Urban Renewal, Gentrification, and Inequality

Evidence from Chicago Public Housing Demolitions

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Introduction

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Policies focused on urban renewal have distinct features

- Destruction of housing occupied by lower-income residents
- Forced displacement of residents (especially racial minorities) Map

How can urban renewal programs change neighborhoods and cities?

Direct effects:

- Destruction of low-income housing
  → Preferences for the presence/absence of low-income housing: Diamond & McQuade (2019)
- Direct displacement of residents
  → Residents care about location's demographic composition: Bayer, Ferreira & McMillan (2007)

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Indirect effects due to re-sorting:

- Changes in demographic composition due to re-sorting
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- New equilibrium prices
  → Need to restore market clearing

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New evidence on one of the largest spatially-targeted redevelopment programs in the U.S.

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Focus on PH demolitions in Chicago around the early 2000s

- Affected about 1% of housing stock

Background

Background: Public Housing in Chicago and HOPE VI

Third-largest PH system: 13 high-rise projects and $\approx$ 40k units

Nearly all residents are Black, average HH earnings of $7k

Serious infrastructure problems and high crime

Cabrini Green in 2005

Background: Public Housing in Chicago and HOPE VI

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HOPE VI ≈ 23,000 demolished units between 1995–2010

Section 8 vouchers to evicted residents

Public Housing Demolitions Late 1990s

Data and Motivating Facts

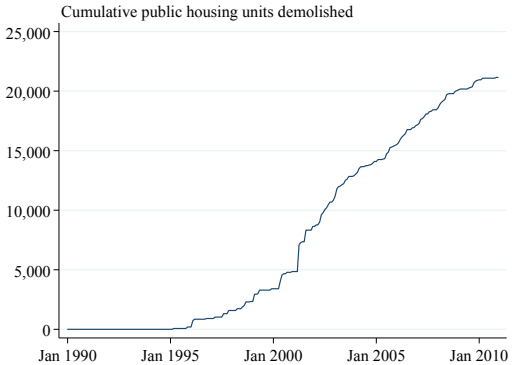
Data

Tract-level data:

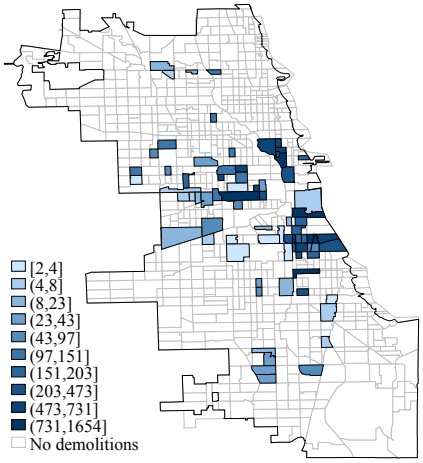
- Chicago Housing Authority: Demolition date and number of units demolished (1995–2010)
- Census Bureau: Population, demographics, and housing values (2000, 2010)

Public Housing Demolitions over Time and Space

Total demolished public housing units



Spatial distribution of public housing demolitions



Tract-level demolitions

Change in Neighborhood Characteristics: Black Population Share and Median House Values

Compare *changes* between 2000–2010 (2016) for tracts with more vs. fewer demolitions

Crime: Aliprantis and Hartley 2015, Sandler 2017, House Prices: Blanco 2021

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Figure 1: Change in Black Population Share

