

The Effects of *Free* Public Housing on Children

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Motivation

- Children growing up in high-poverty areas fare worse than those in low-poverty neighborhoods
 - Aaronson, 1998; Currie and Yelowitz, 2000; Chetty *et al.*, 2016; Nakamura *et al.*, Forthcoming; Chetty and Hendren, 2018; Chyn, 2018; Deutscher, 2020; Laliberte, 2021
- Provides justification for housing assistance to low-income households with young children

Public Housing

- Yet, evidence on efficacy of housing assistance is mixed
 - Collinson *et al.* 2015
- One potential driver of mixed results is characteristics of housing project (relative to counterfactual):
 - Neighborhood quality
 - Local school quality
 - Housing quality
 - Generosity (e.g., rent-geared-to-income vs. wealth transfer)

What We Do:

- Analyze effect of Colombia's ambitious "Free Housing" program on children's educational outcomes
 - Program was highly-generous:
 - 1 housing units were built in desirable areas
 - 2 housing units were given to recipients for free

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- **Empirical strategy:**
 - Exploit public housing lotteries to estimate causal effects of housing on educational outcomes
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- **Empirical strategy:**
 - Exploit public housing lotteries to estimate causal effects of housing on educational outcomes
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- **Findings:**
 - 1 Large improvements in children's educational attainment
 - High school graduation, years of schooling
 - 2 Improved schools drive substantial portion of gains

Outline

- 1 Introduction
- 2 Program Overview
- 3 Data and Empirical Approach
- 4 Results
- 5 Conclusion

Literature on Public Housing

- **United States:**

- Evidence comes from housing vouchers or housing demolitions
- Findings are mixed
 - Positive effects: Chetty *et al.*, 2016, Chyn 2018; Schwartz *et al.*, 2020
 - Null effects: Jacob 2004; Jacob *et al.*, 2015

- **Developing countries:**

- Minimal benefits from public housing receipt (Barnhardt *et al.*, 2017; Picarelli, 2019; Franklin, 2019)

- **Mechanisms:**

- Difficult to separate neighborhood and school effects
- Notable exception: Laliberté (2021)

Colombia's "Free Housing" Program

- April 2012: President announces within *two* years 100,000 homes would be built and given to the disadvantaged for *free*
 - had broad political support
 - focused on large municipalities
 - second phase of program in 2017 targeted small municipalities
- **Program unique in two dimensions:**
 - 1 Public housing units were high-quality and built in desirable areas
 - 2 Housing unit given to recipients for *free* - i.e., recipients became unit's owners
 - Stipulations: could not sublet or sell for 10 years
- We now go through program details in depth:

Site Selection

- Government concerned projects would be located in undesirable areas
 - previous housing programs often located in areas with flood risks or without public services
- Set out call for applications from mayors/governors for suitable properties with strict criteria
 - e.g., nearby public services, 'urban' land, limited flood risk, etc.
- Total of 650 properties submitted, 298 deemed suitable

Unit Construction

- Government allocated 4 trillion pesos to construction (~ 2.2 billion USD)
 - per-unit cost set at 40 million pesos ($\sim 22,000$ USD)
 - $40 \text{ million} = 4 \text{ trillion} / 100,000 \text{ units}$
 - no cross-country variation \implies larger units in low-cost municipalities
- Contractors submitted bids, point system determined winner
 - bids evaluated on: services provided, development layout, unit size, unit quality, etc
 - > 100 companies won, although $> 50\%$ units built by 10 companies
- Substantial auditing to avoid fraud
 - housing units inspected before payment

Unit Quality

- End sample: 225 developments across 191 municipalities built between 2012-14
 - remaining 73 developments completed post-2014
- Typical unit: two-bedroom apartment or row house
 - also furnished with basic appliances (e.g., stove, fridge, etc)
- Counterfactual unit: poorly-built, high-crime neighborhoods
 - e.g., in large cities, applicants typically lived in “*comunas*” (~ Brazil’s *favelas*)

Location of Housing Projects:



Example of applicant housing in Lorica, Cordoba, NE coast



Government housing project in Lorica, Cordoba, NE coast



Examples of large projects in Pasto and Bogota



Access to Public Services

- Housing *location* represented large improvement in access to public services:
 - (results below from survey of lottery winners and losers)

Table 1: Post-Lottery Distance in Minutes to Selected Locations

	Public Transport Station	School	Grocery Store	Park	Hospital or Clinic
Won Lottery	-10.403*** (1.842)	-2.652** (1.060)	-10.698** (5.247)	-6.778*** (1.584)	-7.214*** (2.602)
# Observations	70,506	66,948	71,505	69,845	71,570

Colombia's "Free Housing" Program: Eligibility

- Three (non-mutually exclusive) groups were eligible:
 - 1 The 'extreme' poor
 - i.e., eligible for conditional cash transfers
 - 2 Victims of violence
 - i.e., forcedly displaced due to armed conflict
 - 3 Victims of natural disasters
- Only eligible for projects within municipality of residence

