



2020 Lectures on Urban Economics

Lecture 5: Cities in Developing Countries

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Outline of talk

- Urbanization: Moving to cities
 - Where are the frontiers of urbanization
 - Does the classic framework apply?
 - “Spatial equilibrium” in developing countries
 - Issues and patterns
 - Structural modelling
 - Data needed
 - Relevant questions and revisions to baseline models
- Within cities
 - Building the city: investment in durable capital
 - Role of slums
 - Land and housing market issues

Frontiers of urbanization

- Not Latin America and not much of East and West Asia
 - (Almost) fully urbanized (60-80%) with annual rate of growth in urban share growth typically about **0.25%**
 - Focus is on clean-up of past problems or on distortions in markets
- Sub-Saharan Africa and South and South-East Asia
 - Urban share 35-50% and annual growth rate in that share of **1.2- 1.4%**
 - Africa urbanizing at comparatively low-income levels compared to other regions today or in the past (Bryan et al, 2019)
 - Lack of institutions and lack of money for infrastructure “needs”

Urbanizing while poor



London **slums**, 120 years ago
Sewer system: 1865



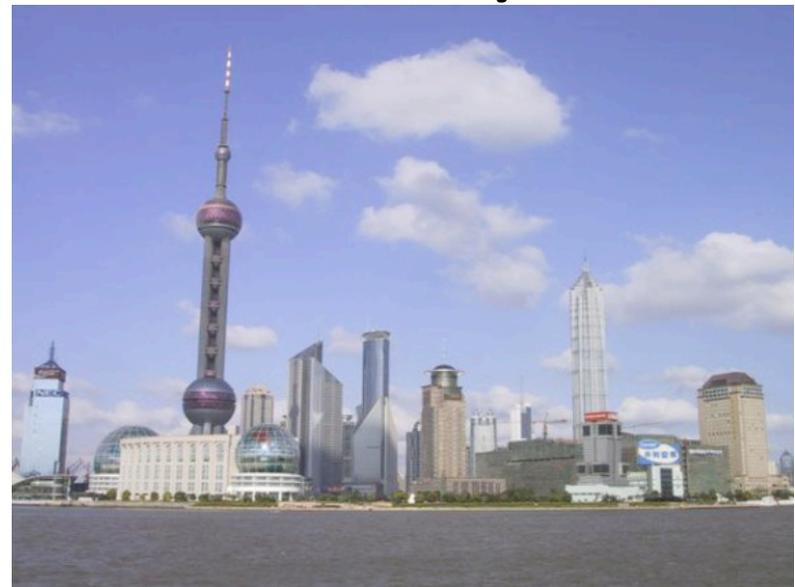
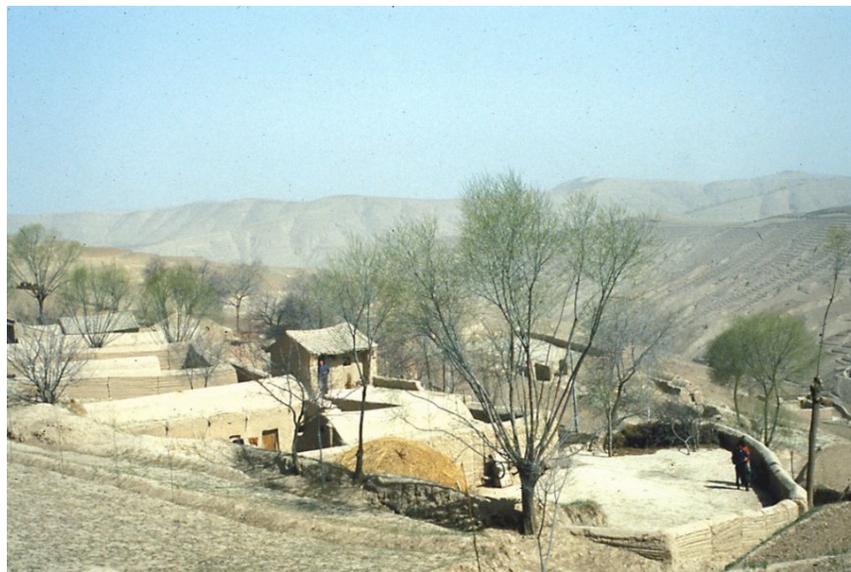
Lagos slums, today
Sewers 1% coverage



Models of urbanization

- Classic dual sector
- Urban = manufacturing; rural = agriculture
- Structural transformation
 - Closed economy:
 - Productivity in agriculture up, relative to limited demand for food.
 - Urban sector with productivity growth in manufacturing draws in people
 - Open economy.
 - “Asian tigers”. External demand for manufacturing (can import food in theory)
 - FDI and productivity growth/transfer

Moving to cities: bright lights or productivity?



Lack of structural transformation

Table 1: Share of manufacturing in GDP by region and year.

Region	1990	2000	2010	2017
E. Asia	24.6	25.2	27.6	27.4
S.E. Asia	22	24.8	22.6	20.9
L. America and Caribbean	20.7	17.9	15.7	15.2
N. Africa	17.6	17.9	16	16
Europe	17.5	15.3	11.9	11.8
S. Asia	15.9	15.6	16.1	14.4
W. Asia	14.4	13.2	12.1	13.8
S.S.A.	13.8	11.6	8	9

- Most of Africa never really has had more than local non-traded manufactures.
 - Why non-competitive: Transport and infrastructure? Labor force quality? Institutions (endogenous?) ?
- Could countries skip the manufacturing phase and move into traded business and financial services?
 - Labor force quality? Institutions?

