

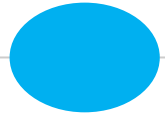


Land use, markets and planning: ‘The physical city’ (Part 2)

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Roadmap



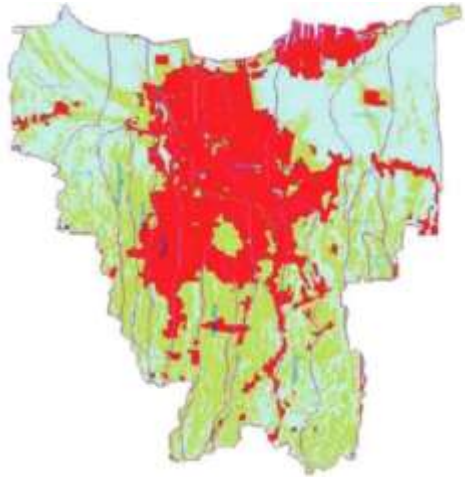
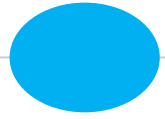
- ◎ Slum upgrading program and land markets in Jakarta (Harari and Wong, 2024)
- ◎ Spillovers from high-rises and slums in Mumbai (Gechter and Tsivanidis, 2024)
 - Slum clearance and children (Rojas Ampuero and Carrera, 2024)
- ◎ Other topics related to land and planning (brief survey only)
 - Titling programs
 - Housing policies
 - Zoning reform
 - Property taxation

Kampung Improvement Program (KIP)

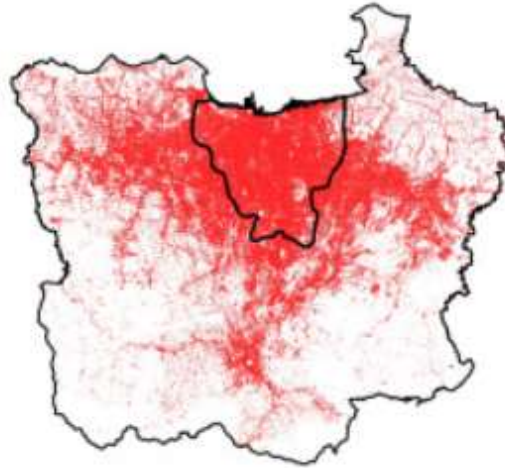
- ◎ Large-scale slum upgrading on-site (1969 to 1984)
 - 5 million beneficiaries, 25% of land
- ◎ Basic upgrades + 15-year verbal non-eviction guarantee
 - Crowd-in private investments



Short- versus long-run impacts of upgrading



KIP
(1969 – 1984)



- 10m people in city
- 30m in metro area



Today

Short (and medium) run:

- Improve quality of lives for many ultra-poor
- Many studies (e.g. World Bank, 1995)

Long-run:

- Slums persists longer and stay informal?
- Good for KIP residents, initial goal of program
- City-wide welfare from social planner's view?

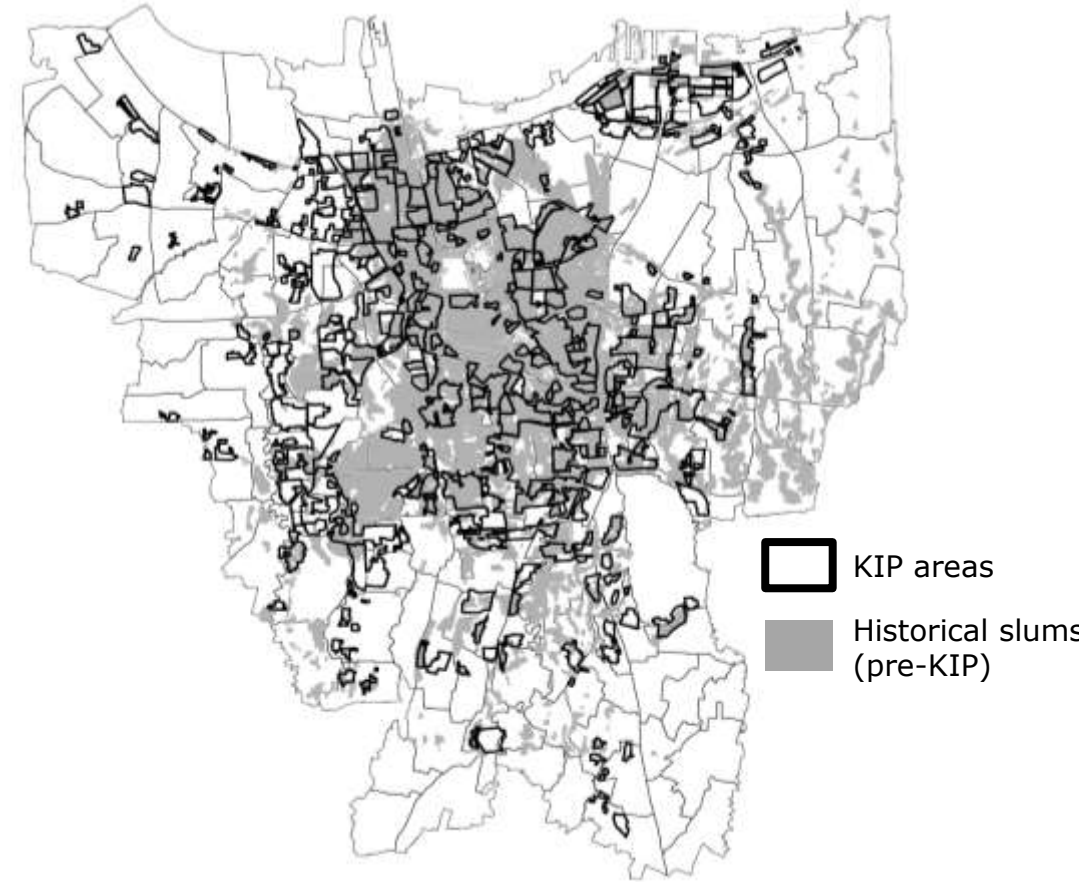
Long-run implications of KIP as Jakarta grows out of informality

