Public Housing Spillovers: Evidence from South Africa

Ben Bradlow (Harvard University)
Stefano Polloni (MapDwell)
Will Violette (Federal Trade Commission)
william.j.violette@gmail.com

Any opinions expressed herein are those of the authors and do not necessarily represent the views of the Federal Trade Commission.

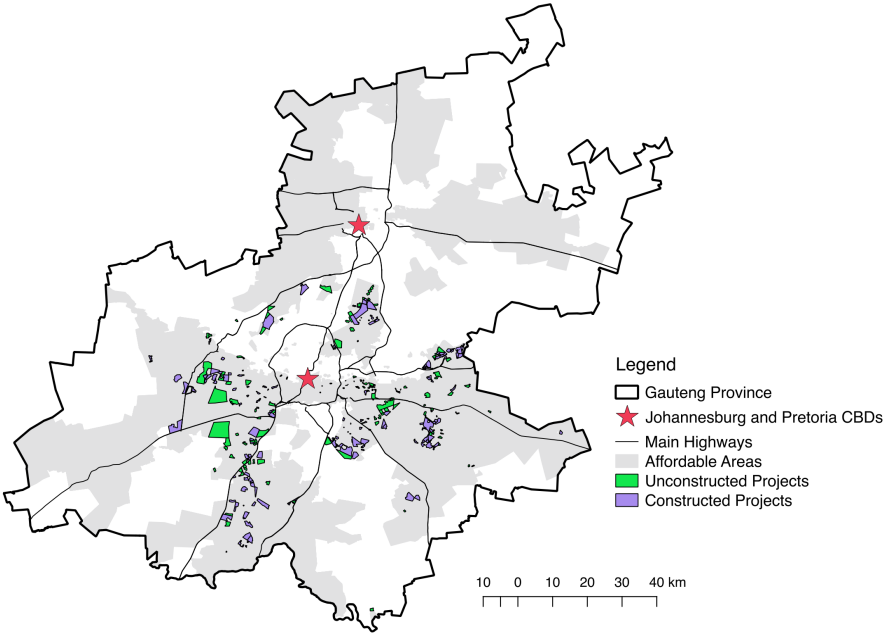
October 2020

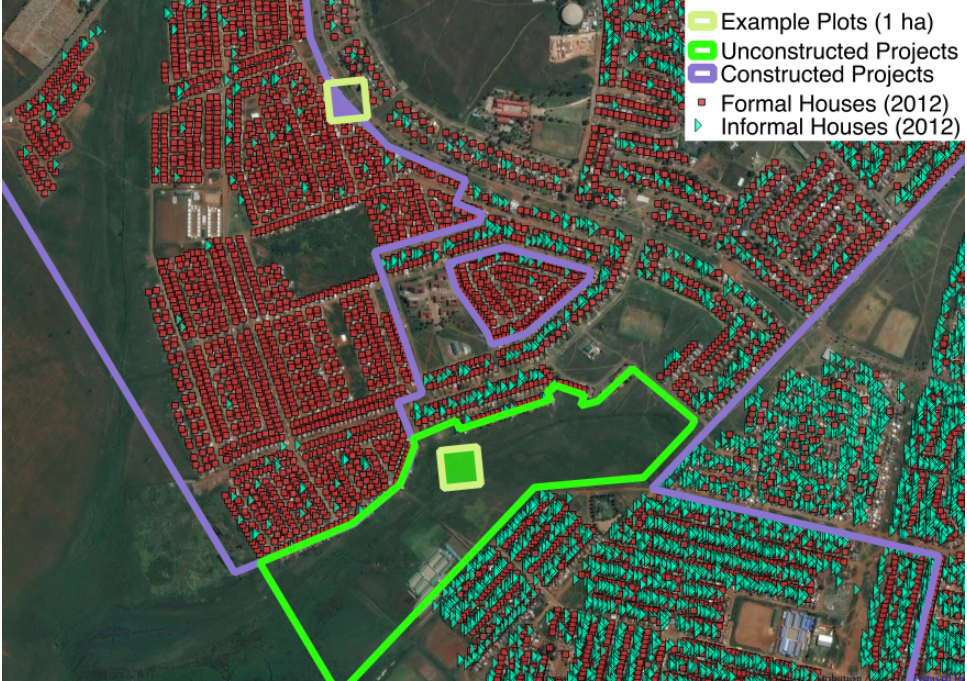
Public Housing and Development

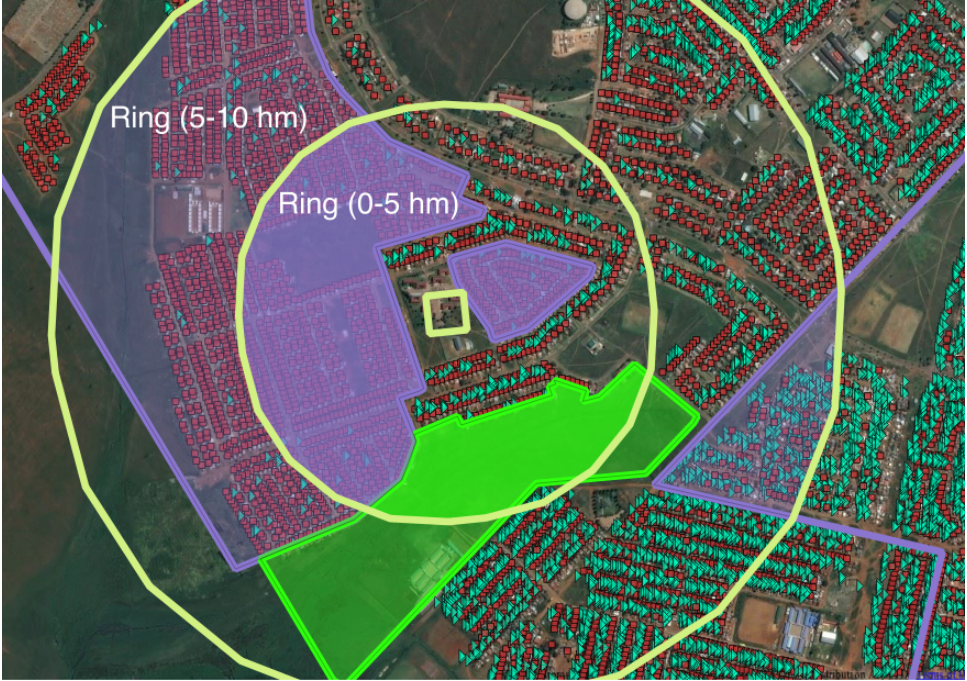
- In developing countries, 30% of urban pop. live in informal housing [UN, 2015]
- In Africa, governments have built $\sim$5.4 mil. houses often replacing slums ($\sim$3 mil. in South Africa)
- Place-Based Policy?
  - Housing projects may improve congestion, sanitation, and investment; or they may invite new slum growth (ie. backyard housing [Brueckner et al., 2019])

This paper

- Asks how housing projects in Johannesburg affect areas *within* as well as *nearby* project footprints
- Compares changes in outcomes by exposure to 166 constructed projects and 140 planned, but unconstructed projects
  - Measures exposure as neighborhood overlap with project footprints
- Finds that both formal + informal housing grow both within + nearby footprints
- Better houses, improved public goods, and more local firms help explain positive spillovers