Why is there urbanization?

One perspective: not clear

1. Farmers move to cities: jobs for family members and in off season; to get services private or public
2. But what supports jobs in cities? Consumer cities: Resource rents *including* farm income spent in cities (vs. oil, gas and minerals)
3. Add in horticulture, tourism, aspects maybe of IT , regional finance centers

Table 2: Farmers in African cities by city size.

Spatial scale	All urban	All rural	Primate city	Secondary cities (top 25%)	Tertiary cities (50-75%)	All others
Percentage of workers reporting agriculture as main industry	20.5	88	8.5	23.8	38.6	41.3
Percentage of workers reporting manufacturing as main industry	10.6	<2	12.4	10	8.3	7.3

Recent IPUMS data for 11 African countries



Why is there urbanization?

Second perspective: Just (unexplained) higher incomes

- Apply “Roback model”
 - What data needed?
 - What adjustments to the model?
 - Designing a structural model

What data do we need to bring to models

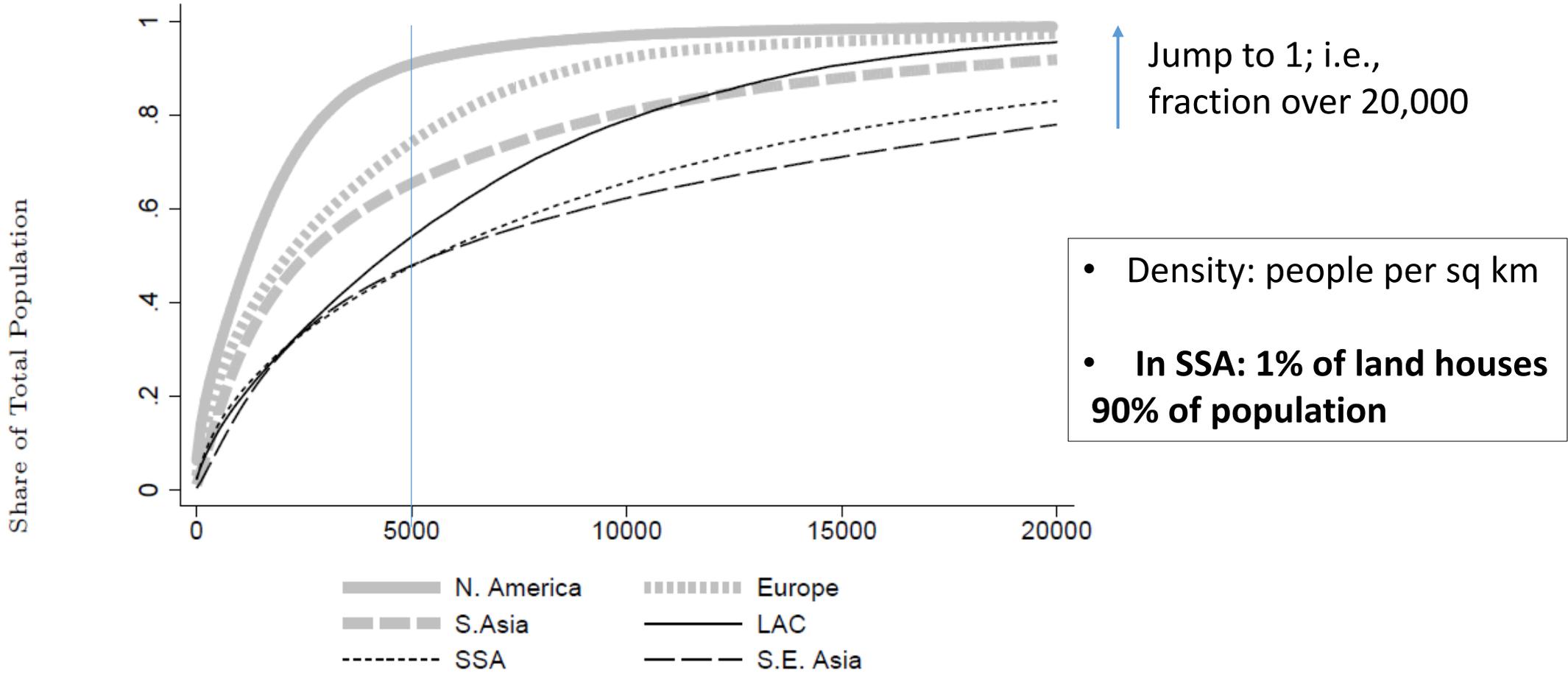
- Data needed to characterize issues
 - Population and population density
 - Gridded Population of the World [GPW] : gives (census based) data on 1km grid square. Smears data uniformly within administrative units
 - EU's Global Human Settlements [GHS]: tries to improve on GPW by smearing currently based on built cover data from LandSat . Process somewhat transparent and covers 4 epochs back to 1976 consistently
 - Landsat. Smears (ambient) population based on higher resolution satellite data and other information: no consistency over time and no transparency
 - Incomes (no economic census): WB Living Standards and Measurement Survey [LSMS], geocoded for 6 Africa countries
 - Quality of life: DHS covers about 30 Africa countries and South Asia. Afrobarometer as well (crime)