- Assemble database

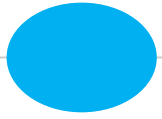
Outcomes:

- ⦿ Assessed land values
- ⦿ Building heights
- ⦿ Quality/informality
- ⦿ Parcel density

... for formal *and informal*



Empirical strategy and findings



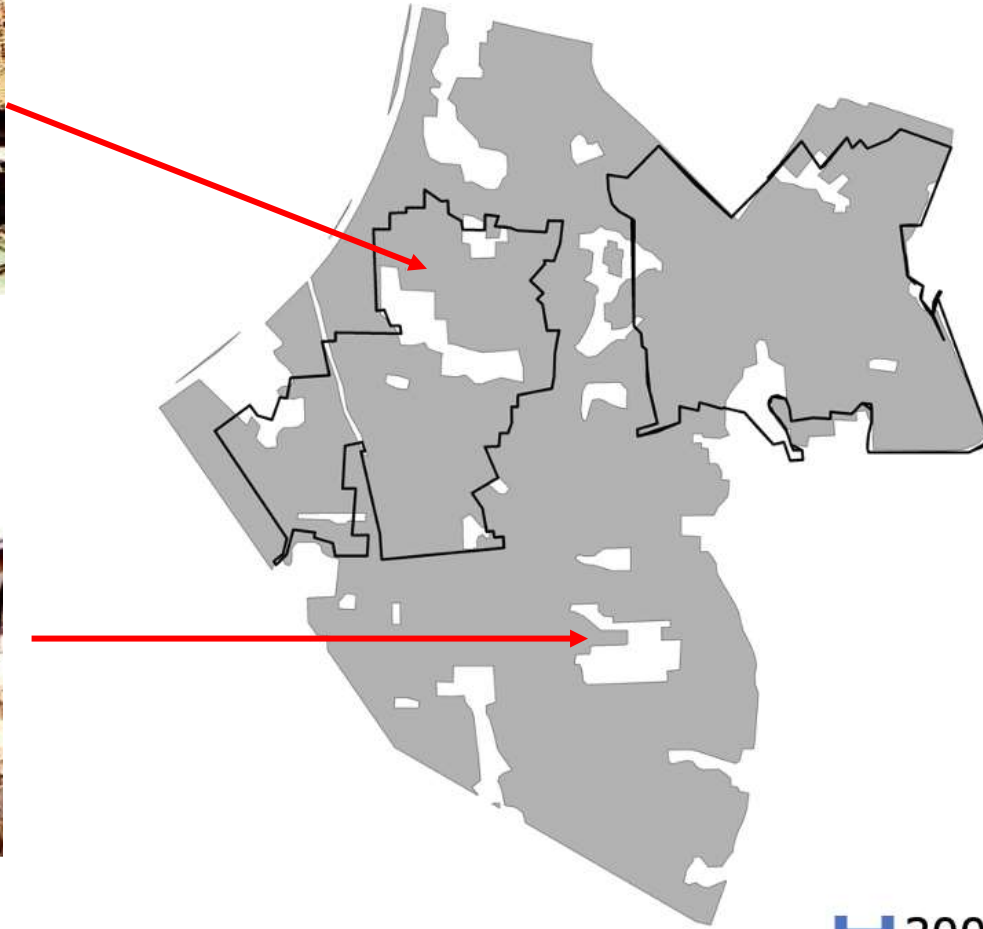
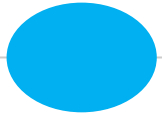
➤ **Research design:** KIP vs. non-KIP

- Key threat: Program selection bias (targeted worst slums)
- Full sample + hamlet FE's (census block groups in U.S.)
- Historical kampungs + locality FE's (similar to census tracts in U.S.)
- Boundary analysis (200m)
- Staggered rollout to assess program selection bias; testing persistence of historical factors

➤ Relative to non-KIP historical kampungs, KIP areas today:

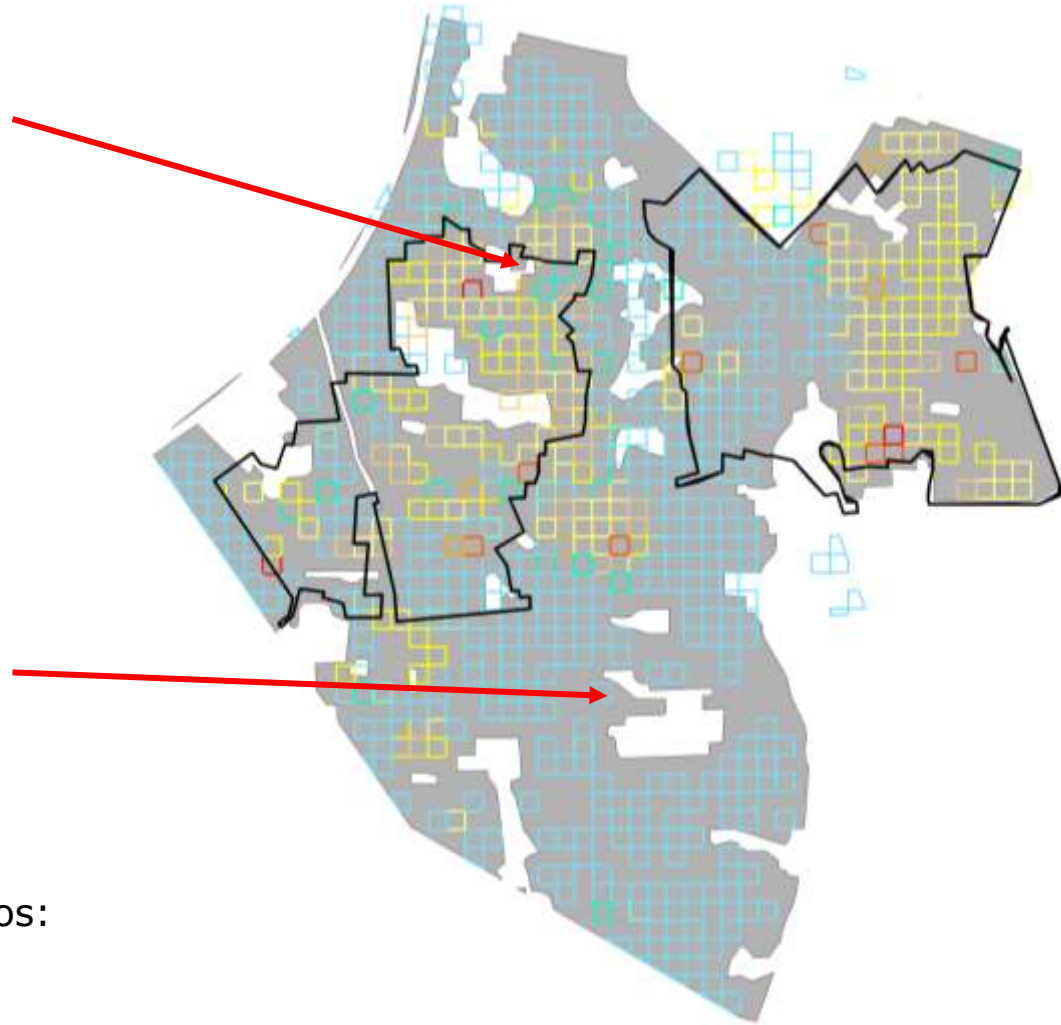
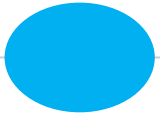
- 10% lower land values, 9% shorter buildings
- Largest effects within 5km of CBD
- **More informal:** quality index based on photos, share of unregistered land parcels
- Consistent with **delayed formalization** of treated slums