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- Only eligible for projects within municipality of residence
- Distribution across groups:
 - Applicants: extreme poor (56%), victims of violence (37%), victims of natural disasters (7%)
 - Beneficiaries: extreme poor (47%), victims of violence (45%), victims of natural disasters (8%)

Application Process

- ① Ministry of Housing constructs project-specific lists of 'potential beneficiaries'
- ② Applications open and potential beneficiaries contacted via phone
 - also informed via radio, television, newspaper, billboards, etc
 - applications could also be made by those not on the potential beneficiary list
- ③ List of applicants sent to Department of Social Protection to verify identity/eligibility

Call for Applicants or “*convocatorias*”



Housing Assignment

- For each project, housing units pre-assigned to each beneficiary group
 - decision made jointly by Ministry of Housing and mayor
 - units disproportionately assigned to 'victims of violence'
- Applicants within each beneficiary group assigned 'priority tier'
 - priority tier range: 1-6
- Units assigned according to priority tier; lottery held if $\# \text{ applicants} > \# \text{ units within priority tier}$

Lottery Assignment

- 25% of units ($\sim 20,000$ units) assigned via lottery
 - remainder directly assigned as their priority tier was sufficiently high
- After assignment, housing units within projects *randomly* assigned
 - (using this feature in future research)
- Families who lost could apply to other projects in municipality
 - use *first* lottery outcome in our empirical analysis
 - (although most municipalities only had one project)

Lotteries



Administrative Data

- ① **Universe of housing lottery applicants: 2014+**
 - Names and IDs of all household members (including children), beneficiary group, priority tier, date of application, application outcome, project ID, exact unit assigned, etc.
 - N=71,974 lottery applicants

- ② **“Census of the poor” (Sisben III): 2009-10**
 - covers 60% of Colombia's population; used to target social programs
 - provides baseline demographic and socioeconomic characteristics

- Match rate from housing applications to Census: 94%

Sources of Administrative Data: Education

- ① **Universe of students in public schools: 2006-2019**
 - indicates (i) enrollment status, (ii) graduation status
 - ② **Universe of end-of-high school exam takers (ICFES): 2012-2019**
 - mandatory exit exam taken by all HS graduates
 - used for university admissions
- Match rate from housing applications to education data: 91%

Administrative Data: Education

- Key outcome: High school graduation
- So need children to have reached 'graduation age'
- Restrict sample to:
 - Children who were aged 14 or below at *1st* lottery application
 - By law, students are allowed to drop out of school at age 15
 - Children who in 2019 (our last year of data) were old enough to have finished HS (age 18)
 - (implies that our sample born between 1998-2001)
- $N = 11,045$ children

Table 2: Summary Statistics

	All Applicants	Direct Assignment	Lottery Sample
Age at Lottery	12.8	12.8	13.4
Female	0.46	0.49	0.49
Household Size	5.53	5.78	5.81
Household Head Characteristics:			
Head's age at birth	28.2	28.6	27.8
Head is Married	0.53	0.50	0.53
Head is Employed	0.57	0.55	0.51
No High School Education	0.51	0.51	0.47
High School Graduate	0.40	0.32	0.39
Pre-Lottery House Characteristics:			
Urban	0.82	0.79	0.78
# Rooms	2.40	2.39	2.76
Has Fridge	0.48	0.48	0.43
Has Washing Machine	0.14	0.13	0.11
Observations	132,554	74,568	11,045

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Empirical Approach

- ① **Empirical approach:** Compare outcomes for children in families who won vs. lost the housing lottery

$$Y_i = \alpha + \beta Won_i + \theta AgeLottery_i + \delta X_i + LC_i + \epsilon_i,$$

where:

- Y_i : outcome of child i
- Won_i : indicator for whether child's i 's family won *first* lottery they applied for
- $AgeLottery_i$: child's age at (first) lottery
- X_i : vector of individual controls (sex, parental education, etc)
- LC_i : housing project-by-lottery fixed effects

Table 3: Covariate Balance

	Lottery Winners	Lottery Losers	Test of Equality (p-value)
Age at Lottery	13.46	13.40	0.50
Female	0.50	0.49	0.97
Household Size	5.80	5.82	0.24
Household Head Characteristics:			
Head's age at birth	27.99	27.78	0.41
Head is Married	0.51	0.53	0.53
Head is Employed	0.50	0.51	0.56
No High School Education	0.47	0.47	0.81
High School Graduate	0.29	0.39	0.72
Pre-Lottery House Characteristics:			
Urban	0.75	0.80	0.91
# Rooms	2.74	2.77	0.65
Has Fridge	0.42	0.43	0.64
Has Washing Machine	0.10	0.11	0.44
Observations	2,982	8,063	11,045