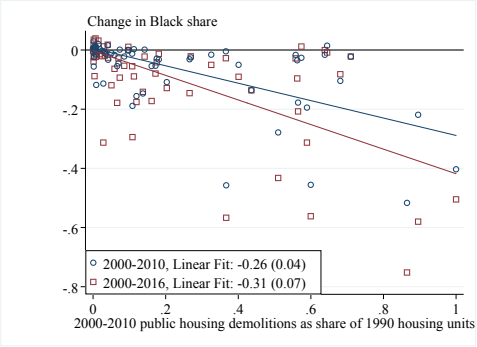
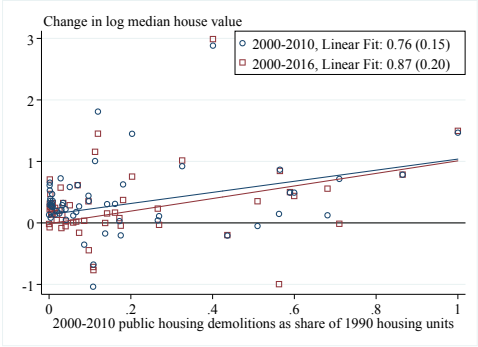


Figure 2: Change in Median House Values



More

Structural Model

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- Housing Demand
- Housing Supply
- Equilibrium Definition and Model Fit

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Residential Choice Model by Demographic Type

Household of *race* and *income* type k chooses neighborhood j by solving:

$$\max_j V_{jt}^i = \alpha_p^k \ln(p_{jt}) + \alpha_b^k b_{jt} + \alpha_h^k h_{jt} + \alpha_{Inc}^k \ln(Inc_{jt}) + \alpha_{PH}^k PH_{jt} + \theta^k x_{jt} + \xi_{jt}^k + \epsilon_{ijt},$$

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- ξ^k_{jt}: unobservable neighborhood characteristics
- ϵ_{ijt}: Type I EV i.i.d. idiosyncratic shock, leading to choice probability:

$$\mathbb{P}^k_{jt} = \frac{\exp\left(\alpha^k_p \ln(p_{jt}) + \alpha^k_b b_{jt} + \alpha^k_h h_{jt} + \alpha^k_{Inc} \ln(Inc_{jt}) + \alpha^k_{PH} PH_{jt} + \theta^k x_{jt} + \xi^k_{jt}\right)}{\sum_{j'} \exp(\alpha^k_p \ln(p_{j't}) + \alpha^k_b b_{j't} + \alpha^k_h h_{j't} + \alpha^k_{Inc} \ln(Inc_{j't}) + \alpha^k_{PH} PH_{j't} + \theta^k x_{j't} + \xi^k_{j't})}$$

Estimation

Eight demographic types: Race (White, Black, Hispanic, Other) and income groups (Low/High)

Empirical model:

$$\log\left(\frac{\mathbb{P}_{jt}^k}{\mathbb{P}_{0t}^k}\right) = \alpha_p^k \ln(p_{jt}) + \alpha_b^k b_{jt} + \alpha_h^k h_{jt} + \alpha_{Inc}^k \ln(Inc_{jt}) + \alpha_{PH}^k PH_{jt} + \theta^k x_{jt} + \xi_{jt}^k \quad (1)$$

→ Construct $\mathbb{P}_{jt}^k$ using share of type k living in tract j in year $t = 2000, 2010$ using census/ACS data

→ Spatially smooth $\mathbb{P}_{jt}^k$ to deal with noise due to small samples and zero shares

Identification: Endogeneity of Prices and Demographic Composition

Address several threats to identification:

$$\xi_{jt}^k = \lambda_j^k + \lambda_t^k + \tilde{\xi}_{jt}^k$$

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2. Year fixed effects λ_t^k: control for city-wide shocks
3. Instruments: potential correlation between time-varying characteristics and unobservables $\tilde{\xi}_{jt}^k$

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Extend Bayer, Ferreira, and McMillan 2007 to a panel setting

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Intuition

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- Increase in the number of 3-bedroom apartments in Lincoln Park
- Lowers demand for living in Hyde Park
    - Reduction in rents
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  - Reduction in high-income HHs that substitute away from Hyde Park
- Requires no correlation with Hyde Park's unobservables