Historical kampung sample



 200 m

KIP neighborhoods today have lower land values, shorter buildings, more informal (as non-KIP neighborhoods formalize)

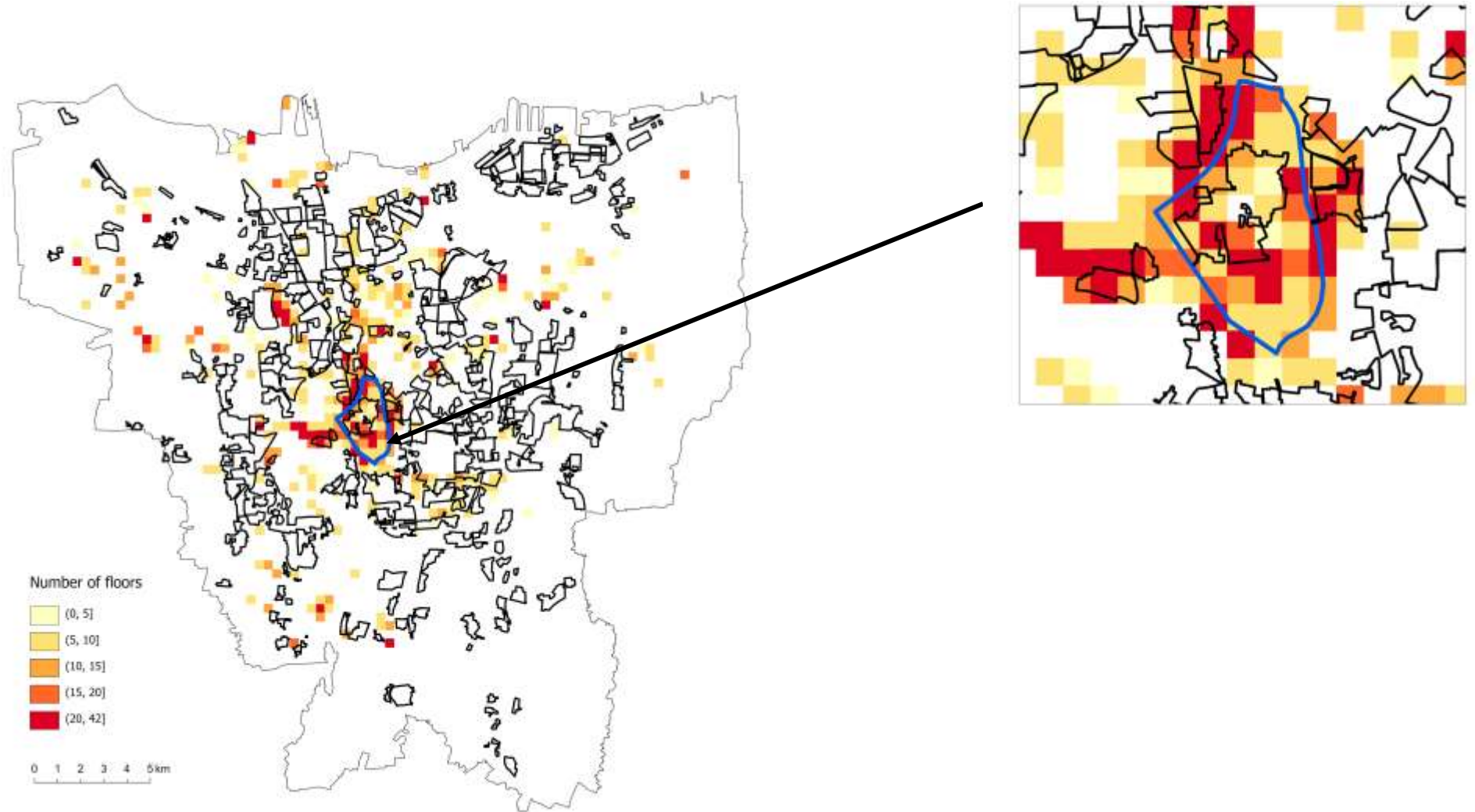


Quality index from photos:

