Does Growing Up in Tax-subsidized Housing Lead to Higher Earnings and Educational Attainment?

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Overview

Research Question

- Do children who live in subsidized housing constructed under the Low Income Housing Tax Credit (LIHTC) have higher educational attainment and higher salaries as adults than they would otherwise?

Approach

- Created original data set using information/tax returns matched with LIHTC addresses
- Exploit variation in the number of years each child spends in low income housing
  - Use a stratified sampling approach to eliminate bias from leaving LIHTC housing and timing of entry
- Estimate heterogeneous effects based on neighborhood and family characteristics

Main Findings

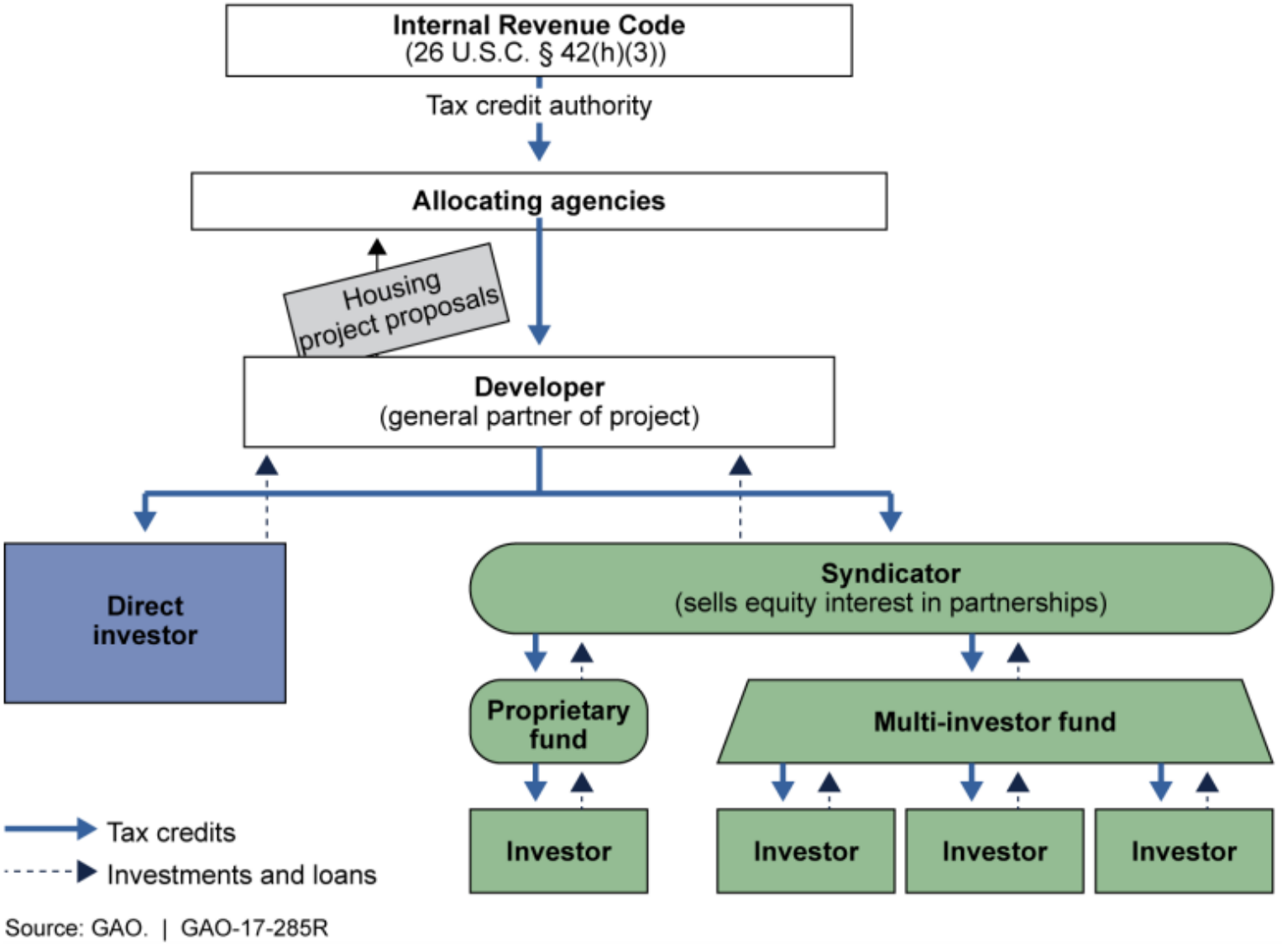
- Each additional year spent in LIHTC housing is associated with a 3.9% increase in the likelihood of attending 4+ years of higher education
  - Large cumulative effect: 28% difference over seven years
- One additional year spent in LIHTC housing also associated with a 5.2% increase in future earnings
  - The mechanism behind the increase in earnings appears to be higher levels of education
- The estimated effect is heterogeneous in age when grouping individuals by age of exit
- Evidence of heterogeneous neighborhood effects but they can be explained by individual characteristics (race)
- Strong evidence of heterogeneous effects at the family level (in housing stability and household income)

Background

The Low Income Housing Tax Credit

- Largest federal subsidy for the construction of low income housing in the United States (started in 1987)
  - Currently costs \$9 billion per year
  - Serves $>$ 2.6 million households in over 24,500 active buildings
- Credits issued directly to developers who trade them to banks and other lenders for equity
- Credit equivalent to 30% of qualified basis (4% credit) or 70% of qualified basis (9% credit)
- State Housing Finance Agencies (HFAs) select projects based on federal guidelines and Qualified Allocation Plans (QAPs)

Background


Internal Revenue Code
(26 U.S.C. § 42(h)(3))
Tax credit authority
Allocating agencies
Housing project proposals
Developer
(general partner of project)
Direct investor
Syndicator
(sells equity interest in partnerships)
Proprietary fund
Multi-investor fund
Investor
Investor
Investor
Investor
Tax credits
Investments and loans
Source: GAO. | GAO-17-285R

Affordability Requirements

- Taxpayers can claim the tax credit over 10 years if they meet the affordability requirements for 15 years
- Income limits are either 50% or 60% of area median income depending on percent of LIHTC units in the building
  - 20-50 or 40-60 rule
- Rent is set at 30% of building-specific income limit

▸ Tenant Demographics

Possible Mechanisms

- **Moving to "better" neighborhoods**: lower poverty, better schools, more economic mobility
  - Chetty, et al. (2018)
  - Ludwig, et. al (2013)
- **More disposable income**: family has more resources to invest in children
  - Noble, et al. (2015)
- **Housing security**: alleviating homelessness or frequent moving
  - Silva, et al. (2015)
- **Neighborhood improvement**: greater economic/racial integration and lower crime rates after construction of LIHTC buildings
  - Diamond & McQuade (2017)
  - Baum-Snow and Marion (2009)

Data

Sources

- IRS Compliance Data Warehouse
  - Tax/Information Returns (F1040, F1099, W-2)
  - F1098-T (tuition statements)
  - Social Security Administration (for DOB, gender)
- US Department of Housing and Urban Development
  - LIHTC addresses
  - Tenant income thresholds
  - Area Median Income (county level)
  - Placed in service dates
- 2000 US Census, Department of Education, & Opportunity Atlas (Chetty, et al.)
  - Neighborhood characteristics: poverty rate, high school graduation rate, racial demographics, median income
  - Opportunity measure: percent of individuals in the neighborhood with incomes in top 20% of birth cohort