Key issues

- Huge income and service disparities between urban and rural
- Why not more migration and even more urbanization (despite lack of structural transformation)? Gollin and co-authors
 - Problems in urban living, not noted before
 - Moving costs and/or locational affinities
- We look at:
 - A different world: people live at densities in cities that the West does not experience
 - Review benefits and costs of moving to density

World view: people live in very concentrated locations

Figure 3: Population density gradients by region

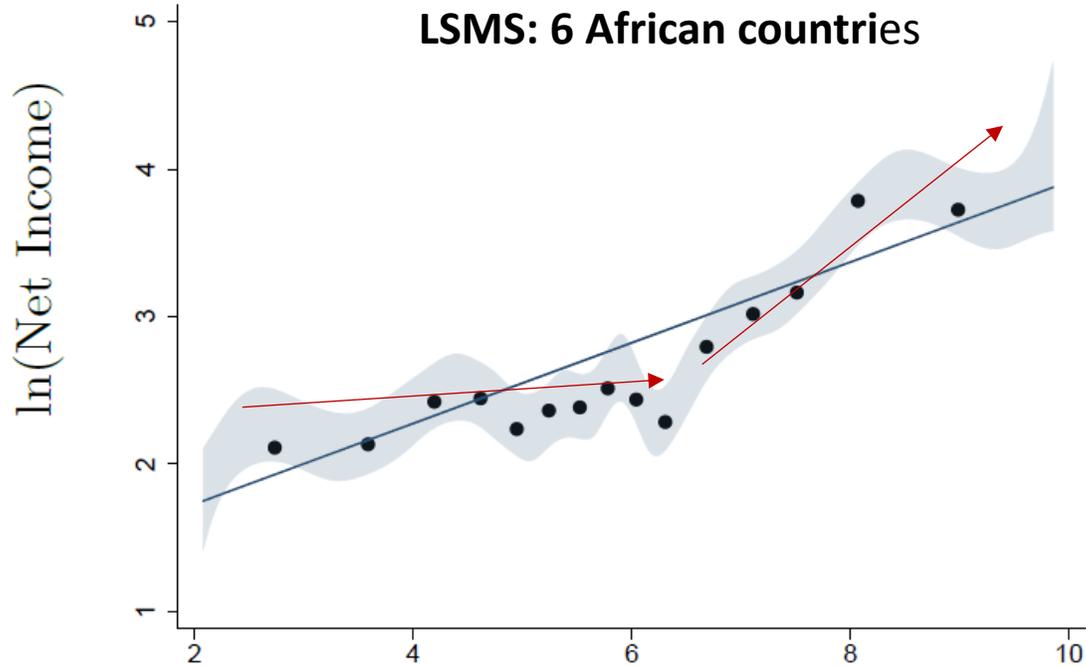


Quality of life correlations with density:

Outcomes vs. **density in 5 km disk around hh.**

Age, gender, education controlled for.

LSMS: 6 African countries



- Wage elasticity: 0.05

- Income elasticity: 0.32

Raise density from 550 to 8100 associated with 4-fold increase in income

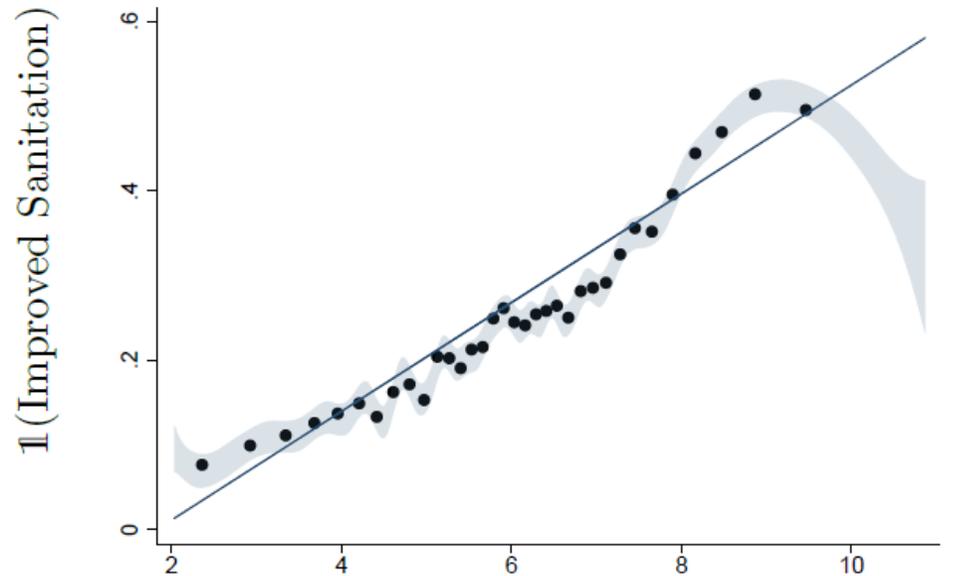
- **Why wage vs income difference?**

- **What would we need for causal inference?**

Urban public goods:

