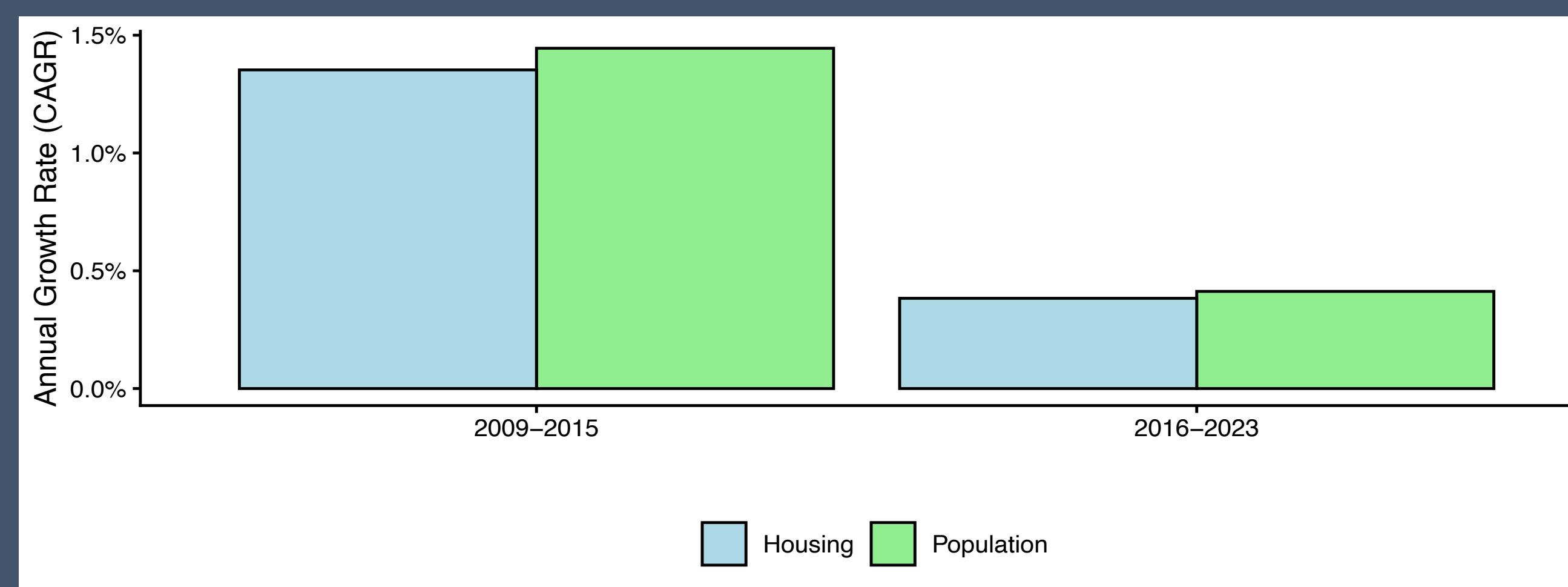
Estimating differences in city level effects:

$$pti_{it} = \beta 1(Post_t \times Treat_i) + \gamma_i + \delta_t + \epsilon_{it}$$

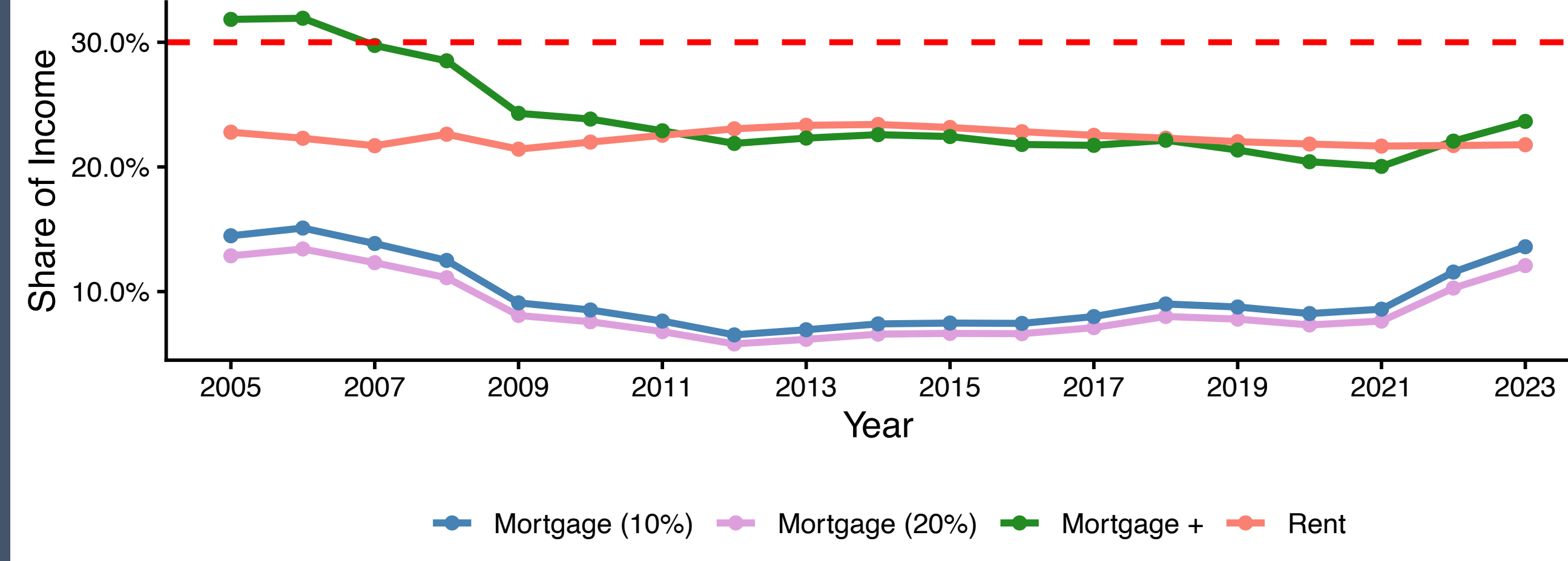
- Interest rate (r)
- Price (P)
- Payment (d)
- Group mean (x)
- Standard deviation(s)
- Group size(n)
- City effect( $\gamma_i$ )
- Time effect( $\delta_t$ )
- Treatment effect( $\beta$ )