Summary Statistics

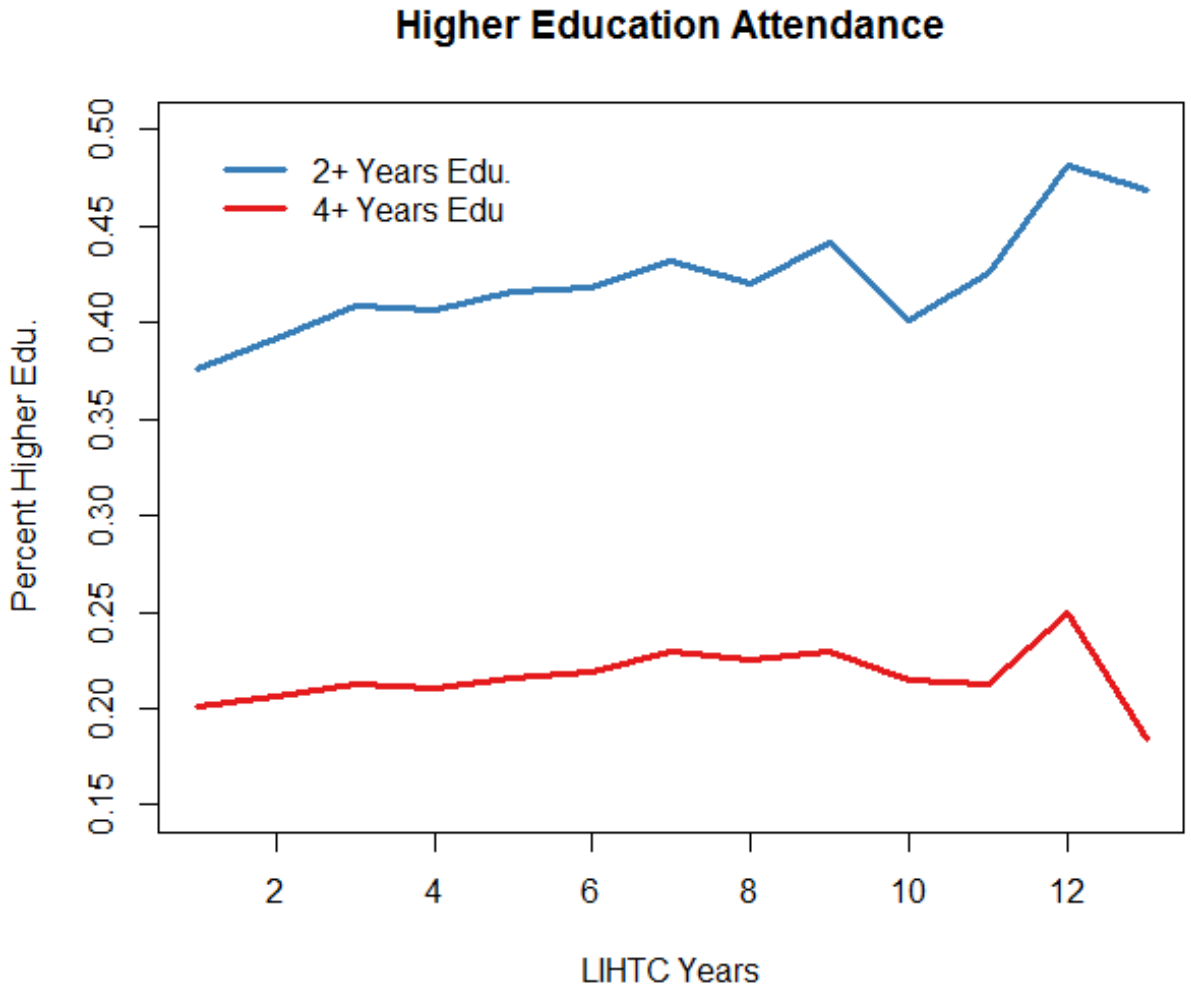
Data Summary

- 540,839 individuals
- Born between 1982 and 1994
- Observed in LIHTC housing between 2000 and 2012
- Between age 6 and 18 when they live in LIHTC housing
- Between age 24 and 36 in 2018

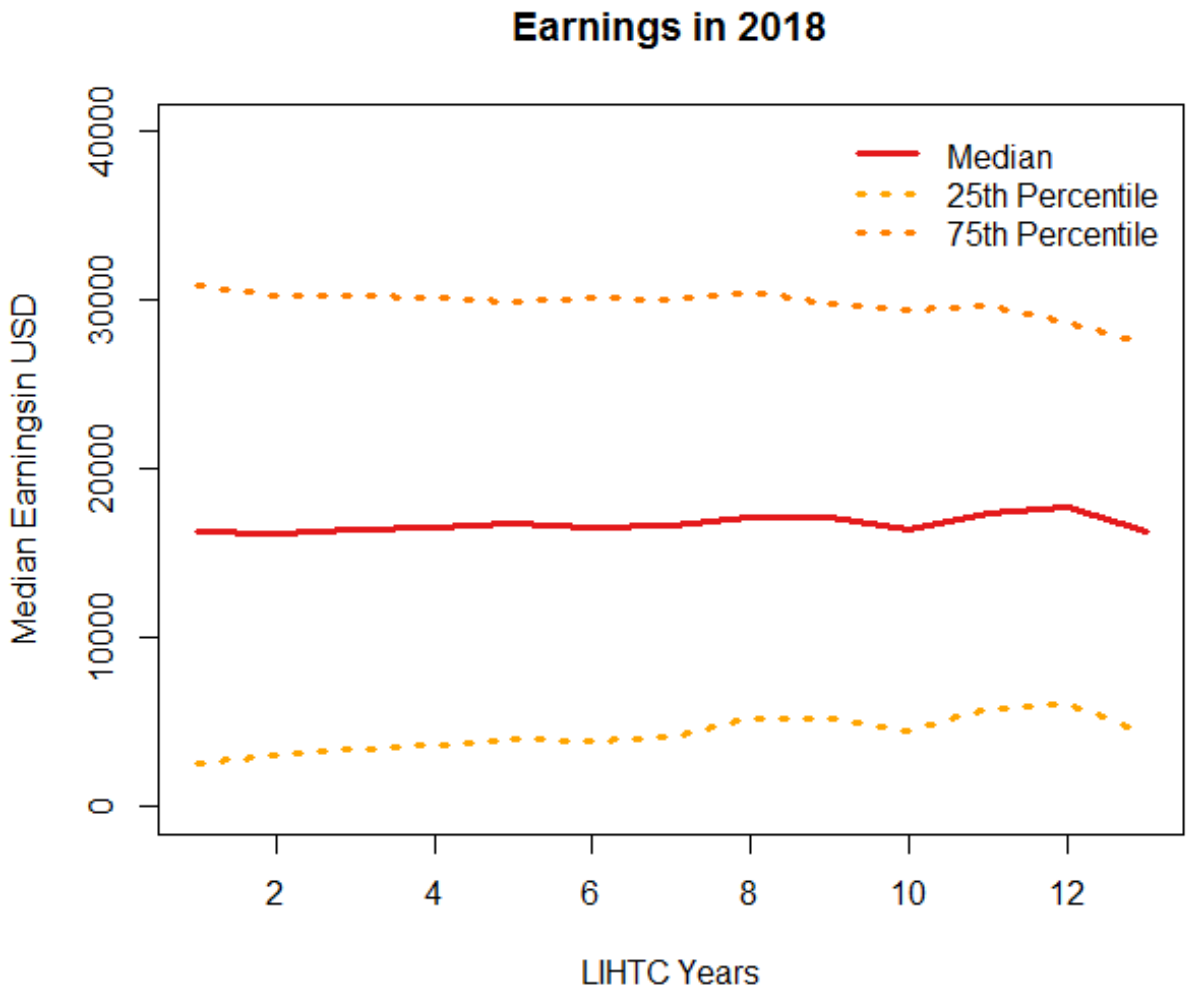
LIHTC Years: the number of years individual *i* spends in a building constructed using the Low Income Housing Tax Credit

- Variation in "exposure" to LIHTC housing (dosage measure)

Summary Statistics



Summary Statistics



Estimation Strategy

1. **"All LIHTC"**: full sample of individuals who spent 1 to 13 years in LIHTC housing

$$y_{i,b,z} = \theta h_{i,b,z} + \beta X_{i,b,z} + \gamma_b + \delta_z + \epsilon_{i,b,z}$$

$y_{i,b,z}$: incidence of attending 2+/4+ years of higher education; earnings in 2018

$h_{i,b,z}$: LIHTC Years

$X_{i,b,z}$**:** gender, household income, age of parent at birth, area median income, family size, number of units in the building, parents' filing/marital status

γ_b: birth year fixed effect

δ_z: zip code fixed effect

Estimation Strategy: Stratified Sampling

2. **"Stayers"**: weighted average of estimated coefficients for sub-groups categorized by age of exit from LIHTC housing
   - Deals with bias of leaving LIHTC housing due to age/circumstances of exit

$$\hat{\theta}_S = \sum_{k=8}^{18} \hat{\theta}_k w_k$$

$$E[y_{i,b,z} \mid i \in \mathcal{S}_k] = E[\theta_k h_{i,b,z} + \beta X_{i,b,z} + \gamma_b + \delta_z \mid i \in \mathcal{S}_k]$$

$$w_k = \frac{\sum_i I\{i \in \mathcal{S}_k\}}{\sum_i I\{i\}}$$

Estimation Strategy: Stratified Sampling

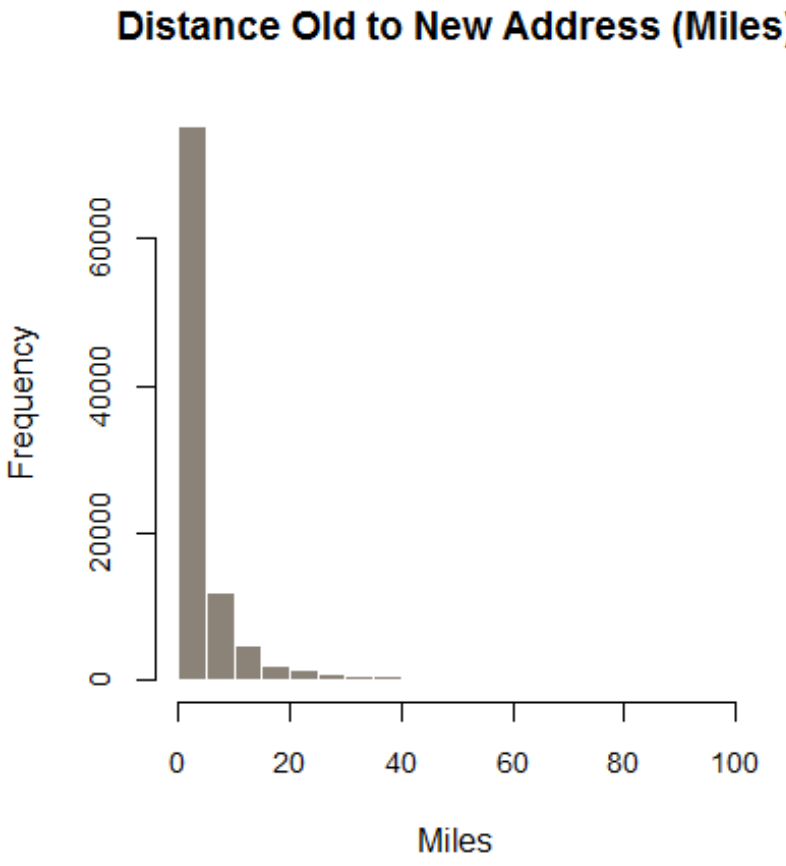
3. **"New Building"**: sub-sample of individuals who entered into a LIHTC building the same year (or one year after) it was placed in service
   - Deals with bias of parents moving when their child is a particular age
   - 60% do not change zip codes and 90% move less than 10 miles