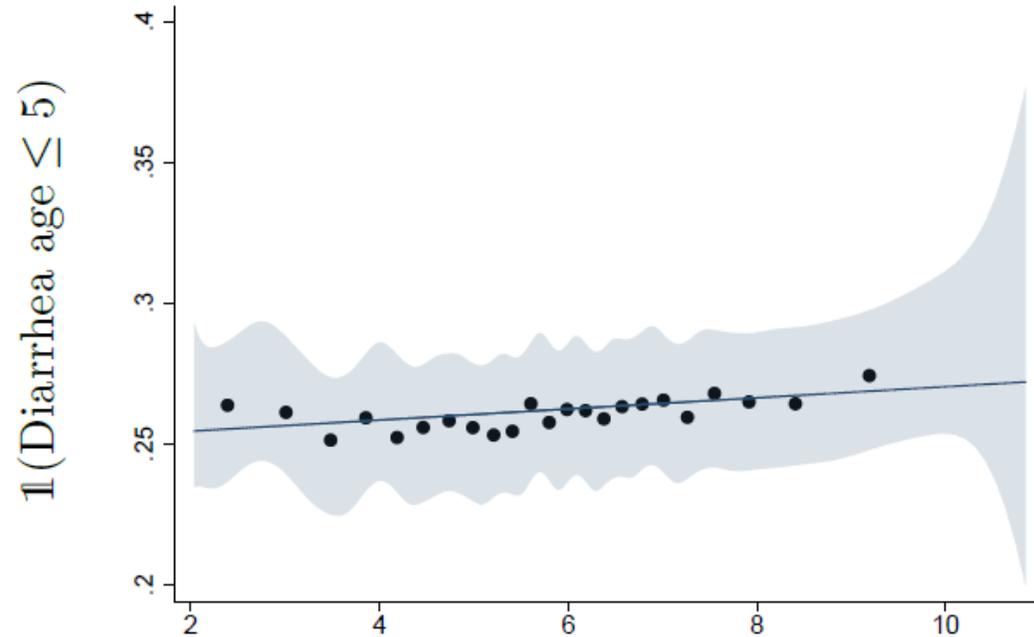
Schooling (complete grade 8), electricity, “safe” water, fertility (down), contraception.

DHS: 40 developing countries



Quality of life: The bads of cities

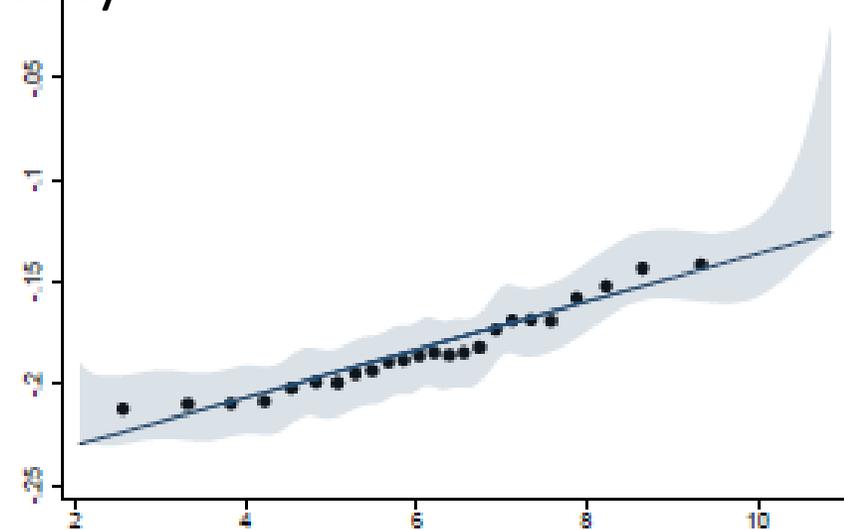
Outcomes vs. density in 5 km disk around hh.
Effects of age, gender, education controlled for.



But “safe” water and “improved” sanitation
UN sustainable development goals?

- **Other bads (stress and life style?):**
High BP (India), diabetes (India), domestic violence, crime (20 African countries), child cough, infant mortality
- No data: commuting times

Obesity



Spatial equilibrium?

- Of course... always in a transitory equilibrium
- Huge income and public service differences between low and high density. “Should be moving to cities”
- Why not faster pace?
 - Huge migration costs and/or affinities for where you are born?
- Worker utility

$$U_{ni} = Z_i a_i V_i g_{ni}$$

This worker gets a productivity draw a_i from a Frechet distribution that is iid across cities and workers.

a_i is effective labor supply so she earns $a_i w_i$ if she moves from city n to city i .

$g_{ni} \leq 1$ is the fraction of utility left-over net of migration costs.