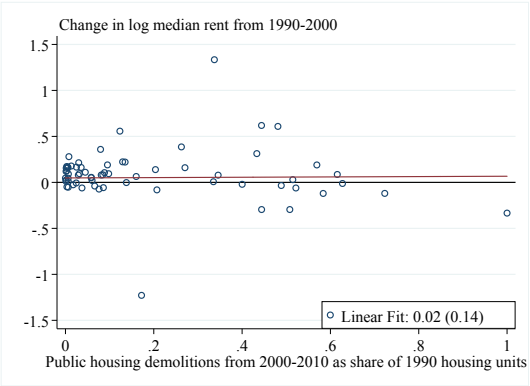
IV details: Three-step approach

Three-step approach to increase strength of first-stage (Davis, Gregory, Hartley, and Tan, 2021):

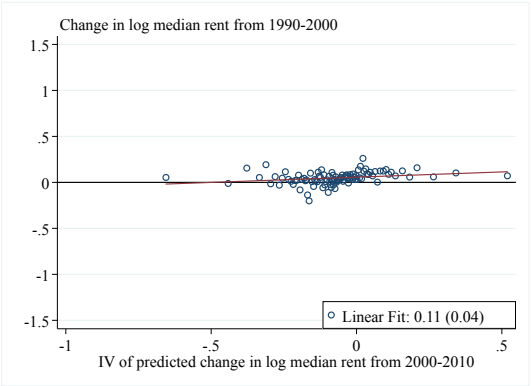
1. Estimate initial preference parameters using previously discussed instruments
2. Solve for equilibrium rents and demographics with initial estimates and no unobservables $\xi_{jt}^k = 0$
3. Estimate preference parameters adding simulated rent and demographics as instruments

IV details: Pre-trends analysis

Changes in Log Rents 1990–2010 against PH Demolitions and IV Predicted Log Rent in 2000–2010



(a) Public Housing Demolitions, 2000–2010



(b) IV Predicted Change in Log Rents, 2000–2010

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- Negative price elasticities for all groups
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Full Results

Robustness

Results are robust to a battery of specifications

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For example, small average absolute changes in rent coefficient after:

- Controlling for crime ~ 0.001
- Adding more or fewer spatial controls ~ 0.01-0.02
- Constructing IVs with more or fewer spatial rings ~ 0.01-0.02
- Including region-specific time trends ~ 0.03-0.05
- Dropping tracts that are nearby Cabrini-Green ~ 0.02

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Closing the model: Housing Supply

Housing supply curve:

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Calibration:

- Housing supply elasticity $\psi = 0.163$ (Baum-Snow and Han 2021 estimates for Chicago)
- Shifter θ_{jt} to match observed equilibrium quantities and prices

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Distinctive equilibrium definition

Requires simultaneous market clearing in

- Housing (prices)
- Demographics

Solve for a $\sim$ 4,000-dimensional fixed point

Incorporate endogenous demographic changes

No (suggestive) evidence of multiple equilibria
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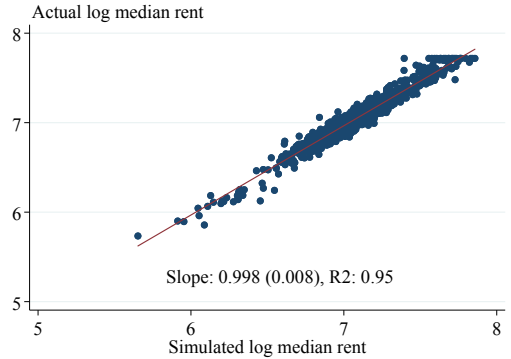
High Correlation between Actual & Simulated Rent



(a) 2010

2000 Changes

Counterfactuals and Welfare

Effects of Demolitions for Non-Hispanic White and Black HHs

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But effects unevenly distributed across demographic groups

Effects of Demolitions for Non-Hispanic White and Black HHs

Annual Rent Equivalent Under Various Scenarios, White and Black HHs (Median Annual Rent: $12,288)

					Non-Hisp. White		Black	
Own Demos	Nearby Demos	PH Demographics	Re-sort Demographics	Rent Change	Low Income	High Income	Low Income	High Income
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✓	✓	✓	✓	✓	-$51	$56	-$429	-$72