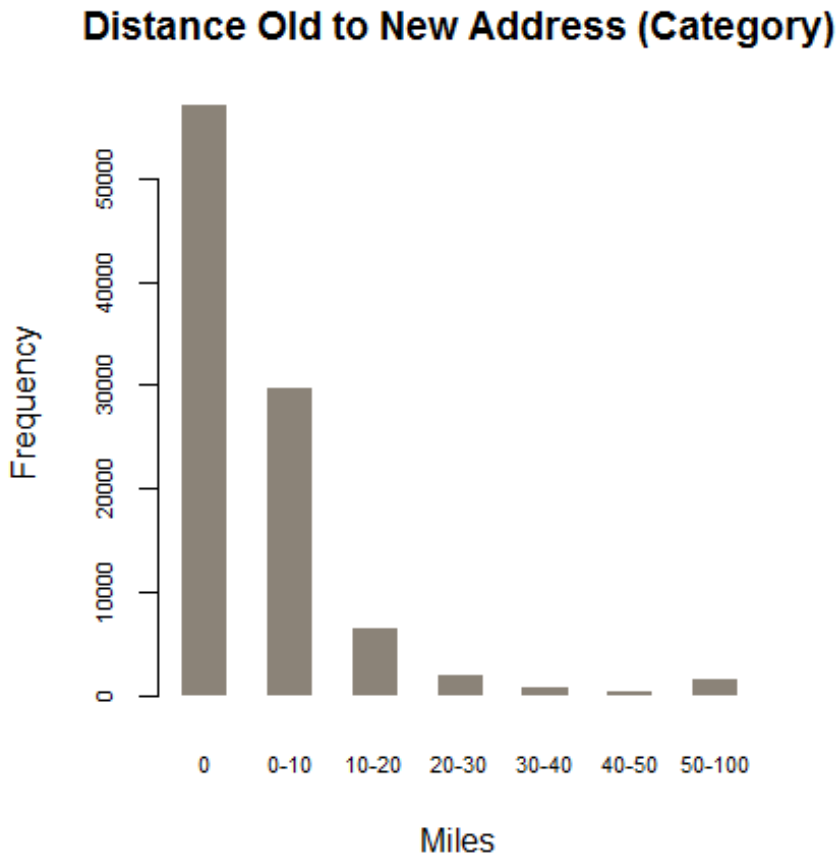
$$\hat{\theta}_{NB} = \sum_{k=11}^{18} \hat{\theta}_k w_k$$

$$E[y_{i,b,z} | i \in \mathcal{S}_k, i \in \mathcal{NB}] = E[\theta_k h_{i,b,z} + \beta X_{i,b,z} + \gamma_b + \delta_z | i \in \mathcal{S}_k, i \in \mathcal{NB}]$$

$$w_k = \frac{\sum_i I\{i \in \mathcal{S}_k\}}{\sum_i I\{i\}}$$

Estimation Strategy





Education Results: 4+ Years Higher Education

	4+ Years Higher Education (Log Odds Ratios)		
	All LIHTC	Stayers	New Building
LIHTC Years	0.039***	0.068***	0.039**
	(0.004)	(0.011)	(0.018)
Male	-0.537***	-0.540***	-0.540***
	(0.007)	(0.011)	(0.018)
Log Household Income	0.228***	0.254***	0.234***
	(0.013)	(0.025)	(0.039)
Parent's Age at Birth	0.008***	0.009***	0.009***
	(0.001)	(0.002)	(0.003)
Log Area Median Income	1.481***	0.111	-0.021
	(0.359)	(0.249)	(0.316)
Family Size	-0.102***	-0.121***	-0.133***
	(0.007)	(0.012)	(0.020)
Log Units in Building	0.033**	0.047*	0.030
	(0.014)	(0.024)	(0.052)
Filing status fixed effects	✓	✓	✓
Birth year fixed effects	✓	✓	✓
Zip code fixed effects	✓	✓	✓
Observations	540,839	531,088	108,825
Baseline Enroll Rate	0.200	0.207	0.232
Note:		*p<0.10, **p<0.05, ***p<0.01	

▸ Alt. HH Income Controls

Education Results: 2+ Years Higher Education

	2+ Years Higher Education (Log Odds Ratios)		
	All LIHTC	Stayers	New Building
LIHTC Years	0.050***	0.078***	0.037**
	(0.004)	(0.009)	(0.015)
Male	-0.534***	-0.539***	-0.547***
	(0.005)	(0.009)	(0.015)
Log Household Income	0.181***	0.206***	0.191***
	(0.010)	(0.019)	(0.031)
Parent's Age at Birth	0.003***	0.004***	0.005**
	(0.001)	(0.001)	(0.002)
Log Area Median Income	1.829***	0.257	0.330
	(0.337)	(0.236)	(0.391)
Family Size	-0.087***	-0.108***	-0.121***
	(0.006)	(0.010)	(0.017)
Log Units in Building	0.033***	0.044**	0.003
	(0.011)	(0.020)	(0.043)
Filing status fixed effects	✓	✓	✓
Birth year fixed effects	✓	✓	✓
Zip code fixed effects	✓	✓	✓
Observations	540,839	531,088	108,825
Baseline Enroll Rate	0.376	0.391	0.426
Note:			*p<0.10, **p<0.05, ***p<0.01