blue = very formal

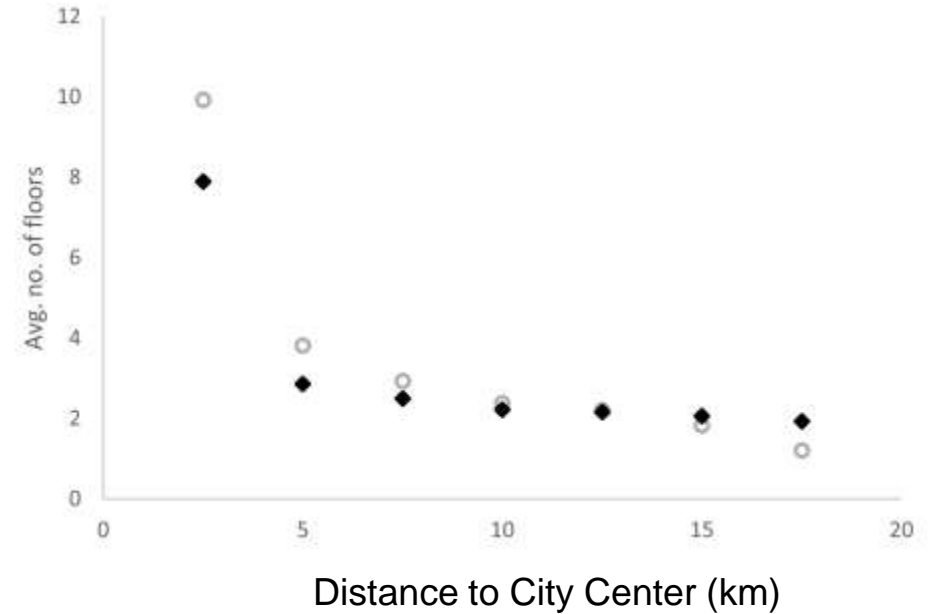
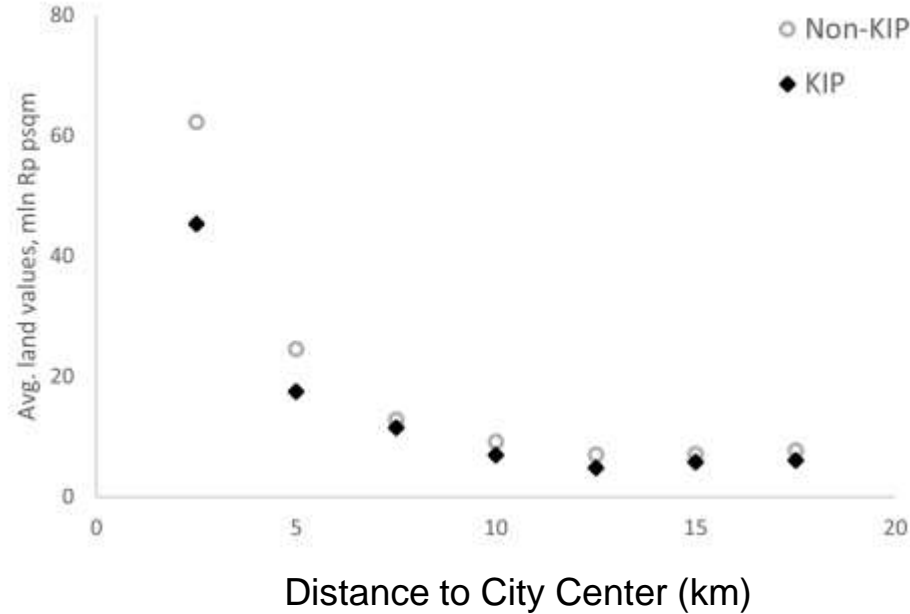
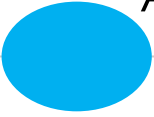
red = very informal

KIP kampungs were early settlements, disproportionately central
- Close to half of modern CBD today part of KIP program

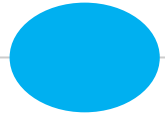


Largest effects are closest to the city center

- Average of land values and number of floors by KIP status

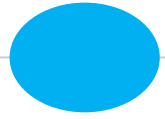


Heterogeneity by distance to the CBD



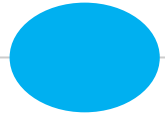
Dependent Variable	Log land values (1)	1(Height>3) (2)	Log height (3)
KIP X Center	-0.14** (0.06)	-0.07*** (0.02)	-0.13** (0.06)
KIP X Middle	-0.10** (0.05)	-0.07*** (0.02)	-0.06** (0.03)
KIP X Periphery	-0.09** (0.04)	-0.06*** (0.02)	-0.04 (0.03)
Center	0.30** (0.12)	-0.01 (0.05)	-0.04 (0.10)
Middle	0.09 (0.07)	-0.02 (0.02)	-0.04 (0.05)
N	19848	19515	17233
R-Squared	0.85	0.36	0.41
Control Group Mean	15.80	0.18	0.92
Infrastructure	Y	Y	Y
Topography	Y	Y	Y
Landmarks	Y	Y	Y
Geography FE	Hamlet	Hamlet	Hamlet

Model to quantify welfare implications of KIP



- ① Why do we need a model?
 - Characterize welfare for high- versus low-skilled
 - Account for GE effects (sorting, spatial linkages, spillovers from gentrification)
- ② Welfare from lifting KIP (city-wide, center only, middle only, periphery)
 - Static model with different regions (center/middle/periphery)
- ③ **Reduced form:** For each non-KIP region, construct KIP counterpart
 - Back out wedges in amenities and formalization costs that rationalizes the HTE estimates in height and land values

Model to quantify welfare implications of KIP



⦿ **Demand:** 2 types, High- and Low-skilled (Gechter and Tsivanidis, 2024)

- Choosing where to live and where to work
- Locations differentiated by cost of living (rents, r), amenities (u), spillovers (share high types)

$$U_{ij\omega}^g = (u_i^g)^\rho Y_{ij} (r_i^g)^{(\beta^g-1)} \varepsilon_{i\omega} v_{j\omega}^g$$

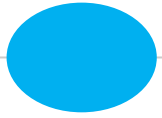
⦿ **Supply:** Formal and informal housing (segmented)