Demolitions → welfare gains for high-income white HHs & losses for others (esp. low-income Black)

Additional Results

- More elastic housing supply increases welfare for all groups More
- Distributing rent income raises welfare gap between LI Black and HI White by $210 (43%) More
- "Race-blind" equilibrium → racial preferences account for 40% of welfare changes More
- Redevelopment in PH areas increases aggregate welfare by $419 per person More
- Spatial spillovers and heterogeneity: More
  - 5.3% average rent increase in treated tracts
  - 1.7% average rent increase in untreated tracts
- The effect of displaced PH households on demand is negligible, both globally and locally.

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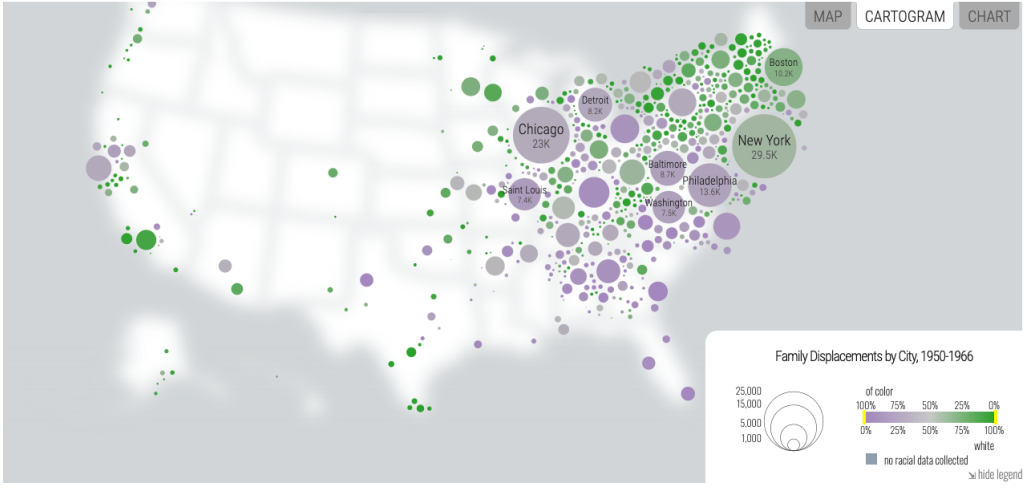
Differences in WTP and equilbrium adjustments shape welfare effects of urban renewal programs

Increasing the elasticity of housing supply can benefit lower-income minorities in particular

Appendix

Map of forced displacement of Urban Renewal programs 1950-1960



Source: Renewal Inequality, dsl.richmond.edu/panorama/renewal

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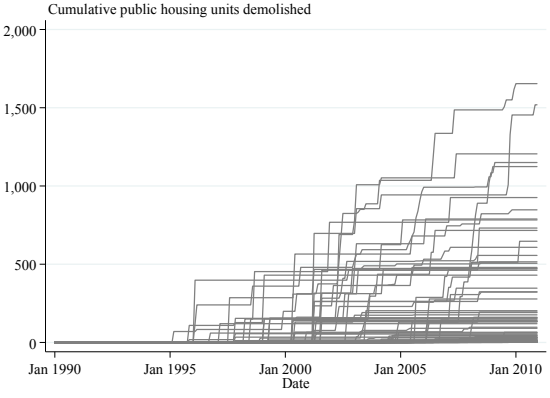
Cumulative Public Housing Demolitions in Chicago, by Tract



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Change in Neighborhood Characteristics: White Population Share and Median HH Income