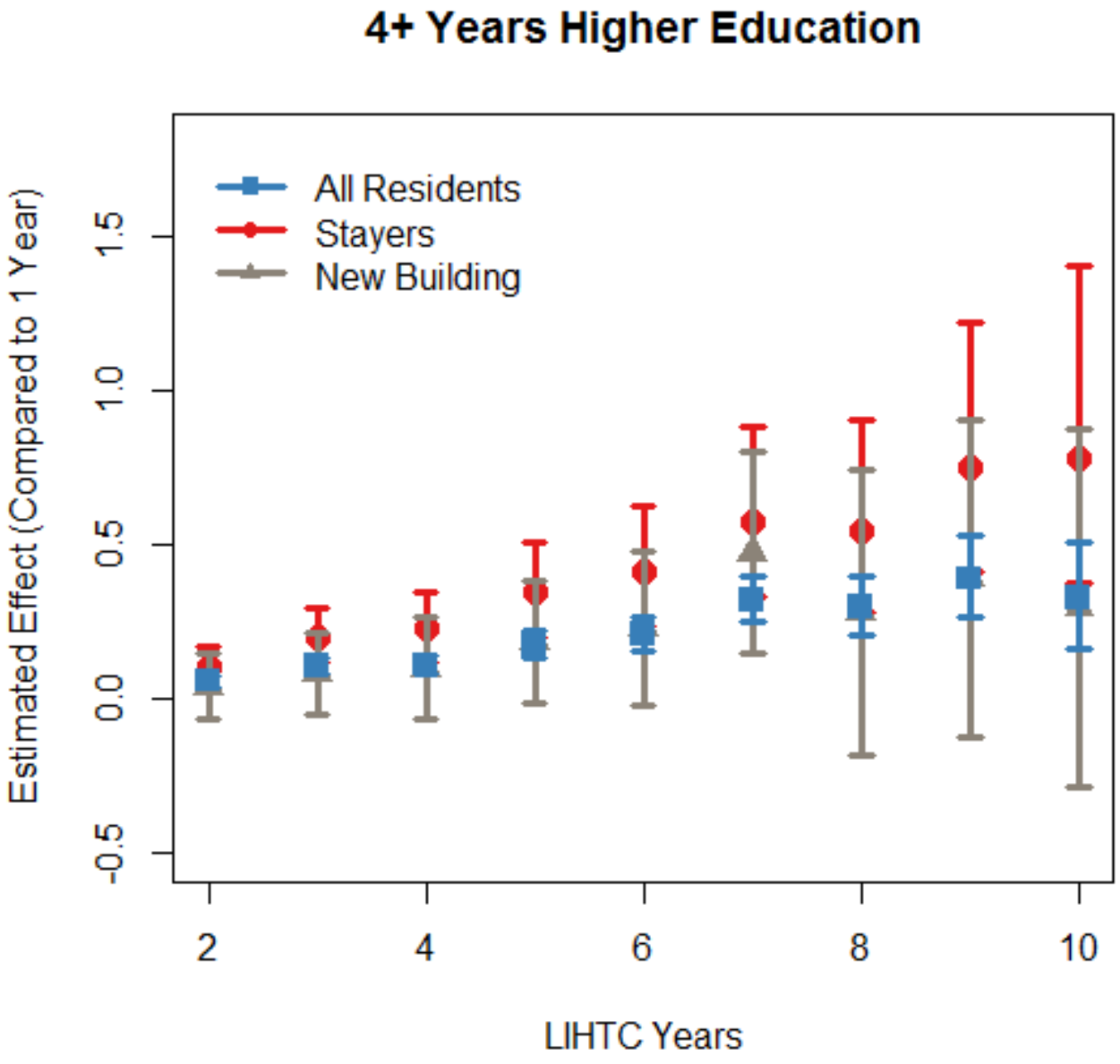
Earnings Results

	Log Adult Earnings (in 2018)		
	All LIHTC	No Leavers	New Building
LIHTC Years	0.036***	0.057***	0.052**
	(0.003)	(0.014)	(0.025)
Male	-0.430***	-0.447***	-0.525***
	(0.021)	(0.039)	(0.062)
Log Household Income	0.192***	0.204***	0.196***
	(0.007)	(0.024)	(0.041)
Age of Parent at Birth	-0.002***	-0.002	-0.001
	(0.001)	(0.002)	(0.004)
Log Area Median Income	0.663***	-0.321	0.726
	(0.112)	(0.418)	(0.786)
Family Size	-0.101***	-0.106***	-0.107***
	(0.007)	(0.020)	(0.035)
Log Units in Building	0.016	0.017	-0.056
	(0.013)	(0.034)	(0.080)
Filing status fixed effects	✓	✓	✓
Birth year fixed effects	✓	✓	✓
Zip code fixed effects	✓	✓	✓
Observations	540,839	179,356	41,989
Baseline Mean Wage	$23,007	$22,505	$24,127
Note:		*p<0.10, **p<0.05, ***p<0.01	

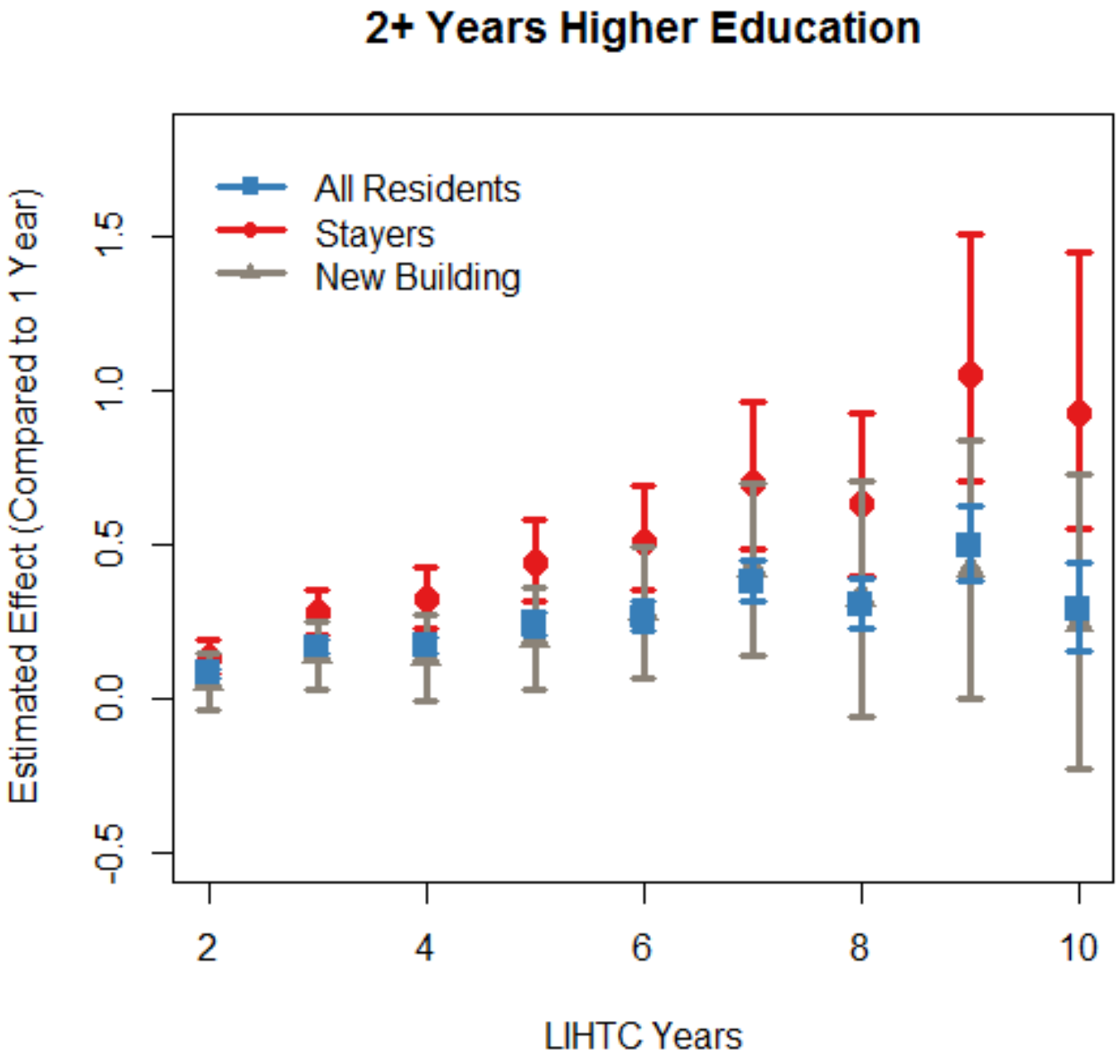
Earnings Results (Controlling for Education)

	Log Adult Earnings (in 2018)		
	All LIHTC	No Leavers	New Building
LIHTC Years	0.014***	0.024*	0.029
	(0.003)	(0.014)	(0.018)
2+ Years Education	2.019***	2.039***	1.610***
	(0.020)	(0.037)	(0.046)
Male	-0.083***	-0.097**	-0.126**
	(0.020)	(0.039)	(0.049)
Log Household Income	0.125***	0.131***	0.101***
	(0.007)	(0.022)	(0.030)
Age of Parent at Birth	-0.003***	-0.004**	-0.001
	(0.001)	(0.002)	(0.003)
Log Area Median Income	0.194*	-0.226	0.446
	(0.103)	(0.403)	(0.586)
Family Size	-0.060***	-0.054***	-0.036
	(0.006)	(0.019)	(0.026)
Log Units in Building	0.002	-0.002	-0.034
	(0.011)	(0.032)	(0.059)
Filing status fixed effects	✓	✓	✓
Birth year fixed effects	✓	✓	✓
Zip code fixed effects	✓	✓	✓
Observations	540,839	179,356	41,989
Baseline Mean Wage	$23,007	$22,505	$24,127
Note:		*p<0.10, **p<0.05, ***p<0.01	