Legend
Gauteng Province
Johannesburg and Pretoria CBDs
Main Highways
Affordable Areas
Unconstructed Projects
Constructed Projects
10 0 10 20 30 40 km


Example Plots (1 ha)
Unconstructed Projects
Constructed Projects
Formal Houses (2012)
Informal Houses (2012)


Ring (5-10 hm)
Ring (0-5 hm)

Estimating Direct and Spillover Effects

$$\begin{aligned}\mathsf{Direct}_{it} = &(\alpha_0 + \alpha_1 \textsc{Post}_t) \times \mathsf{Area}\big(\textsc{Plot}_i \cap \textsc{Proj.}\big) + \\ &(\alpha_2 + \alpha_3 \textsc{Post}_t) \times \mathsf{Area}\big(\textsc{Plot}_i \cap \textsc{Con. Proj.}\big)\end{aligned}$$

$$\begin{aligned}\mathsf{Spillover}_{it} = &\sum_{k=1}^{8} (\beta_0^k + \beta_1^k \textsc{Post}_t) \times \mathsf{Area}\big(\textsc{Ring}_i^k \cap \textsc{Proj.}\big) + \\ &(\beta_2^k + \beta_3^k \textsc{Post}_t) \times \mathsf{Area}\big(\textsc{Ring}_i^k \cap \textsc{Con. Proj.}\big)\end{aligned}$$

Estimating Direct and Spillover Effects

$$y_{it} = \text{Direct}_{it} + (1 - P_i)\,\text{Spillover}_{it} + \gamma_0 + \gamma_1 \,\text{POST}_t + \varepsilon_{it}$$

Where

$$P_i = 1\Big\{\text{Area}\big(\text{PLOT}_i \cap \text{PROJ.}\big) > 0\Big\}$$

- Identification requires assuming parallel trends between exposure to constructed projects and exposure to planned, but unconstructed projects