Figure 5: Change in White Population Share

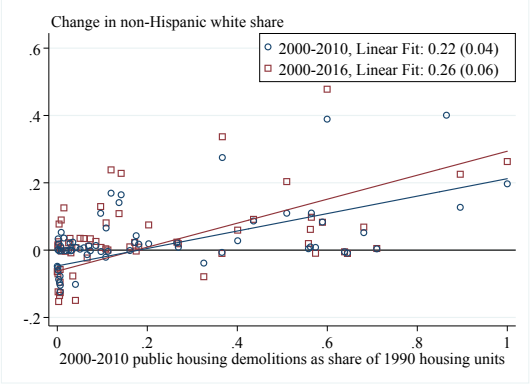
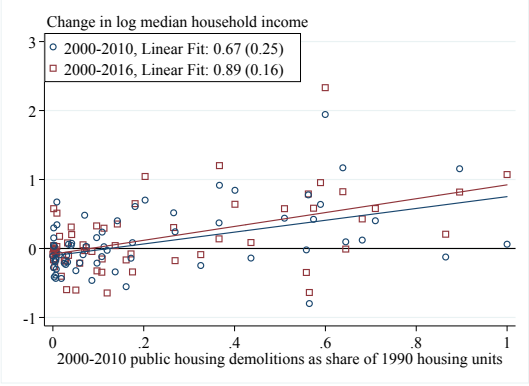


Figure 6: Change in Median Household Income



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Preference Estimates for Low Income Groups

IV Estimates of Neighborhood Preference Parameters, Low-Income Only

	Preference parameters for indicated group			
	Non-Hisp White (1)	Black (2)	Hispanic (3)	Other (4)
Log median rent	-0.417***	-0.168***	-0.240***	-0.152***
	(0.0486)	(0.0255)	(0.0370)	(0.0296)
Black population share	-0.204***	0.203***	0.227***	-0.158***
	(0.0787)	(0.0406)	(0.0537)	(0.0401)
Hispanic population share	-0.0818**	-0.0205	0.345***	0.197***
	(0.0359)	(0.0174)	(0.0300)	(0.0280)
Log median household income	0.0877***	0.0132	0.0259*	0.0631***
	(0.0211)	(0.00933)	(0.0152)	(0.0125)
PH units as a share of housing stock	-0.345***	-0.177***	-0.255***	-0.153***
	(0.0823)	(0.0472)	(0.0667)	(0.0507)
Observations (tract-by-year)	2,476	2,476	2,476	2,476
Number of tracts	1,238	1,238	1,238	1,238

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Preference Estimates for High Income Groups

IV Estimates of Neighborhood Preference Parameters, High-Income Only

	Preference parameters for indicated group			
	Non-Hisp White (1)	Black (2)	Hispanic (3)	Other (4)
Log median rent	-0.0624***	-0.0520***	-0.150***	-0.0265
	(0.00879)	(0.0124)	(0.0265)	(0.0169)
Black population share	-0.127***	0.231***	0.165***	-0.107***
	(0.0147)	(0.0218)	(0.0346)	(0.0205)
Hispanic population share	-0.133***	0.0888***	0.317***	0.0434**
	(0.00787)	(0.00918)	(0.0234)	(0.0198)
Log median household income	0.0211***	0.0130***	0.0289***	0.0406***
	(0.00395)	(0.00457)	(0.0110)	(0.00694)
PH units as a share of housing stock	-0.0457***	-0.0839***	-0.157***	-0.0294
	(0.0137)	(0.0216)	(0.0447)	(0.0298)
Observations (tract-by-year)	2,476	2,476	2,476	2,476
Number of tracts	1,238	1,238	1,238	1,238

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Robustness of Preference Estimates for High-Income White Households