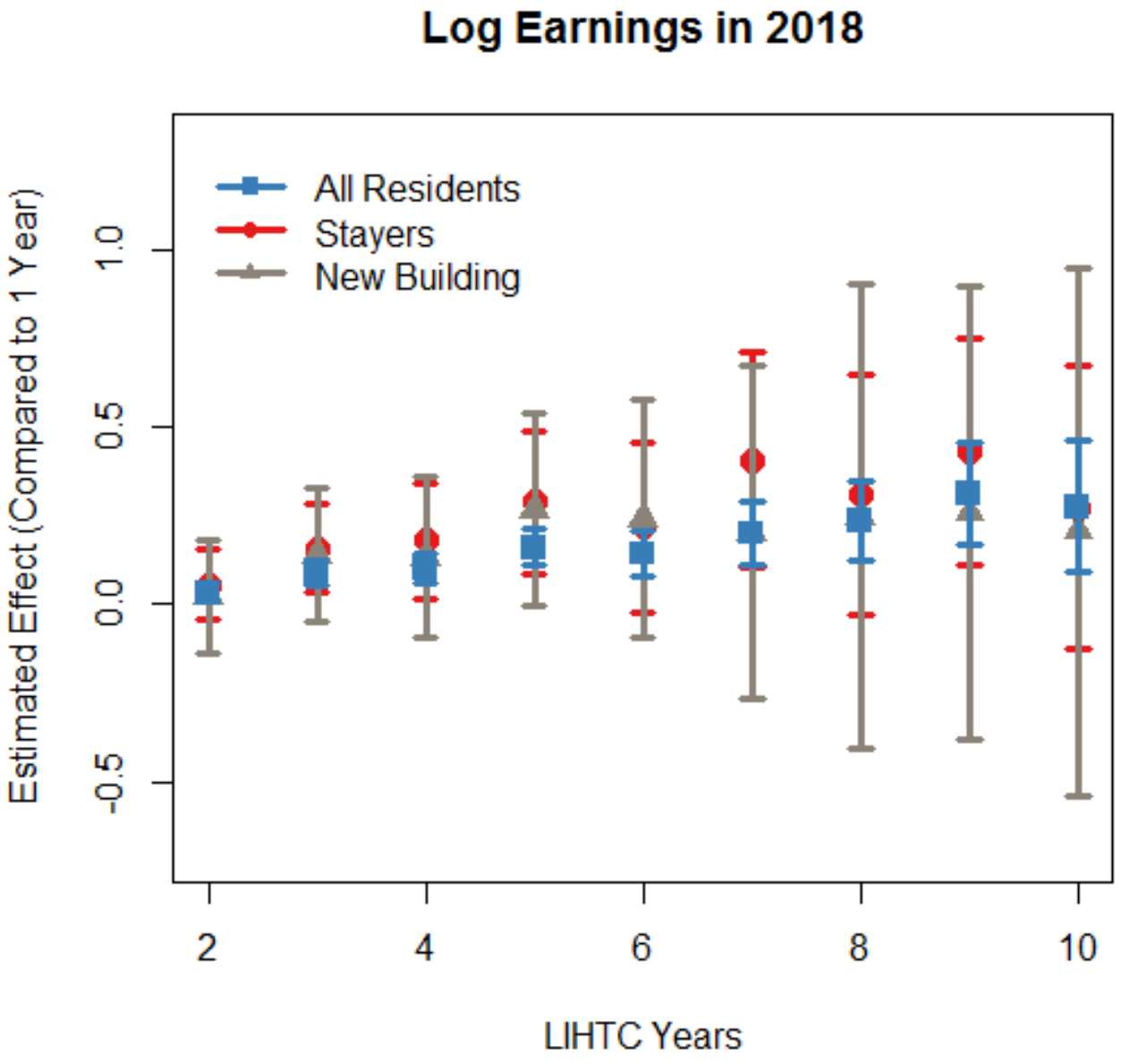
Fixed Effect Results



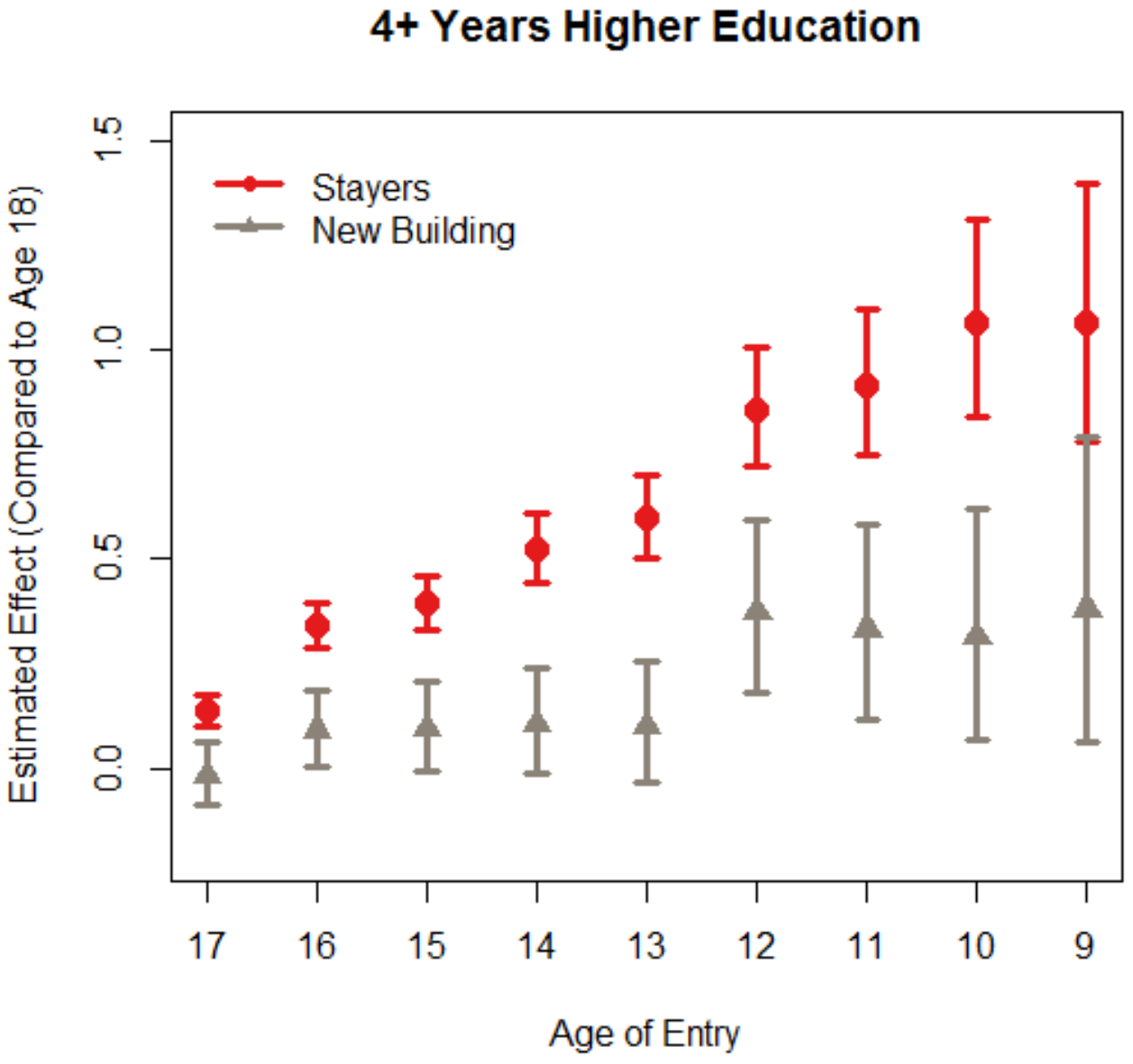
Fixed Effect Results



Fixed Effect Results



Fixed Effect Results: Stay through Age 18



Heterogeneous Effects

Heterogeneous Neighborhood Effects

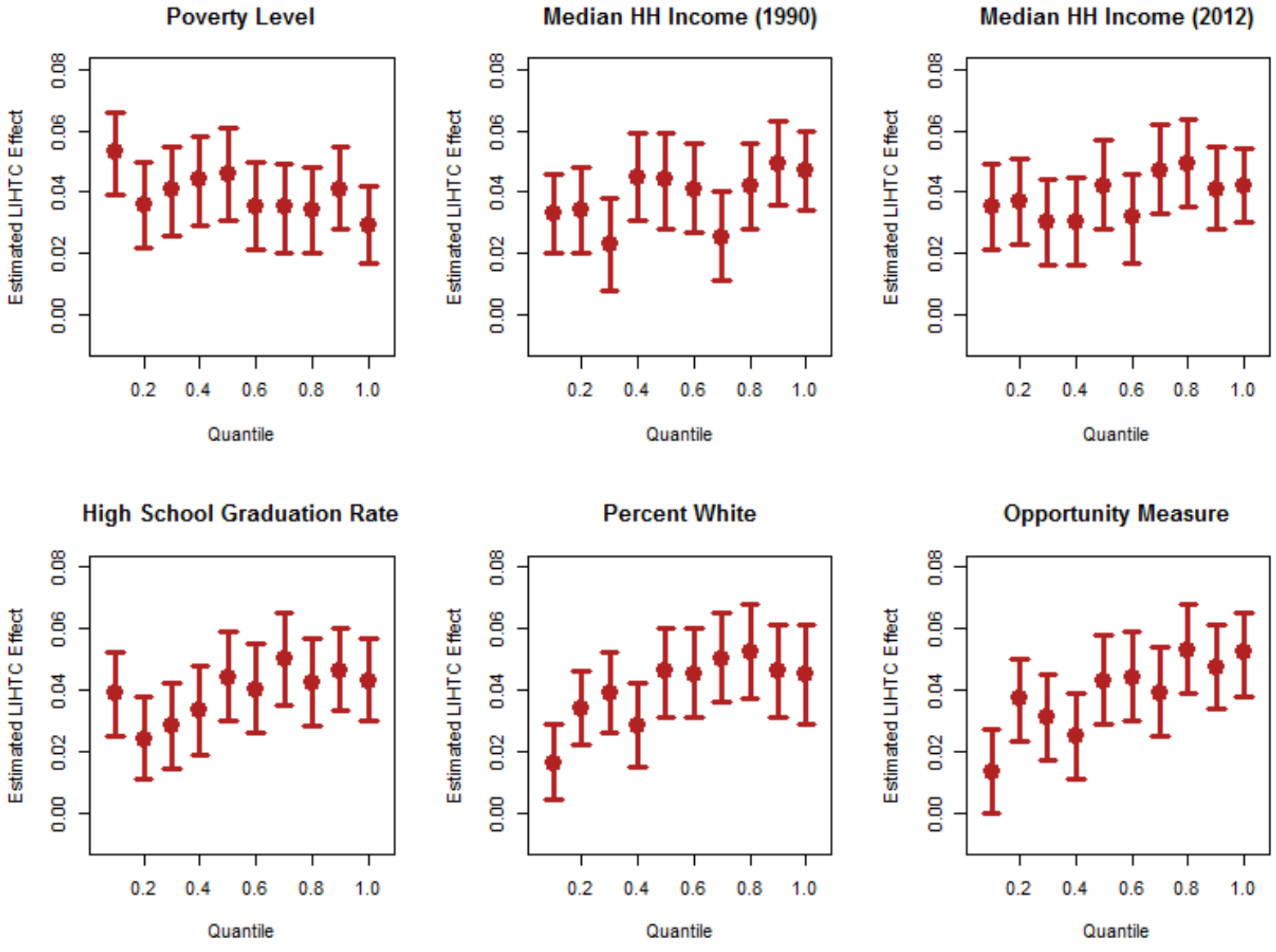
- Poverty Level
- Median Household Income
- High School Graduation Rate
- Race (percent White)
- Opportunity Measure
- Public School Quality