- Developers decide formal (λ) versus informal and building heights (h)
- Baseline: Informal supply is inelastic, horizontal coverage (ϕ^g) is fixed

$$\begin{aligned}\pi^L &= (r_i^L - \bar{c}^L) \cdot \phi^L \\ \pi^H &= (r_i^H - c^H(h_i^H)) \cdot h_i^H \cdot \phi^H\end{aligned}$$

$$\lambda_i^H = \frac{((1-\tau_i)\pi_i^H)^\gamma}{((1-\tau_i)\pi_i^H)^\gamma + (\pi_i^L)^\gamma}$$

Equilibrium conditions



- Location choice optimization

$$p_i^g = \frac{(\Phi_i^g)^\theta}{\sum_i (\Phi_i^g)^\theta}; \quad \Phi_i^g = (u_i^g)^\rho \bar{Y}_i^g (r_i^g)^{(\beta^g - 1)}$$

- Developers profit maximization

$$r_i^H = k_i v h_i^{H(v-1)}; \quad \lambda_i^H = \frac{((1-\tau_i)\pi_i^H)^\gamma}{((1-\tau_i)\pi_i^H)^\gamma + (\pi_i^L)^\gamma}$$

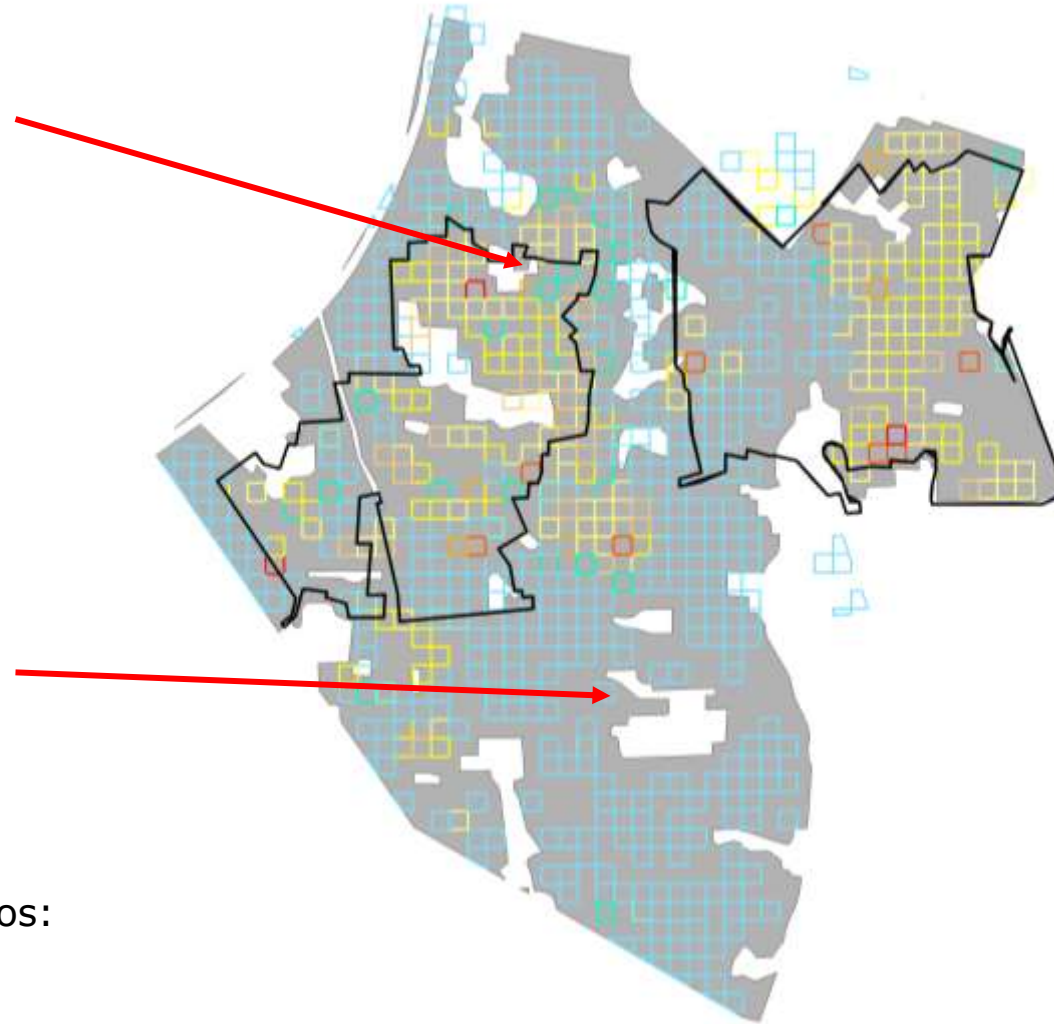
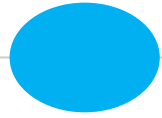
- Housing market clears

$$\frac{L_i^g (1-\beta^g) \bar{Y}_i^g}{r_i^g} = \lambda_i^g \cdot T_i^g \cdot h_i^g \cdot \phi_i^g$$

- City-wide welfare metric

$$\bar{U}^g \propto \left(\sum_i (\Phi_i^g)^\theta \right)^{1/\theta}$$

Back out wedges in amenities and formalization costs that rationalizes the HTE estimates in height and land values