	Baseline (1)	No spatial controls (2)	More spatial controls (3)	Add murder rate (4)	IV rings: 2–3, 3–5 miles (5)	IV rings: 2–3, 3–5, 5–10 miles (6)	Comm. region by year FEs (7)	Comm. division by year FEs (8)	Drop < 1 mile Cabrini-Green (9)
Log rent	-0.0624***	-0.0672***	-0.0753***	-0.0634***	-0.0768***	-0.0708***	-0.0655***	-0.0717***	-0.0499***
	(0.00879)	(0.00941)	(0.0101)	(0.00893)	(0.0101)	(0.00956)	(0.0206)	(0.0221)	(0.00832)
Sh. Black	-0.127***	-0.141***	-0.112***	-0.126***	-0.123***	-0.115***	-0.387***	-0.338***	-0.125***
	(0.0147)	(0.0170)	(0.0157)	(0.0150)	(0.0180)	(0.0157)	(0.0601)	(0.0707)	(0.0139)
Sh. Hispanic	-0.133***	-0.130***	-0.128***	-0.132***	-0.140***	-0.149***	-0.189***	-0.243***	-0.130***
	(0.00787)	(0.00845)	(0.00892)	(0.00790)	(0.00803)	(0.00830)	(0.0203)	(0.0265)	(0.00728)
Log Income	0.0211***	0.0284***	0.0225***	0.0215***	0.0228***	0.0219***	0.0868***	0.0583*	0.0185***
	(0.00395)	(0.00463)	(0.00422)	(0.00402)	(0.00463)	(0.00404)	(0.0212)	(0.0337)	(0.00337)
PH units	-0.0457***	-0.0651***	-0.0629***	-0.0448***	-0.0611***	-0.0575***	0.00925	-0.0201	-0.0355***
	(0.0137)	(0.0142)	(0.0160)	(0.0139)	(0.0164)	(0.0154)	(0.0308)	(0.0410)	(0.0132)

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Robustness of Preference Estimates for Low-Income Black Households

	Baseline (1)	No spatial controls (2)	More spatial controls (3)	Add murder rate (4)	IV rings: 2–3, 3–5 miles (5)	IV rings: 2–3, 3–5, 5–10 miles (6)	Comm. region by year FEs (7)	Comm. division by year FEs (8)	Drop < 1 mile Cabrini-Green (9)
Log rent	-0.168***	-0.197***	-0.128***	-0.171***	-0.178***	-0.188***	-0.192**	-0.192**	-0.205***
	(0.0255)	(0.0295)	(0.0196)	(0.0258)	(0.0229)	(0.0240)	(0.0851)	(0.0827)	(0.0294)
Sh. Black	0.203***	0.247***	0.158***	0.204***	0.157***	0.186***	0.908***	0.722***	0.225***
	(0.0406)	(0.0448)	(0.0332)	(0.0416)	(0.0453)	(0.0443)	(0.169)	(0.196)	(0.0470)
Sh. Hispanic	-0.0205	-0.0152	-0.0227	-0.0202	0.0344**	-0.00644	0.0241	0.0619	-0.0268
	(0.0174)	(0.0199)	(0.0144)	(0.0176)	(0.0172)	(0.0192)	(0.0604)	(0.0727)	(0.0198)
Log income	0.0132	0.0155	0.0135**	0.0139	0.0256**	0.0270***	-0.229***	-0.147	0.0143
	(0.00933)	(0.0110)	(0.00675)	(0.00947)	(0.0104)	(0.00998)	(0.0614)	(0.0913)	(0.0108)
PH units	-0.177***	-0.163***	-0.124***	-0.177***	-0.171***	-0.188***	-0.390***	-0.328**	-0.199***
	(0.0472)	(0.0526)	(0.0353)	(0.0470)	(0.0454)	(0.0486)	(0.136)	(0.145)	(0.0552)

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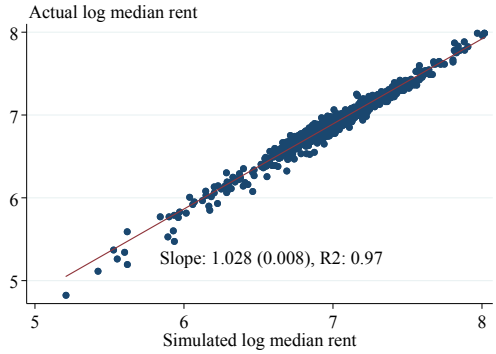
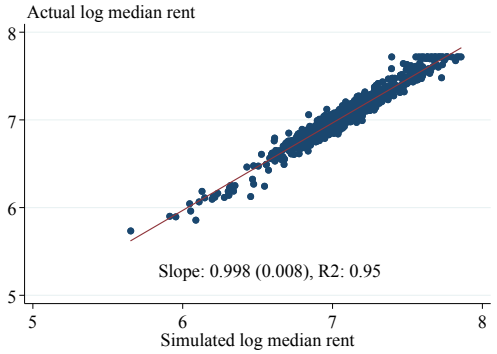
Model Fit