Migration costs

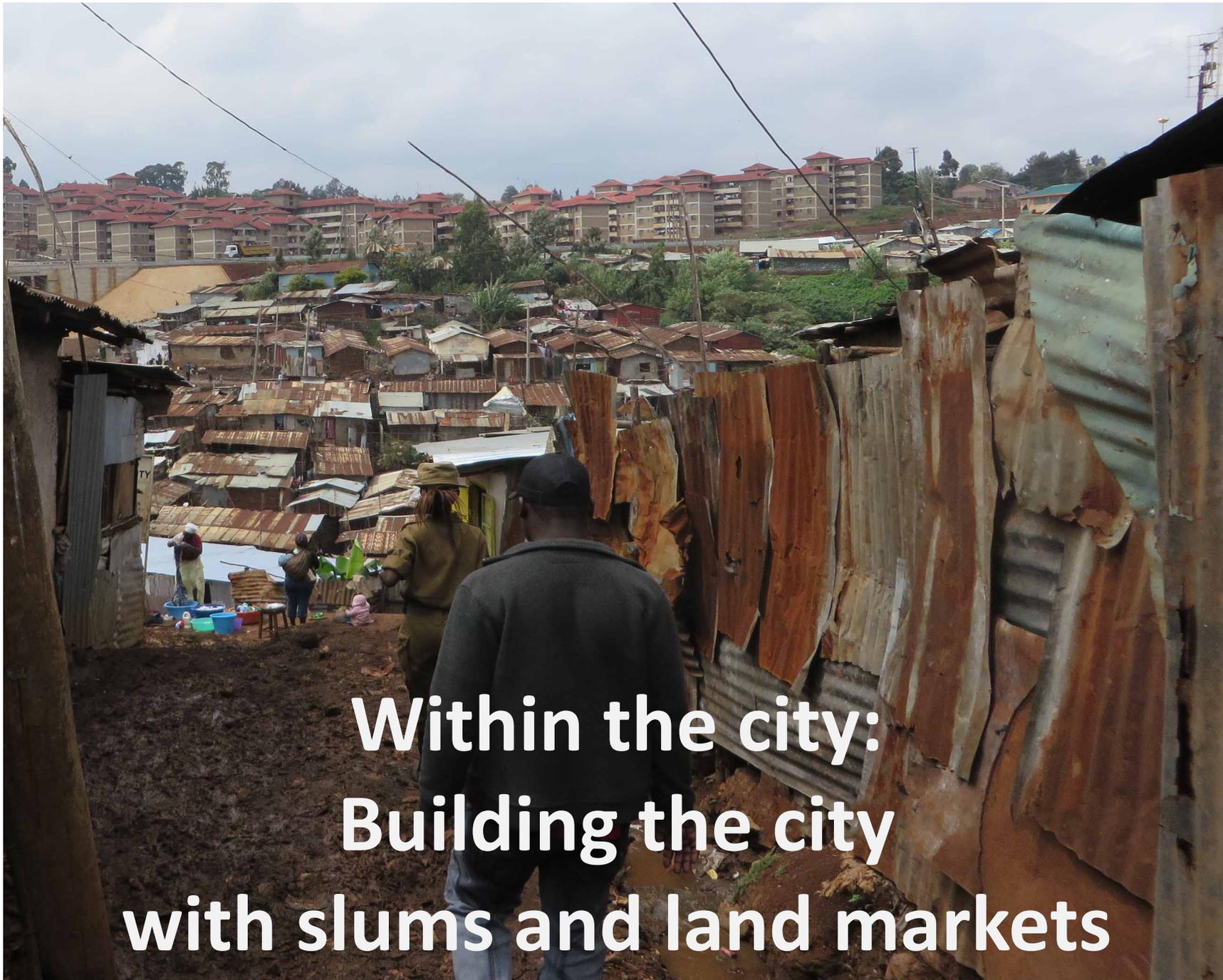
- $M_{ni} = Prob(U_{ni} > \max\{U_{ns}, s \neq i\}) = \frac{(Z_i V_i g_{ni})^\theta}{\sum_s (Z_s V_s g_{ns})^\theta}$
- Similar for M_{ii} where $g_{ii}=1$
- $$\ln\left(\frac{M_{ni}}{M_{ii}}\right) = \underbrace{\theta \ln(t_{ni})}_{\theta g_{ni}} + \underbrace{\theta \ln(\tilde{t}_i) + \ln(\sum_s (Z_s V_s g_{is})^\theta)}_{J_i} - \ln(\sum_s (Z_s V_s g_{ns})^\theta)$$
- $$= \delta \cdot \text{dist}_{ni} + I_n + J_i$$
- But static world where observing flows over 5 or 10 years.
- In general low flows (China, Indonesia) from which infer high costs: lose 40-90% of income at destination. (Tombe and Zhu 2019 or Bryan and Morten 2019)
- But need dynamic and life cycle models to understand migration (Kennan and Walker)
 - Dynamic for long period of returns, in face of high costs
 - So much (planned?) round trip migration

Structural spatial models (g.e. & welfare costs)

- Initially focused on migration or transport costs:
 - Donaldson and Hornbeck (2016), Alder (2019), Baum-Snow et al (2020), Tombe and Zhu (2019), Bryan and Morten (2020).....given based on Eaton-Kortum model
 - Now environment (Balboni, 2019); factor market distortions driven by “politics” (Henderson, Su, Zhang and Zheng, 2020)
- Fixed number of “cities” (admin areas). No city formation and perfunctory analysis of agglomeration economies and diseconomies.
- For most versions: need local GDP (or night lights), population for two periods, migration flows or costs (inferred from extent of flows), transport flows or costs.
- And then data for problem at hand : e.g., local costs of capital and residential and industrial land prices. Or GDP breakdown by 3 sectors, fiscal transfers (Holger Sieg et al).
- Challenge for Africa!