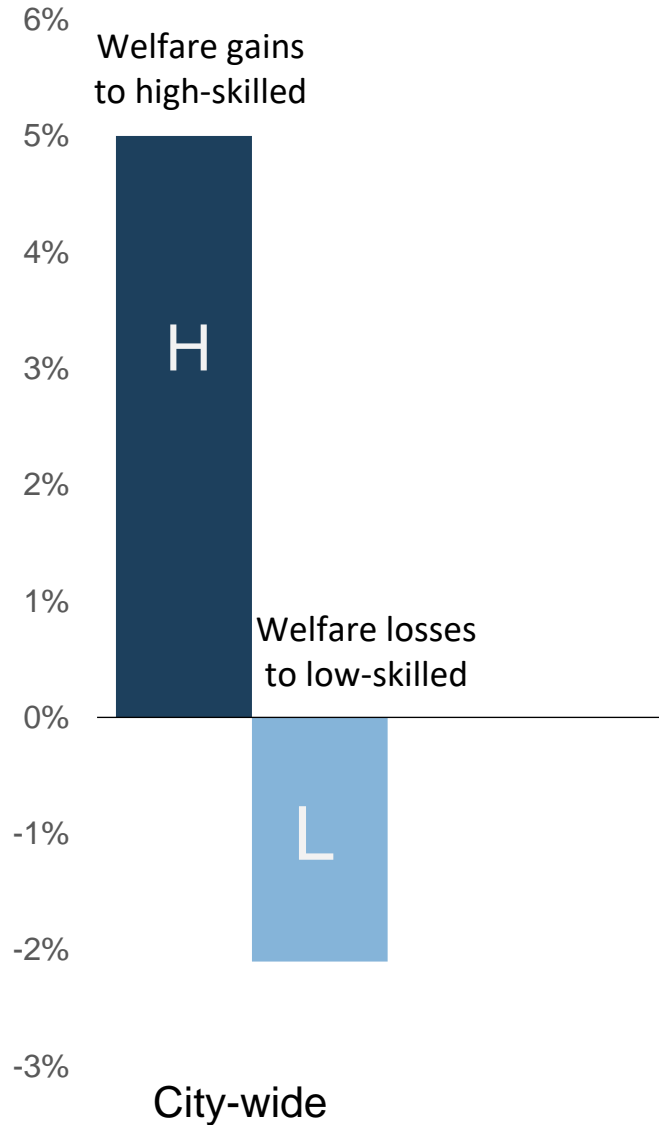
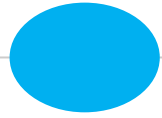
Quality index from photos:

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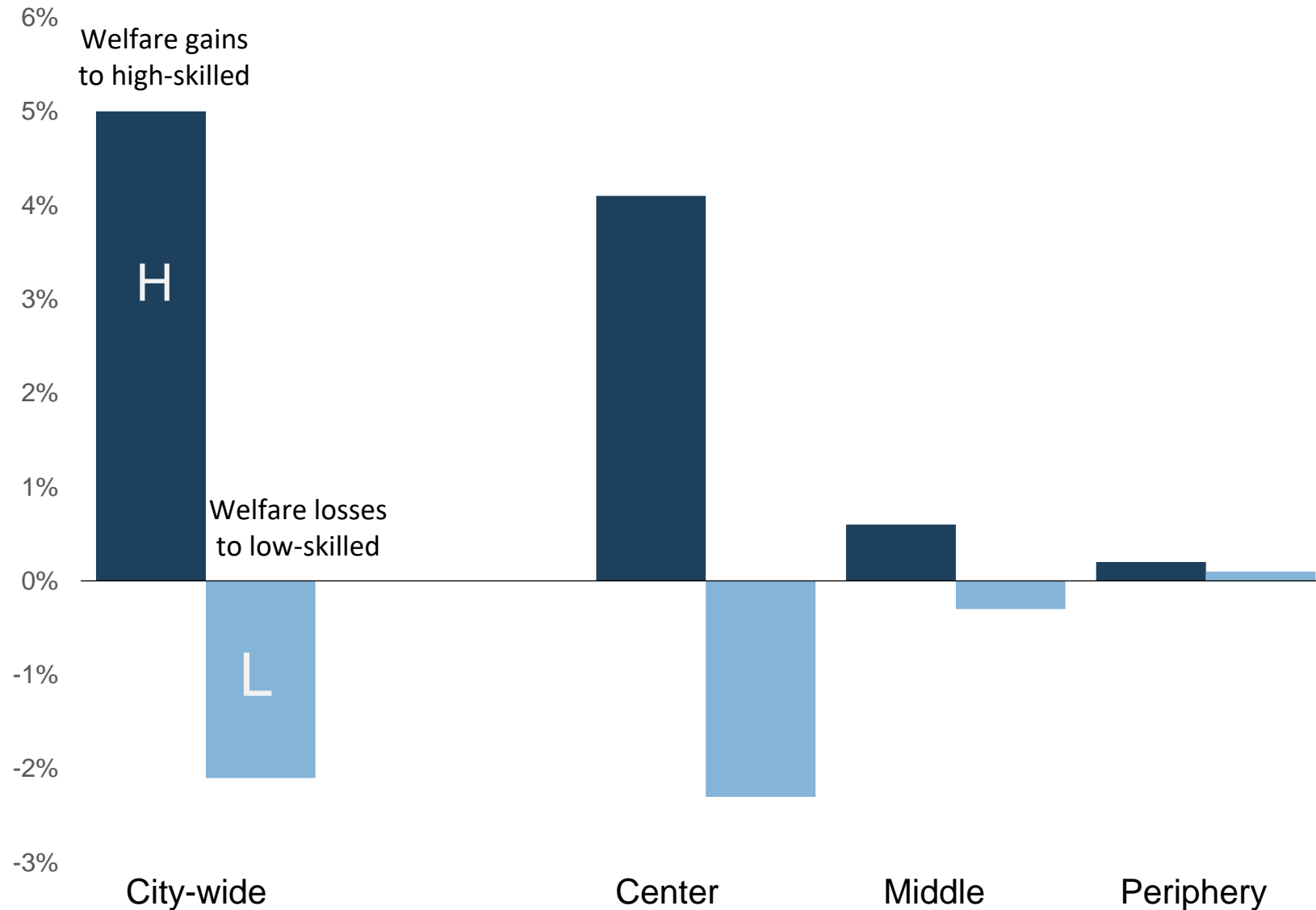
red = very informal

City-wide welfare implications from lifting KIP

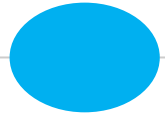
- High-skilled gain (access to formal housing) and low-skilled lose (displacement)



Most of gains and losses from lifting KIP in the center (within 5km of CBD)
- Paper: [Where](#) gains/losses are largest and [how](#) to compensate poor?