Actual vs. Simulated Log Rent



(a) 2000



(b) 2010

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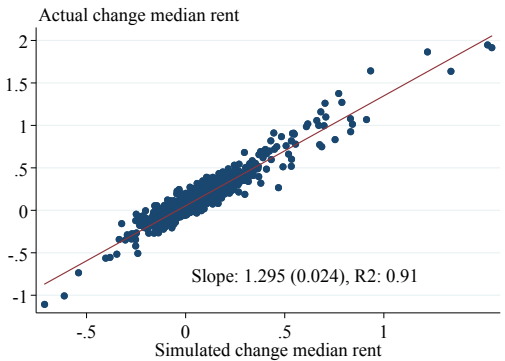
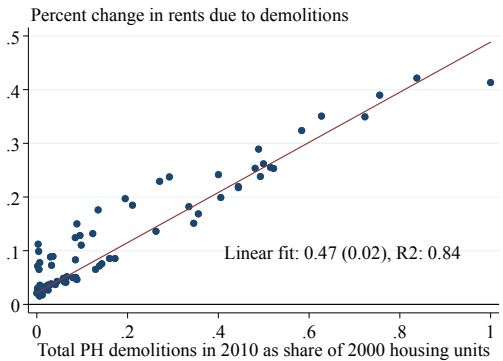
Model Fit: Rent Changes

Actual vs. Simulated Log Rent Changes 2000-2010



Rent Changes against Demolitions 2000-2010



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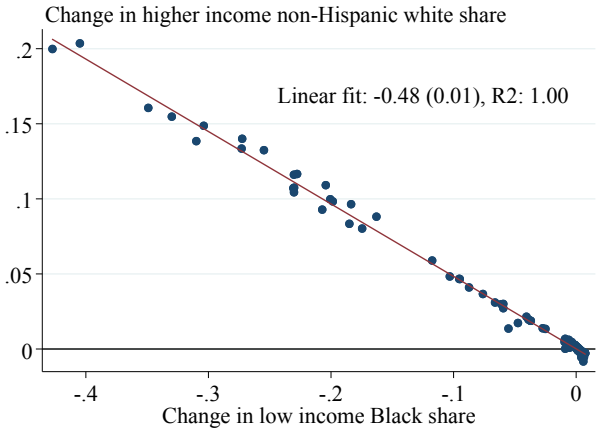
Composition effects: High Income White HHs displacing Low Income Black HHs



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The Role of Housing Supply

	Change from Baseline (2010 Census)			
	White		Black	
Housing supply elasticity	Low income (1)	High income (2)	Low income (3)	High income (4)
0.000	-313	-241	-1029	-641
0.106	-83	18	-508	-146
0.163 (baseline)	-51	56	-429	-72
0.220	-31	78	-382	-27
0.440	2	115	-300	50

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Incorporating Rental Income

	Change from Baseline (2010 Census)			
	White		Black	
	Low income (1)	High income (2)	Low income (3)	High income (4)
Baseline welfare change (no rent redistribution)	-51	56	-429	-72
Average welfare change with rent redistribution	122	329	-366	109
Welfare change for renters	–51	56	-429	-72
Welfare change for homeowners	286	392	-94	264
Homeownership rate	51.3%	81.2%	19.0%	53.9%

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“Race-Blind” Counterfactual

	Change from Baseline (2010 Census)			
	White		Black	
	Low income (1)	High income (2)	Low income (3)	High income (4)
Rent equivalent change in welfare from demolitions				
Baseline preferences	-51	56	-429	-72
No race/ethnicity preferences	-30	21	-381	20
Percent change in rent equivalent when eliminating race/ethnicity preferences	41%	-63%	11%	128%