Heterogeneous Family Effects

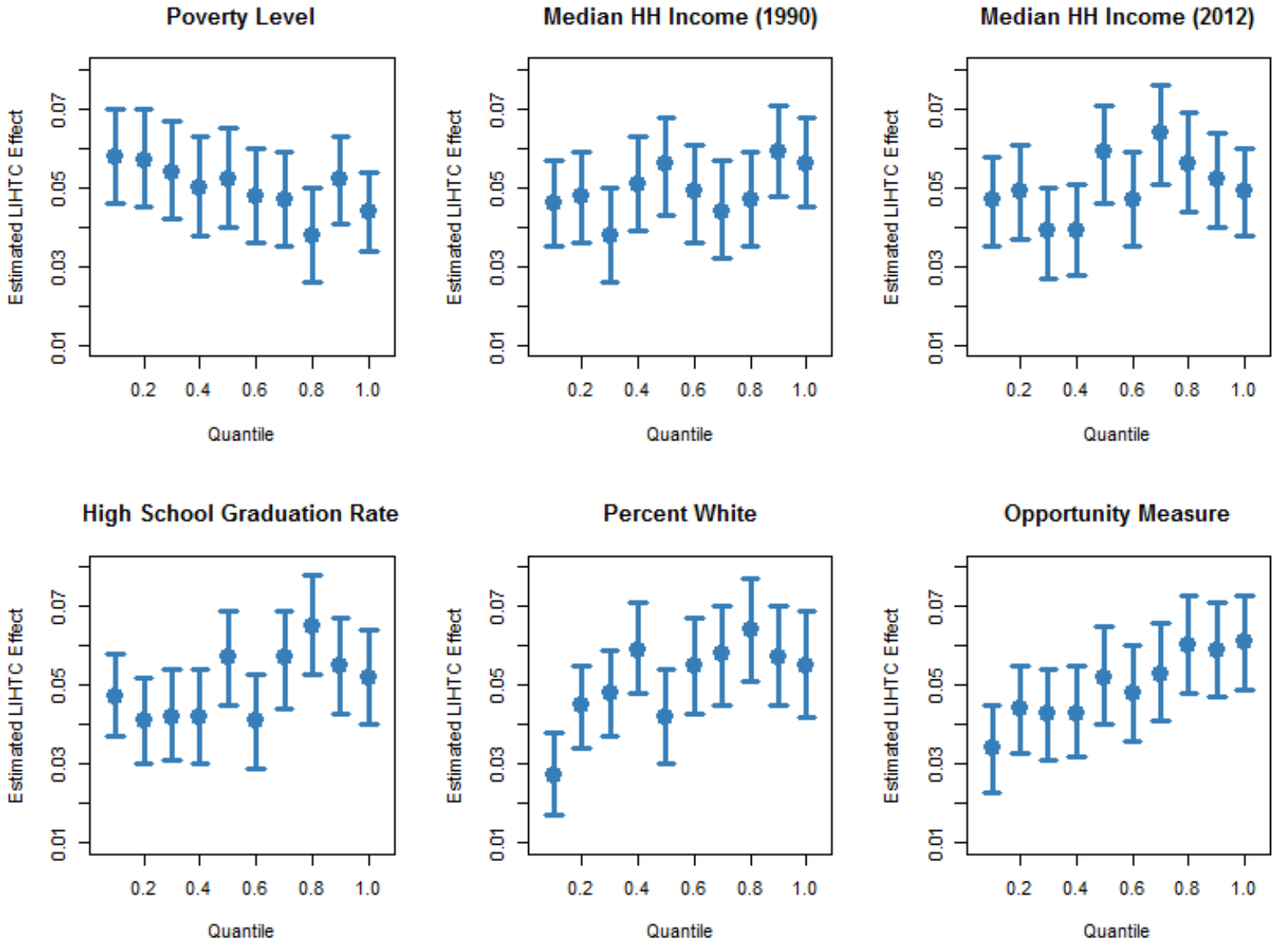
- Housing Security
- Household Income

▸ Quantile Cutoff Points ▸ Public School Quality

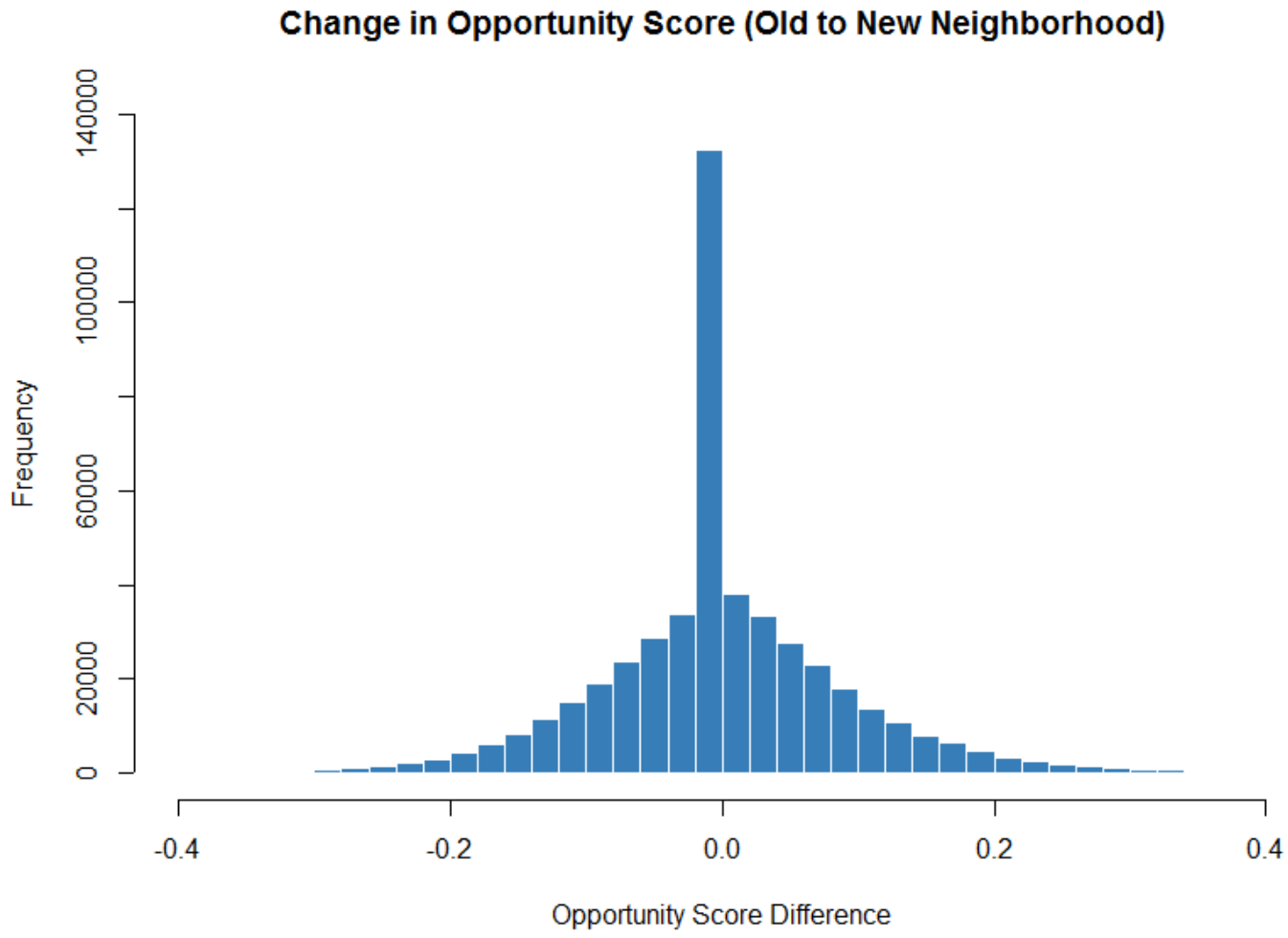
Heterogeneous Neighborhood Effects (4+ Years Edu.)