Not systems of cities models

- Little on systems of cities and their evolution
 - Endogenous numbers (and sizes) of cities
 - Having different specializations and functions
 - Growth in a system
 - Bigger vs more cities



Kibera,
Nairobi

**Within the city:
Building the city
with slums and land markets**

Outline for “Within cities”

- **Specific model and results** (Henderson, Regan, and Venables, ReStud, forthcoming)
 - Model the dynamics of a growing (monocentric) city with durability, slums and institutional frictions
 - Take to the data on **Nairobi** for 2003 and 2015: estimate parameters of the model from the 2015 cross-section
 - Examine evolution from 2003 to 2015: model predictions versus outcomes
 - Quantify costs of institutional frictions delaying development of inner-city slums into formal sector use.
- **General issue of role of slums and land markets**
 - Review two papers (Harari and Wong and Michaels et al)
 - Gradations of property rights vs. full rights
 - Who rents vs owns: why does it matter?

Motivation

- Rapid urbanization and construction means rapid (re)deployment of nation's capital.
 - Major cities are growing at about 4% a year in population with rising incomes
 - Huge increase in demand for building space
 - Buildings are 2/3 of the private capital stock of nations (WB 2007).
 - We know little about the issues with this redeployment.
- Define the way people live well into the future
- How does the shape of cities change?
 - Do cities just sprawl (World Bank focus on fringe: de novo)
 - Or do they densify in the core:
 - Build high (or infill)?
 - Have enormous churn?

Motivation

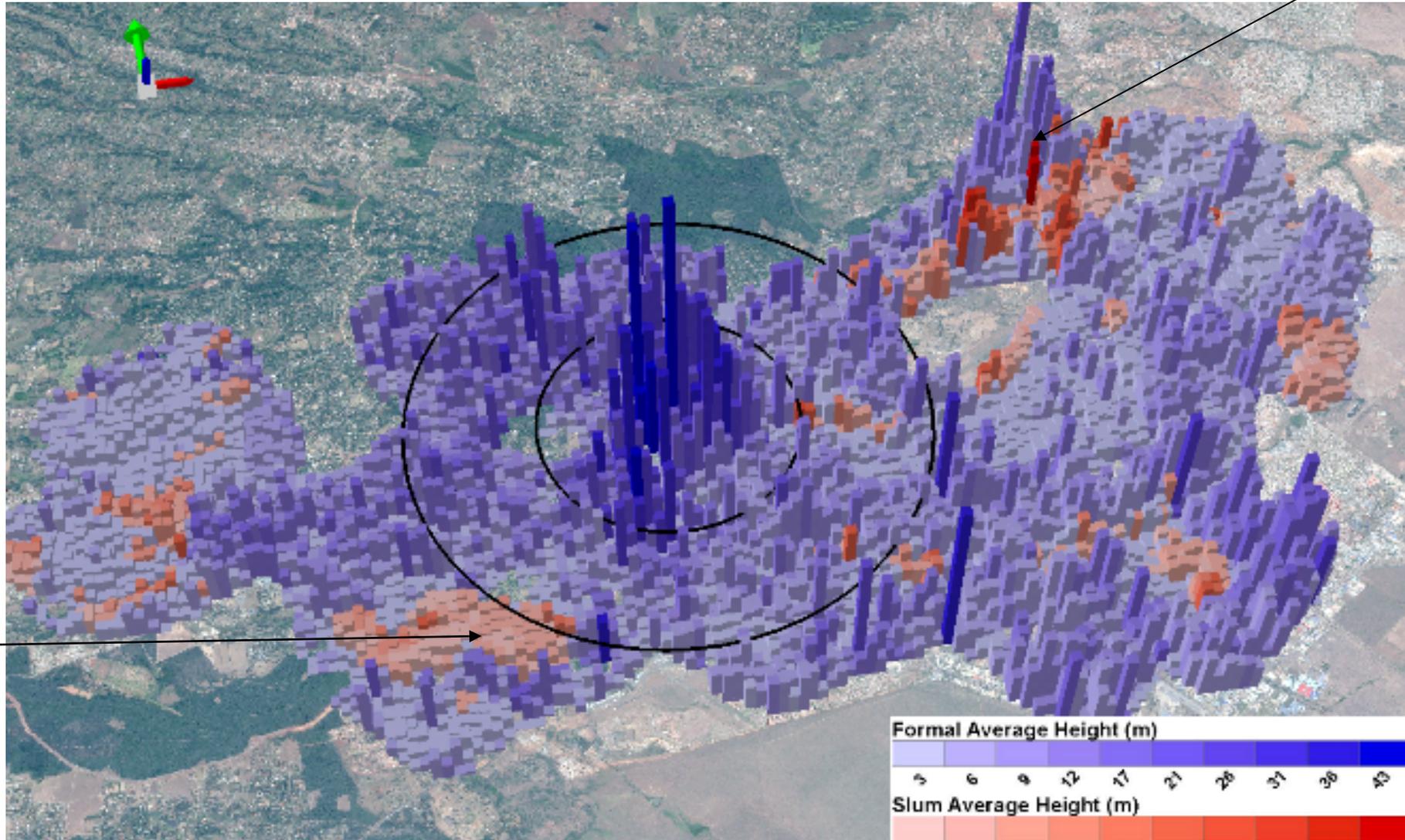
- What is the role of slums in the evolving urban environment?
 - House 30-60% of population in African cities.
 - Where, in a market-based economy, would new slums form and exist (if ever)?
 - That is, are slums just the result of poor institutions?
 - What types of institutional reforms occur and what are pitfalls?