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Redevelopment Counterfactual

We replace all PH units with new construction developed by the government

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We replace all PH units with new construction developed by the government

City-wide prices no longer increase after demolitions, with heterogeneous impacts across locations:

- Tracts with PH with an average rent of $870 experienced a 28% drop in rents
- Tracts without PH with an average rent of $1138 experienced a 1% increase in rents

Redevelopment Counterfactual

We replace all PH units with new construction developed by the government

City-wide prices no longer increase after demolitions, with heterogeneous impacts across locations:

- Tracts with PH with an average rent of $870 experienced a 28% drop in rents
- Tracts without PH with an average rent of $1138 experienced a 1% increase in rents

	Change from Baseline (2010 Census)			
	Non-Hispanic White		Black	
	Low income (1)	High income (2)	Low income (3)	High income (4)
Actual redevelopment (baseline)	-51	56	-429	-72
Replace all public housing units with new construction	229	273	90	359

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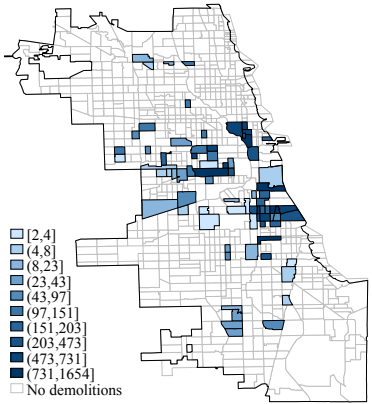
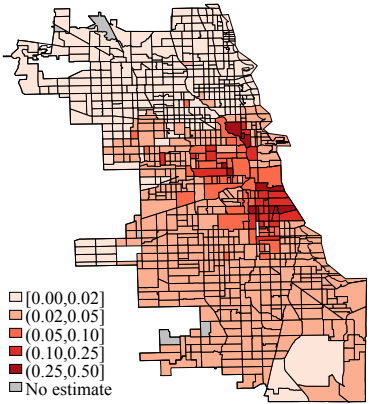
Tract-level Effects of Demolitions on Rents and Spatial Spillovers

Demolitions of PH directly affected 6% of tracts, with spatial spillovers to 27% tracts
→ 2.5% city-wide rent increase





Displacement Back

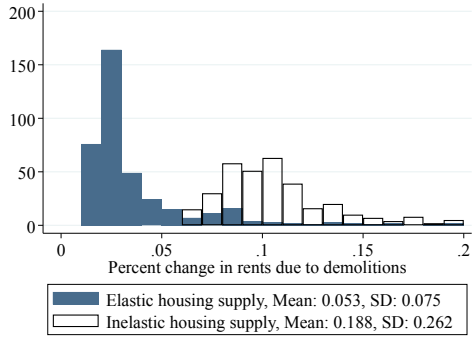
Tract-level Effects of Demolitions on Rents and Spatial Spillovers

Demolitions of PH directly affected 6% of tracts, with spatial spillovers to 27% tracts

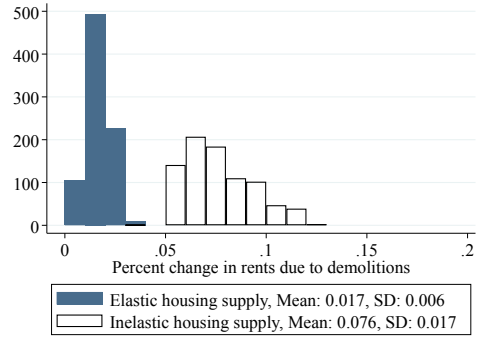
→ 2.5% city-wide rent increase

→ 5.3% in directly treated areas, 1.7% in areas more than 1 mile away

Rent Change, Tracts with PH < 1 Mile Away



Rent Change, Tracts with PH > 1 Mile Away



Displacement Back