## Results

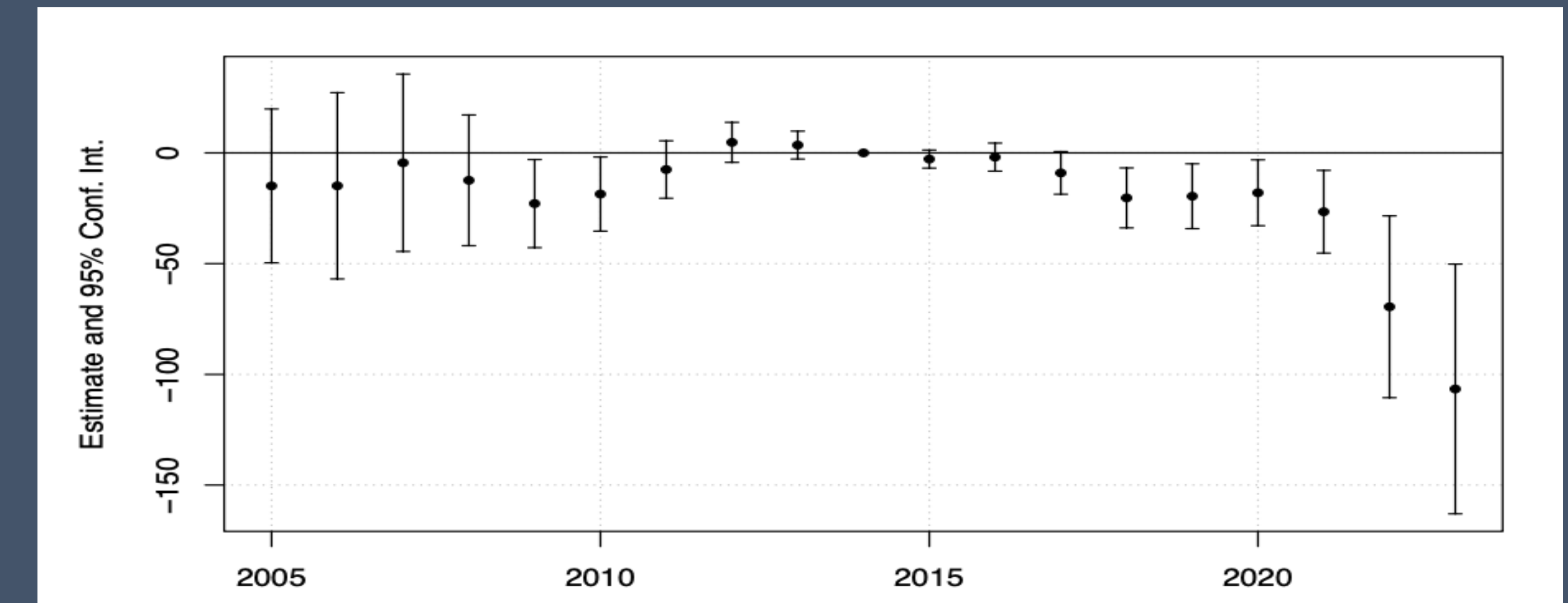
- Descriptive analysis
  - Housing and mortgage prices outpaced income after 2015
  - Divergence is growing after 2020
- Difference-in-differences
  - Uneven affordability across high- and low-income cities
  - High income cities experience different mortgage and price-to-income appreciation at a higher rate
- Event Study
  - Strong divergence in mortgage payments the post 2020 period



This figure shows housing and population growth in 2009–2015 and 2016–2023, with population growth slightly exceeding housing growth in both periods [2].