Other counterfactuals and future work



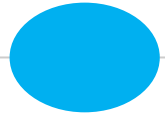
Other counterfactuals and robustness

- Redeveloping KIP + relaxing zoning → H gains still whilst L lose less

Future research:

- Add production side (firms hiring workers and using land for commercial use)
- Relax segmented housing assumption (inter-generational spillovers)
- Sharing of land surplus between formal and informal

Mumbai Mills (Gechter and Tsivanidis, 2024)



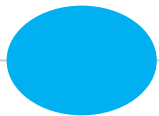
Model features

- Nairobi: Dynamic supply (formal and informal), homogenous demand
- Jakarta: Static, KIP/non-KIP in center/middle/periphery, 2 types on demand side
 - Some commuting (place of work). No firms, segmented housing.

Mumbai:

- Policy reform to build high-rises on abandoned textile mills in central Mumbai
- Demand (2 types), movers over time (2 cross-section), infer education from names
- Supply: formal supply, informal inelastic

High-rises on abandoned textile mills. Redevelopment nearby (spillovers)



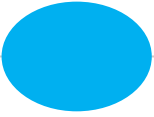
2000



2010

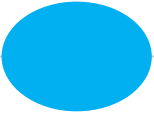


Data (reform in 2001 in 15% of central land in Mumbai)



- ⦿ Assessed floorspace values (900 subzones, 1993 and 2013)
- ⦿ Formal *and informal* establishments (8000 hand-drawn maps, 1998, 2005, 2013)
- ⦿ Population: 2001 and 2011
 - Machine learning (educational composition from names), 2001 and 2016
- ⦿ Satellite imagery: Slum locations over time

Table 1: Main Results



	Res Price	Slum Share	Inf Emp	Form Emp	Ed Index	Population
Contains Mill	0.130** (0.059)	-0.226** (0.102)	-0.413** (0.186)	0.196 (0.330)	0.262** (0.126)	-0.150** (0.059)
1m-500m	0.089* (0.049)	-0.270*** (0.097)	-0.400** (0.201)	0.202 (0.286)	-0.197 (0.175)	-0.117* (0.061)
500m-1000m	0.046 (0.048)	0.084 (0.109)	0.298 (0.258)	0.286 (0.365)	-0.157 (0.168)	-0.111 (0.092)
<i>N</i>	1,050	894	486	438	446	434

Event study (floor space values)

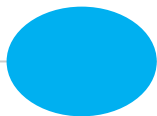
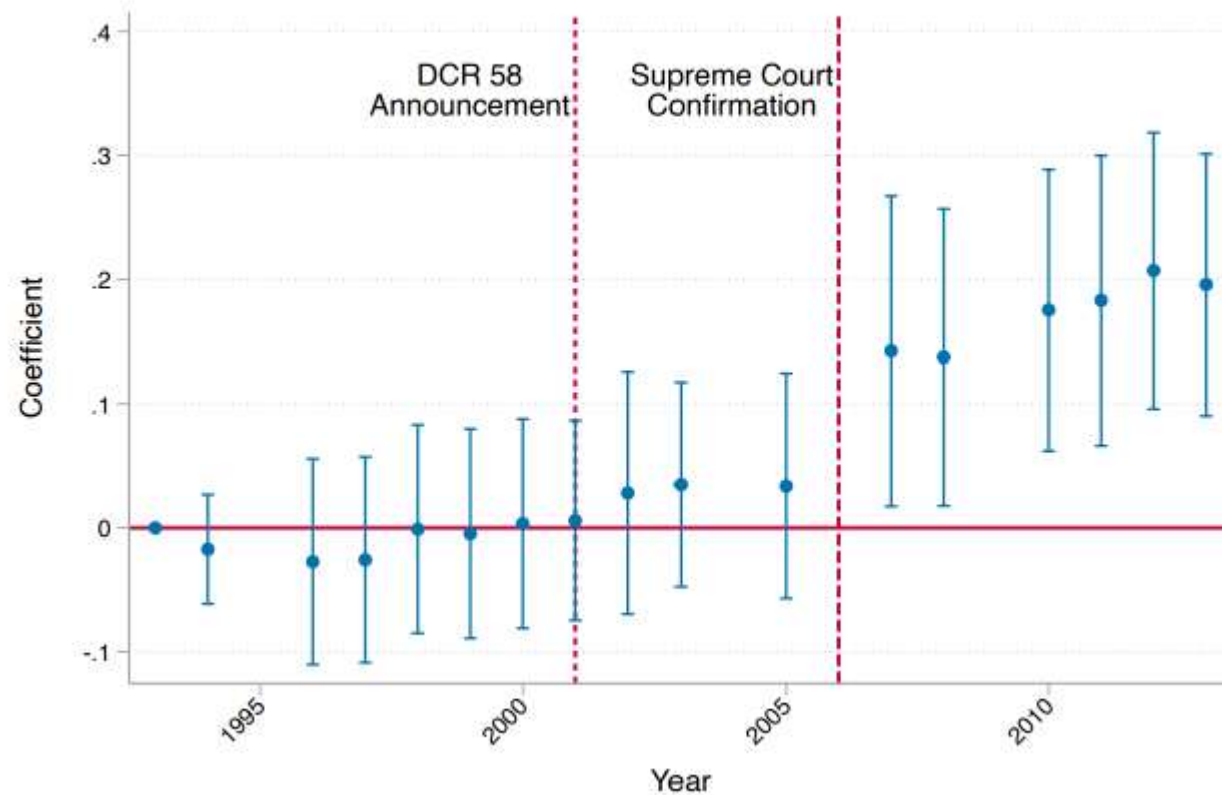


Figure 3: No significant pretrends



Model to quantify welfare and GE forces

Residential demand (2 types)

$$U_{ijk_g}(\omega) = \rho_g \ln u_{igk} + \ln w_{jg} - (1 - \beta) \ln r_{Rik} - \ln d_{ij} + \epsilon_j(\omega)$$