Nairobi in the 2015 cross-section

3-D average height of all buildings by 150x150m grid square

Monocentric but with a 'hodgepodge'

misclassification



Kibera

Rings at 2 and 4 kms from centre

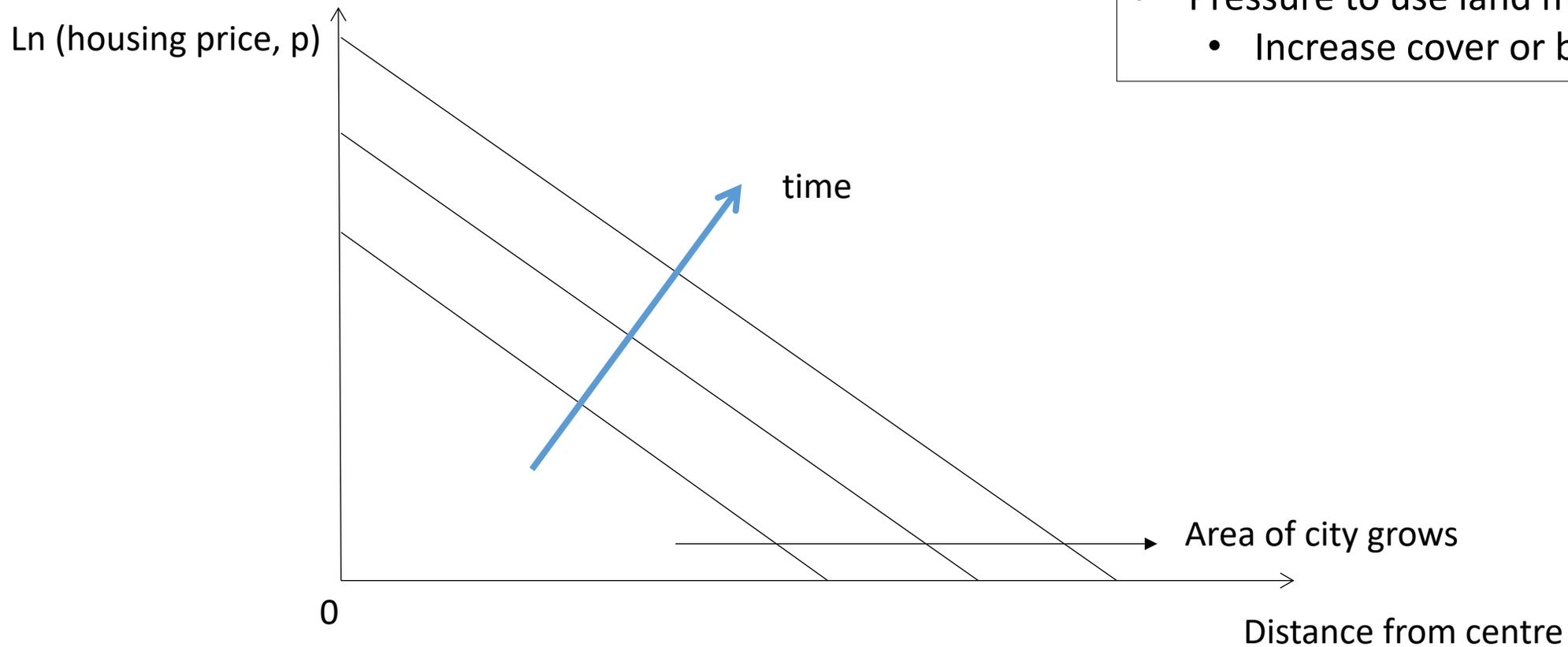
Model ingredients

- Open city
- Growing 'monocentric' city:
 - **House prices and population increasing due to rising city productivity relative to outside options in rest of country.**
- Perfect foresight *competitive* land developers/owners, with infinite horizon.
- Lumpy long-lived capital (in formal sector): need dynamic model
- Growth model assumptions
 - Technologies have iso-elastic form
 - Price gradients have exponential form
- Representative agent

Dynamic driver: Price growth

$$p_i(x, t) = \bar{p}_i e^{\hat{p}t} e^{-\theta x}$$

Urban Econ 1. House price gradient



- **CROSS-SECTION**; premium on access to city centre (jobs)
- **DYNAMICS**: Rising prices over time (Productivity up relative to outside option)
- Housing prices mirror land prices
- Pressure to use land more intensively
 - Increase cover or build higher

Technology differences

- Formal and slum sectors as differences in technology:
 - **Formal sector.** Buildings are ‘putty-clay’.
 - Choose & fix height, for *fixed cover to area ratio*.
 - Subject to redevelopment: smash and reconstruct (to higher height)
 - Nairobi: 84% of formal residential walls are made of stone, brick, block. (55% roofs iron sheets).
 - **Slum.** Buildings are land intensive and ‘putty’ (Meccano parts/legos)
 - Cheap to build one storey with flexible coverage, but cannot build high with the utilized materials.
 - *Vary cover, not height.*
 - Nairobi: 52% of slum buildings walls are corrugated iron sheets; 19% mud or mud mix;
 - Wood as residual
 - 85+% ≤ 5m
 - **Quality issue added:**
 - Crowded (little green space, side streets)
 - Construction quality
- Fixed cost of formalisation ($D(x)$): on first formal sector development.