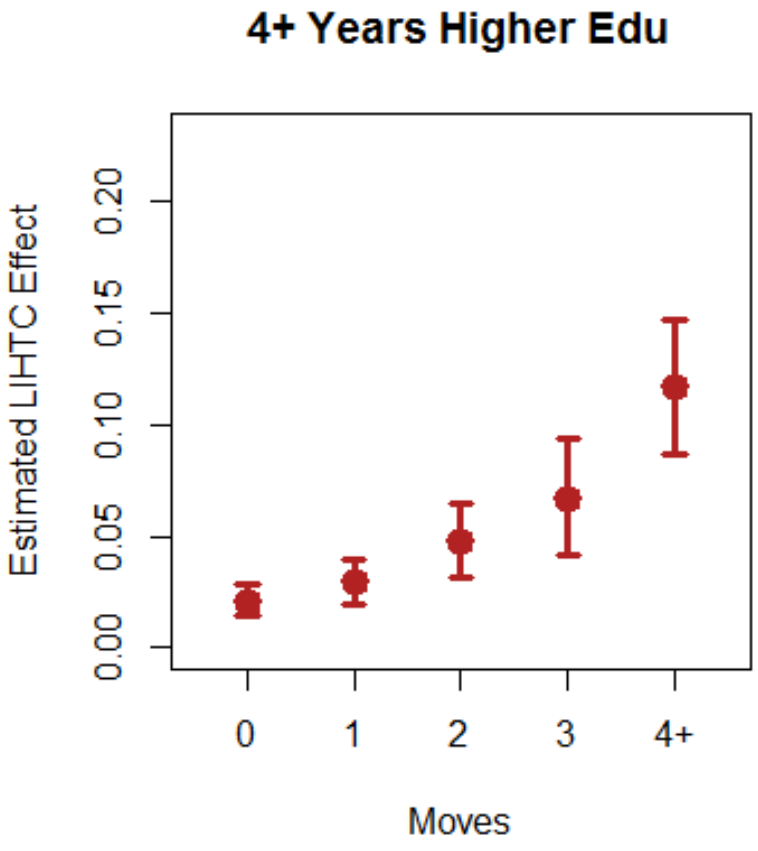
Heterogeneous Neighborhood Effects (2+ Years Edu.)

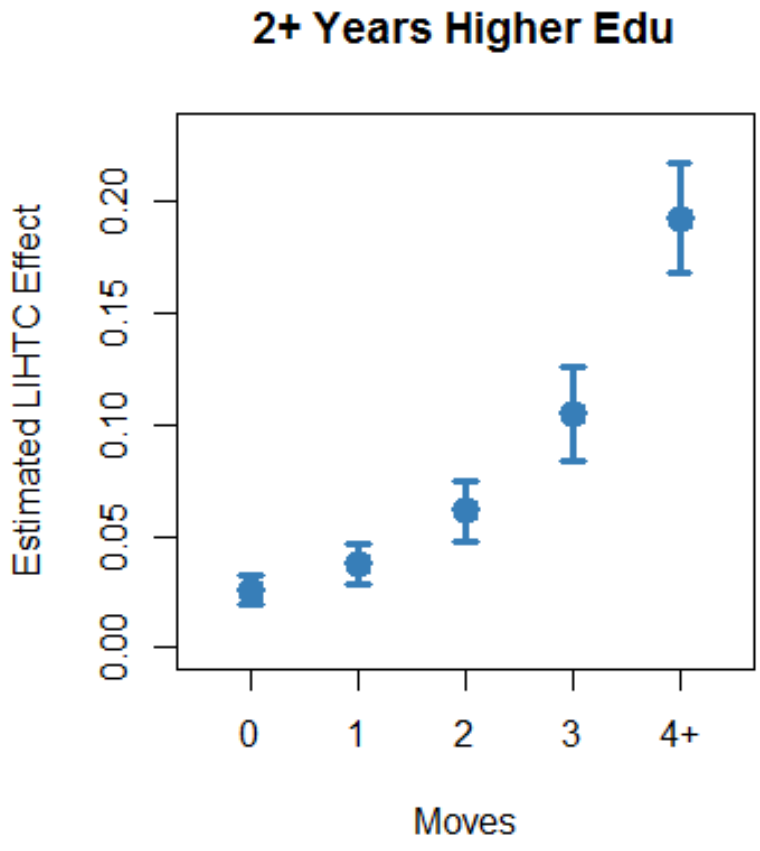


Opportunity Score Differences (Moving to LIHTC)

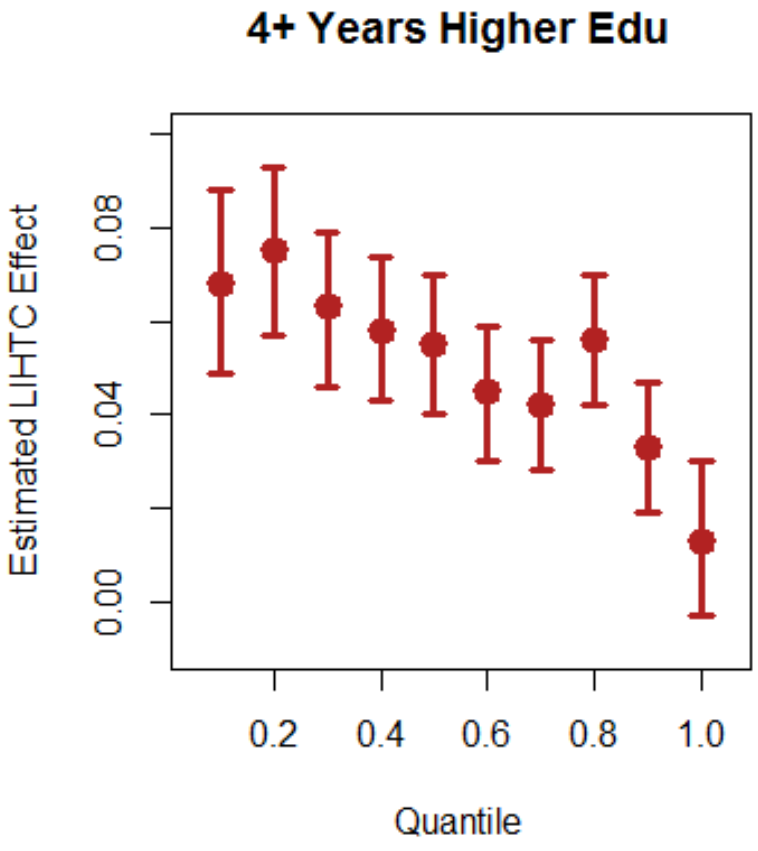


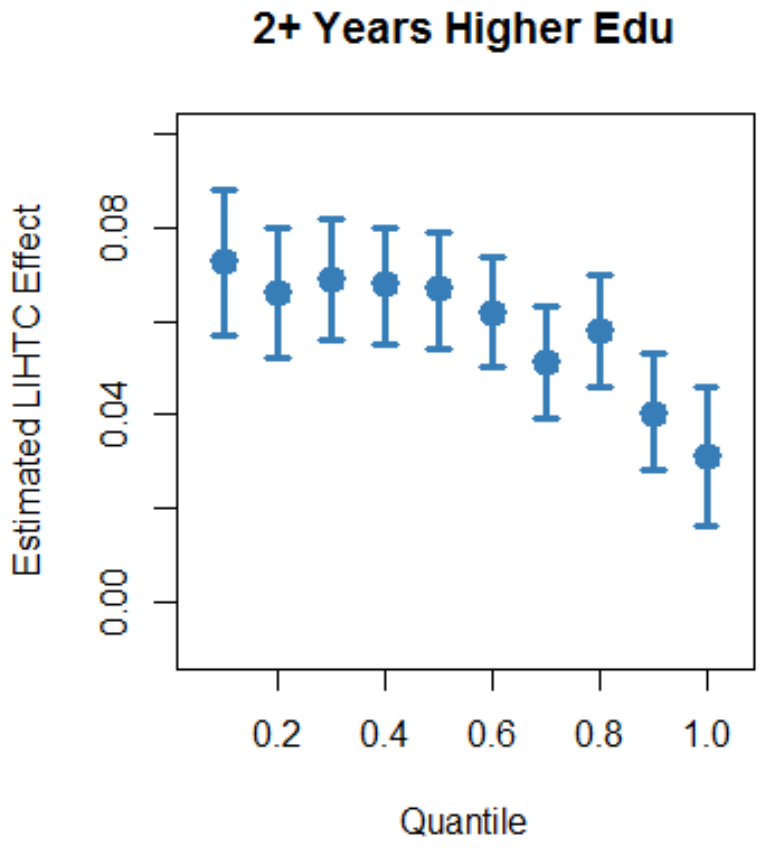
Heterogeneous Family Effects: Housing Stability





Heterogeneous Family Effects: Household Income





Conclusions

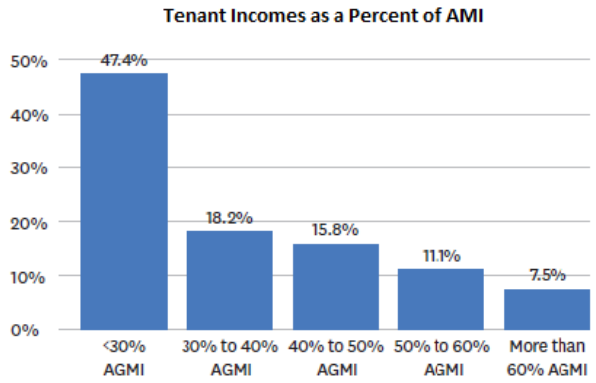
- Spending more time in LIHTC housing appears to have a positive effect on the probability of enrolling in higher education
- Through the effect on higher education, spending additional time in LIHTC housing has an positive impact on earnings
- The effect is larger for those who move in before age 13 (but still statistically significant for moving in at an older age)
- Evidence of heterogeneous neighborhood effects but they might be explained by individual characteristics (race)
- Strong evidence of heterogeneous effects in housing stability and household income