Commuting and income

$$\pi_{j|ikg} = \frac{(w_{jg}/d_{ij})^{\theta_g}}{\sum_j (w_{jg}/d_{ij})^{\theta_g}}$$

$$\bar{y}_{ig} = E_g \sum_s \pi_{j|ikg} w_{jg}$$

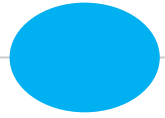
Firms choose labor and land to produce

- Firms: production function

$$Y_{jsk} = A_{jsk} \left[\left(\sum_g \tilde{\alpha}_{gs}^{\frac{1}{\sigma_L}} L_{sgjk}^{\frac{\sigma_L-1}{\sigma_L}} \right)^{\frac{\sigma_L}{\sigma_L-1}} \right]^{\alpha} H_{Cjsk}^{1-\alpha}$$

- Factor demands for labor and land

$$L_{Cjg} = \alpha w_{jg}^{-\sigma_L} \sum_{sk} \tilde{\alpha}_{gs} W_{js}^{\sigma_L-1} X_{jsk}$$
$$(1 - \vartheta_j) r_{Cjk} H_{Cjk} = (1 - \alpha) \sum_s X_{jsk}$$



- ◎ Developer supply
 - Formal and informal land use
 - Formal housing supply; inelastic informal supply

- ◎ Dynamics:
 - Moving cost for high and low types
 - Slums over time

- ◎ Equilibrium conditions

Estimation and identification via indirect inference

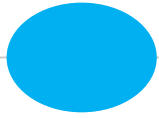


Table 6: Relocation Cost Parameters

Panel A: Model and Data Moments			
Moment	Param Id'd	Model	Data
Fraction Moved in Last 15 Years, High-Skill	F_H	0.454	0.454
Fraction Moved in Last 15 Years, Low-Skill	F_L	0.338	0.338
Odds Ratio Move In vs Outside Nbhd, High-Skill	δ_H^M	0.622	0.623
Odds Ratio Move In vs Outside Nbhd, Low-Skill	δ_L^M	0.782	0.784

Panel B: Parameter Estimates		
Parameter	Description	Estimate
F_H	Fixed Moving Cost, High-Skill	1.482
F_L	Fixed Moving Cost, Low-Skill	1.537
δ_H^M	Variable Moving Cost, High-Skill	0.011
δ_L^M	Variable Moving Cost, Low-Skill	0.013

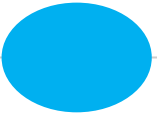
Note: Bootstrapped standard errors to be added.

Table 7: Welfare Effects



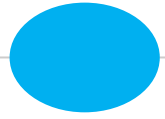
	Formal		Informal		
		Not Evicted	Evicted Average	Evicted Compensated	Evicted Not Compensated
High Skill	0.214	0.168	0.019	0.039	-0.030
Low Skill	0.067	0.083	-0.245	-0.202	-0.352

Table 10: Alternative Compensation Policies



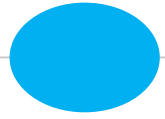
	Observed Compensation	Everyone Compensated	Everyone Compensated 3x
Δ Welfare Informal & Evicted (High-skill)	0.019	0.033	0.137
Δ Welfare Informal & Evicted (Low-skill)	-0.245	-0.208	0.034
Consumer Surplus	0.032	0.032	0.031
Land Surplus	0.085	0.084	0.052
Total Surplus	0.118	0.116	0.083

Recap: Land allocation, slums, urban development



- ◎ Research question
- ◎ Data
 - Land use, building heights (formal and informal)
 - Residents, workers, wages (or commuting patterns)
 - Developers
 - Firm: hire workers and use commercial land
- ◎ Research design: high-resolution or policy reforms
- ◎ Spatial equilibrium model

Roadmap



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- ◎ Spillovers from high-rises and slums in Mumbai (Gechter and Tsivanidis, 2024)
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Many papers on titling and property rights



⦿ Important effects of titling on:

- labor force participation in Peru ([Field, 2007](#))
- Housing investments ([Field, 2005](#); [Galiani and Schargrodsky, 2009](#))
- Other outcomes: Satisfaction, private investments, mental health

⦿ Poor have low willingness-to-pay for titles relative to fees ([Manara and Regan, 2022](#))

⦿ Also:

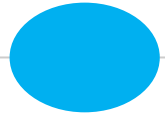
- [IGC, Large-scale titling in Thailand](#)
- Gradualism or incremental approach: very slow progress, intermediate forms of titles not valued (Manara and Regan), informal settlers have tenure security (eviction is politically risky)

Housing and relocating residents



- ◎ Long-term panel of slums in Chile ([Gonzalez-Navarro and Undurraga, 2023](#))
 - Role of slums and housing supply
- ◎ Displacement is harmful for children ([Carrera and Rojas-Ampuero, 2023](#))
- ◎ Relocating faraway is complicated ([Barnhardt et al., 2017](#) lottery in India; [Franklin, 2019](#) in Ethiopia; [Picarelli, 2019](#) in South Africa)
- ◎ Relocating close by or to good areas can be helpful. Lottery in Mumbai ([Kumar, 2021](#)), in Colombia ([Camacho et al., 2022](#)), in South Africa ([Franklin, 2020](#)).
- ◎ Privatization of housing and state misallocation in China ([Wang, 2011](#))

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 - Titling programs
 - Housing policies
 - Housing finance, collateral channel and asset price bubbles ([China](#), [Japan](#))
 - Zoning reform in Brazil ([Anagol et al., 2023](#))
 - Taxation in Mexico ([Brockmeyer et al., 2023](#)) and in India ([Anagol et al., 2024](#))

Land use and planning are important



- ⦿ Making cities work: promote productive, inclusive, sustainable cities
- ⦿ Severe housing shortages and associated challenges
- ⦿ Recent advances of data contributions and modeling approaches to study important questions