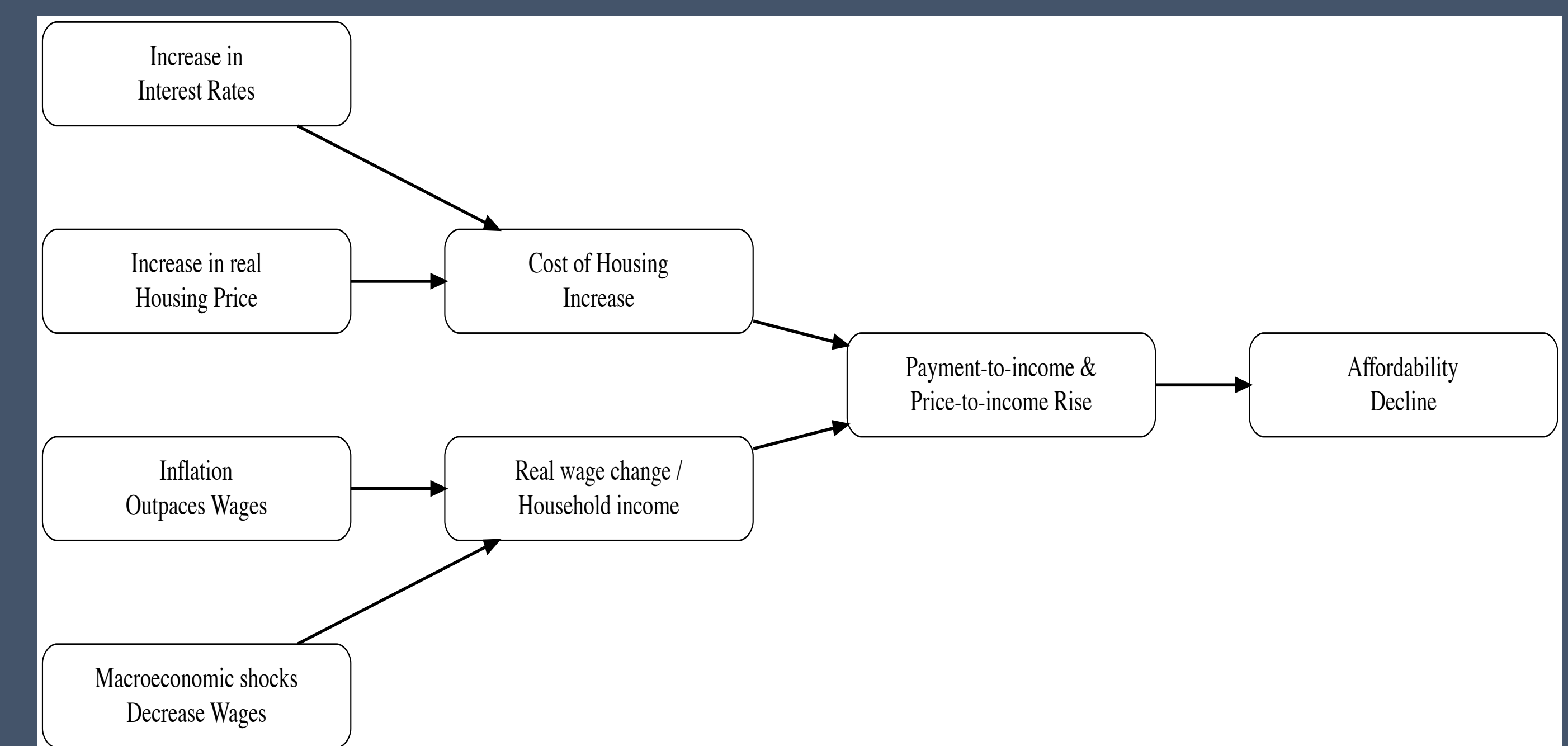
This figure shows mortgage payment and rent burdens from 2005–2023, with ownership costs declining after 2008 before rising again after 2021, while remaining near or below standard affordability thresholds [2][3][4].



This figure shows event-study estimates of affordability differences over time, with little evidence of pre-treatment divergence before 2015 and increasingly negative effects emerging after 2020 [2][3][4].

## Conclusion

- Housing affordability declined across Ohio after 2015, with the largest changes occurring after 2020.
- Rising mortgage rates played a larger role than home price growth in recent affordability declines.
- Affordability pressures were not limited to large cities, suggesting statewide exposure to financing constraints.
- Policies that expand housing supply or improve access to credit may be necessary to restore affordability for first-time buyers.



## Sources

- Visual Capitalist [1]
- US Census Bureau [2]
- Federal Reserve Economic Data [3]
- Zillow.com [4]