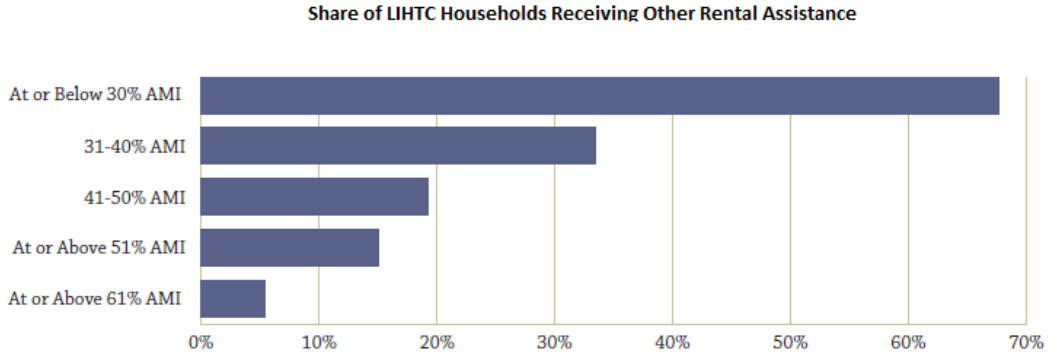
Thank you!

Background

Tenants

- Over 40% of are considered extremely low income (Earning under 30% of AMI)
- About 33% receive another rental subsidy
- Almost 70% of extremely low income residents have some other form of rental assistance, (e.g. Section 8 vouchers)





Back

Results: 4+ Years Education. (Multi-Year HH Inc.)

	4+ Years Higher Education (Odds Ratios)		
	All LIHTC	No Leavers	New Building
LIHTC Years	0.040***	0.068***	0.038**
	(0.004)	(0.011)	(0.018)
Male	-0.538***	-0.541***	-0.541***
	(0.007)	(0.011)	(0.018)
Age of Parent at Birth	0.009***	0.010***	0.010***
	(0.001)	(0.002)	(0.003)
Log Area Median Income	1.312***	0.089	-0.044
	(0.336)	(0.246)	(0.310)
Family Size	-0.103***	-0.122***	-0.134***
	(0.007)	(0.012)	(0.020)
Log Units in Building	0.032**	0.046*	0.029
	(0.014)	(0.024)	(0.052)
Log Household Income 1999-2012	✓	✓	✓
Filing status fixed effects	✓	✓	✓
Birth year fixed effects	✓	✓	✓
Zip code fixed effects	✓	✓	✓
Observations	540,839	531,088	108,825
Baseline Enroll Rate	0.200	0.207	0.232

Note: *p<0.05, **p<0.01, ***p<0.001

▸ Back

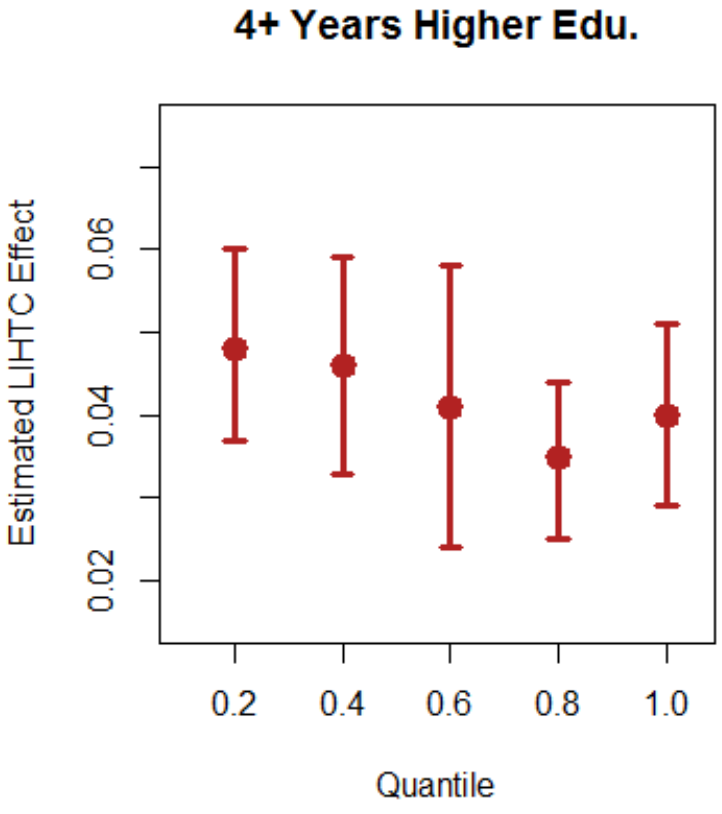
Results: 4+ Years Education (HH Inc. Volatility)

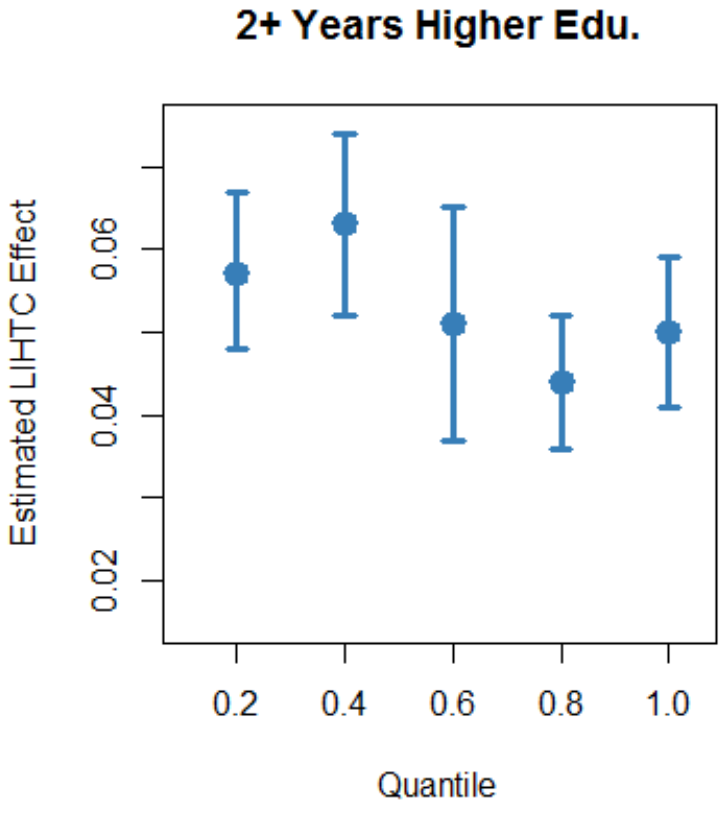
	4+ Years Higher Education (Odds Ratios)		
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LIHTC Years	0.039***	0.068***	0.038**
	(0.004)	(0.011)	(0.018)
Male	-0.537***	-0.540***	-0.540***
	(0.007)	(0.011)	(0.018)
Log Household Income	0.203***	0.233***	0.205***
	(0.016)	(0.031)	(0.048)
Log Standard Deviation, HH Inc	0.019***	0.017	0.023
	(0.007)	(0.013)	(0.022)
Log Min/Max Ratio, HH Inc	-0.007*	-0.004	-0.019
	(0.006)	(0.011)	(0.018)
Age of Parent at Birth	0.008***	0.009***	0.009***
	(0.001)	(0.002)	(0.003)
Log Area Median Income	1.482***	0.113	-0.025
	(0.360)	(0.250)	(0.315)
Family Size	-0.103***	-0.122***	-0.134***
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Note: *p<0.05, **p<0.01, ***p<0.001

▸ Back

Heterogeneous Neighborhood Effects: School Quality





Back

Heterogeneous Neighborhood Effects

Neighborhood Characteristics: Quantile Cutoff Points

Quantile	**0.1**	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**
Poverty Rate	5.5	8.4	11.3	14.5	17.9	22.2	27.1	32.3	39.7
Med HH Inc (1990)*	21.7	29.1	33.9	38.5	43.3	48.6	53.8	60.3	72.8
Med HH Inc (2012)*	21.6	26.1	30.1	34.2	37.6	42.1	47.7	54.7	66.8
% High School Grad	7.5	12.4	16.7	21.1	25.2	30.2	35.3	41.4	48.8
% White	11.3	28.3	43.5	53.1	62.0	70.6	79.0	85.6	92.2
Opportunity Measure	0.04	0.06	0.08	0.10	0.12	0.15	0.18	0.22	0.27
Public School Grad		44.00		87.06		95.00		97.00	

*In thousands of US Dollars, adjusted for inflation

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