Table 3: Covariate Balance

	Lottery Winners	Lottery Losers	Test of Equality (p-value)
Age at Lottery	13.46	13.40	0.50
Female	0.50	0.49	0.97
Household Size	5.80	5.82	0.24
Household Head Characteristics:			
Head's age at birth	27.99	27.78	0.41
Head is Married	0.51	0.53	0.53
Head is Employed	0.50	0.51	0.56
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First-Stage: Effect of Winning Lottery on Living in Housing Unit

	Full sample		Education sample	
	Ever winning housing unit (1)	Years in Public Housing (age<18) (2)	Ever winning housing unit (3)	Years in Public Housing (age<18) (4)
Without individual controls				
Won lottery	0.89*** (0.02)	4.01*** (0.12)	0.88*** (0.02)	4.30*** (0.10)
With individual controls				
Won Lottery	0.89*** (0.02)	4.02*** (0.12)	0.88*** (0.02)	4.30*** (0.10)
Observations	76,231	76,231	11,045	11,045
Mean (control group)	0.099	0.1	0.115	0.1
% treated	0.37	0.37	0.28	0.28

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% treated	0.37	0.37	0.28	0.28

Effect of Winning Lottery on Children's Education (Intent-to-Treat)

	Years of education (1)	Prob Graduated High School (2)	Prob Took ICFES exam (3)	ICFES score (4)
<i>Without individual controls</i>				
Won lottery	0.448*** (0.089)	0.059*** (0.021)	0.060*** (0.016)	0.030 (0.032)
<i>With individual controls</i>				
Won lottery	0.410*** (0.082)	0.052*** (0.020)	0.052*** (0.016)	0.025 (0.032)
Observations	11,045	11,045	11,045	5,450
Mean (control group)	9.00	0.42	0.48	-0.34
Lottery FE	Y	Y	Y	Y

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Main Findings

- Receiving free public housing for 4 years *on average*:
 - Years of schooling: $\uparrow 0.4$ yrs (5%)
 - HS graduation: $\uparrow 5$ pp (13%)
 - Prob(taking the ICFES): $\uparrow 5$ pp (11%)
 - ICFES: 0.03 SD (not statistically significant)

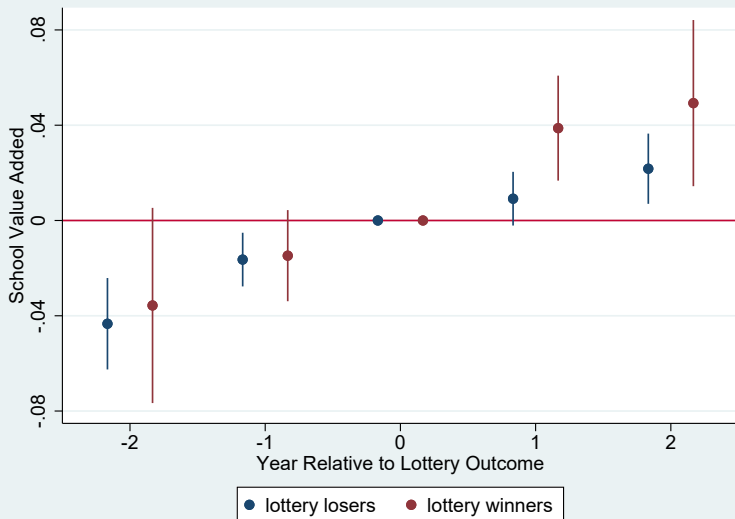
Mechanisms

- Many possible mechanisms:
 - 1 Attend better schools
 - 2 Reside in higher quality neighborhoods
 - 3 Live in nicer housing units
 - 4 Wealth effect
 - either through reduced rent or newfound ownership of housing
- Cannot disentangle, but investigate schools as possible mechanism:

Mechanisms: Schools

- Use “Census of the Poor” matched to *pre-lottery* education data to construct school *value-added*
- **VA Data:** 2006-2008 entering sixth grade cohorts
 - schools usually span K-5 or 6-12
- VA Model:
$$Y_{ist} = \beta X_{ist} + \mu_s + \epsilon_{ist},$$
- where:
 - i = student, s = school, t = year
 - Y_{ist} : HS graduation indicator
 - X_{ist} : vector of individual controls (e.g., parental and housing characteristics)
 - μ_s : school fixed effect (parameter of interest)
- Use empirical Bayes to estimate μ_s

Winning Lottery on School Value-Added



Conclusion

- Examine effects of public housing on children's education
 - Leverage lottery assignment for highly-generous public housing units
 - Units were provided for *free*
 - Units were located in desirable areas of the city
- Results:
 - Free public housing increases HS graduation by 5pp and years of schooling by 0.4 yrs
 - Gains driven largely by higher quality schools attended by lottery winners (relative to losers)
- Our results contribute to a growing literature on effects of public housing on children