Data

- Aerial building counts 2001/2012 per 1 ha plot
  - Formal Houses, Informal Houses, Backyard Houses
  - Water Utility Buildings, Electricity Utility Buildings, Health Centers, Schools, Businesses, Informal Businesses
- Population/housing census in 2001/2011 overlapping 1 ha plots
  - Population, Total Rooms, Own house, Electric Lighting, Flush Toilet, Piped Water Inside, Employment, Log HH Income
- Deeds records of formal property transactions 2001-2011 overlapping 1 ha plots
  - Count Transactions, Prices

- Limitation: constructed project footprints have 4x more housing and 3x more population than unconstructed projects at baseline
- Requires a strong parallel trends assumption

Population and Housing Results

	People	Houses	Formal Houses	Informal Houses	Informal Backyard Houses
Post × Constructed proj overlap with:					
Plot footprint	25.737[a]	9.102[a]	6.629[a]	2.473[b]	6.648[a]
	(4.630)	(1.544)	(0.812)	(1.044)	(1.157)
Plot neighborhood (0-5 hm ring)	0.213[a]	0.070[a]	0.023[b]	0.047[b]	0.037[a]
	(0.075)	(0.023)	(0.011)	(0.019)	(0.013)
R^2	0.090	0.113	0.081	0.093	0.079
N	701,395	871,778	871,778	871,778	871,778

[c] $p<0.10$,[b] $p<0.05$,[a] $p<0.01$

- Per project, direct effect is 3,063 people and 1,083 houses
- Per project, spillover effect is 504 people and 168 houses

Price Results

	Transactions	Transactions	Log Price	Log Price
Post × Constructed proj. overlap with:				
Plot neighborhood (0-5 hm ring)	0.00026 (0.00125)	-0.00026 (0.00080)	0.00368 (0.00481)	0.00963 (0.00821)
Pre: 2001-2006 Post: 2007-2012	✓		✓	
Pre: 2001-2004 Post: 2009-2012		✓		✓
R^2	0.001	0.000	0.128	0.243
N	784,448	784,703	40,176	21,382

[c] p<0.10,[b] p<0.05,[a] p<0.01

- No strong effects on house prices

Mechanisms: Neighborhood Quality

	Total Rooms	Own House	Electric Lighting	Flush Toilet	Piped Water Inside
Post × Constructed proj overlap with:					
Plot footprint	0.3492	0.0396	0.1185[b]	0.2367[a]	0.2795[a]
	(0.2950)	(0.0535)	(0.0555)	(0.0591)	(0.0550)
Plot neighborhood (0-5 hm ring)	0.0044	0.0006	0.0004	0.0008	0.0001
	(0.0028)	(0.0007)	(0.0009)	(0.0007)	(0.0007)
R^2	0.063	0.010	0.049	0.034	0.102
N	698,762	699,801	701,296	701,296	701,296

[c] $p<0.10$, [b] $p<0.05$, [a] $p<0.01$

- Basic services improve in project footprints

Mechanisms: Public Goods

	Water Utility Buildings	Electricity Utility Buildings	Health Centers	Schools
Post × Constructed proj overlap with:				
Plot footprint	0.02453[a]	0.00062	0.00109[b]	0.06251[a]
	(0.00532)	(0.00052)	(0.00048)	(0.01455)
Plot neighborhood (0-5 hm ring)	0.00005	0.00008	-0.00028	0.00119[c]
	(0.00023)	(0.00006)	(0.00018)	(0.00071)
R^2	0.002	0.000	0.001	0.003
N	871,778	871,778	871,778	871,778

[c] $p<0.10$, [b] $p<0.05$, [a] $p<0.01$

- Public goods improve inside footprints (and somewhat nearby)

Mechanisms: Agglomeration Economies

	Businesses	Informal Businesses	Employment	Log Household Income
Post × Constructed proj overlap with:				
Plot footprint	0.05333[a]	0.03445[a]	0.04759	0.01943
	(0.01263)	(0.00831)	(0.03457)	(0.17251)
Plot neighborhood (0-5 hm ring)	0.00042	0.00043	0.00026	-0.00082
	(0.00039)	(0.00029)	(0.00042)	(0.00153)
R^2	0.001	0.002	0.179	0.380
N	871,778	871,778	758,982	699,171

[c] p<0.10,[b] p<0.05,[a] p<0.01

- Some evidence of business/income growth in footprints

Summary

- Housing projects crowd-in formal and informal housing
- Provide positive amenities overall (better home quality, public goods, business growth)
- Comparing housing growth against project costs (noisily) suggests that projects increase welfare

Thank You!