Nairobi:

- Slums 10% of non-public use land (30% of population)
- 20% volume (and more for land) in slums is private– at city edge
- Focus on choice of technology and formalisation costs



Private (?) edge slum



Kibera: Government 'owned'

700 m above ground

Model: A land developer's problem: max PV of rents on land

$$\begin{aligned}
 R(x) = & \underbrace{\int_0^{\tau_0} r_0 e^{-\rho t} dt}_{\text{agriculture}} + \underbrace{\int_{\tau_0}^{\tau_1} r_I(x, t) e^{-\rho t} dt}_{\text{slum use, house} \\ & \text{\& land prices low.}} \\
 & + \underbrace{\left[R_F(x, \tau_1) - D(x) \right] e^{-\rho \tau_1}}_{\substack{\text{first formal development} \\ D(x): \text{formalisation cost}}} + \underbrace{\sum_{i=2} R_F(x, \tau_i) e^{-\rho \tau_i}}_{\text{successive redevelopments}}
 \end{aligned}$$

$R_F(x, \tau_1)$: PV of rents (profits) over life ($\Delta \tau$) of building

- Sequencing (and land rights)

Choices in optimization

- Time to convert agricultural land to slum use
 - Intensities while in slum use
 - Time to convert to formal sector use
 - Intensity of first formal sector use
 - When to demolish and redevelop
 - Intensity of redevelopment
-
- All driven by prices
 - Want key empirical relationships (in red)

Informal sector: Intensity of use

$$\text{land rent: } r_I(x, t) \equiv \underbrace{p(x, t) a(v_I(x, t))}_{\text{quality adjusted, observed price}} v_I(x, t) - \underbrace{k_I v_I(x, t)}_{\text{flow cost}};$$

- Observed (quality adjusted) price gradient in slums in the model and generally in the data is flat.

$$v_I(x, t) = h_I c_I(x, t); \quad (v_I : \text{volume per unit land; height: } h_I = 1;$$

c_I : cover per unit land)

$$a(v_I(x, t)) = a_0 v_I(x, t)^{(1-\alpha)/\alpha}, \quad \alpha > 1.$$

Diseconomies (crowding) in informal sector

Informal sector

- Maximizing land rent (profit) yields equations we use empirically:

$$1) \text{ Maximize wrt } v: \quad r_I(x, t) \equiv \frac{p(x, t) a_0 v_I(x, t)^{(1-\alpha)/\alpha}}{\text{quality adjusted, observed price}} \quad v_I(x, t) - k_I v_I(x, t) \quad \text{flow cost}$$

Optimize:

$$1) v_I(x, t) = [a_0 p(x, t) / \kappa_I \alpha]^{\frac{\alpha}{\alpha-1}}, \quad \text{where } p_i(x, t) = \bar{p}_i e^{\hat{p}t} e^{-\theta x}$$

$d \log v / d \log x = d \log c / d \log x = -\theta \alpha / (1 - \alpha)$: gradient of built volume to area.

Volume and cover up as price rises over time

2) Realized rent at each instant:

$$r_I(x, t) = [1 - 1/\alpha] \quad p(x, t) a(v_I(x, t)) \quad v_I(x, t)$$

land share observed price:
constant over space

Formal sector

(Delaying conversion timing conditions)

$$R_F(x, \tau_i) \equiv \int_{\tau_i}^{\tau_{i+1}} \underbrace{p(x, t)v_F(x, \tau_i)e^{-\rho(t-\tau_i)} dt}_{\text{vol fixed in interval}} - \underbrace{k_F(v_F(x, \tau_i))}_{\text{stock cost:}};$$

escalating in height
no maintenance

$k_F(v_F) = k_F v_F^\gamma$, $\gamma > 1$; formal sector diseconomies

$$v_F(x, \tau_i) = c_F h_F(x, \tau_i);$$

Formal sector volume choice

- Optimizing yields :

$$v_F(x, \tau_i) = \left[\frac{p(x, \tau_i) \Phi(x, i)}{\kappa_F \gamma} \right]^{\frac{1}{\gamma-1}} . \quad p_i(x, t) = \bar{p}_i e^{\hat{p}t} e^{-\theta x}$$

- Used later in examining how new building heights vary by distance from city center

$$d \log v / d \log x = d \log h / d \log x = -\theta / (\gamma - 1);$$

- Used also in predicting volume increase with redevelopment

$$\frac{v_F(x, \tau_{i+1})}{v_F(x, \tau_i)} = e^{\frac{\hat{p} \Delta \tau}{\gamma-1}} = \frac{\gamma}{\gamma - \rho \Phi}$$

- Rent (amortized) at each instant: $r_F(x, t, \tau_i) = [1 - 1/\gamma] p(x, t) v_F(x, \tau_i)$
land share

Basic results

- Optimizing τ_i 's : Trigger house rents with final condition for example:

$$\underbrace{r_F(x, \tau_1, \tau_1)(\gamma - \rho \Phi(x, i)) / (\gamma - 1)}_{\text{Cost of waiting}} = \underbrace{r_I(x, \tau_1) + \rho D(x)}_{\text{Benefits of waiting}}$$

- Sequencing of slum to formal requires $\gamma < \alpha$: Height vs quality diseconomies
 - Also implies share slum land in city shrinks over time

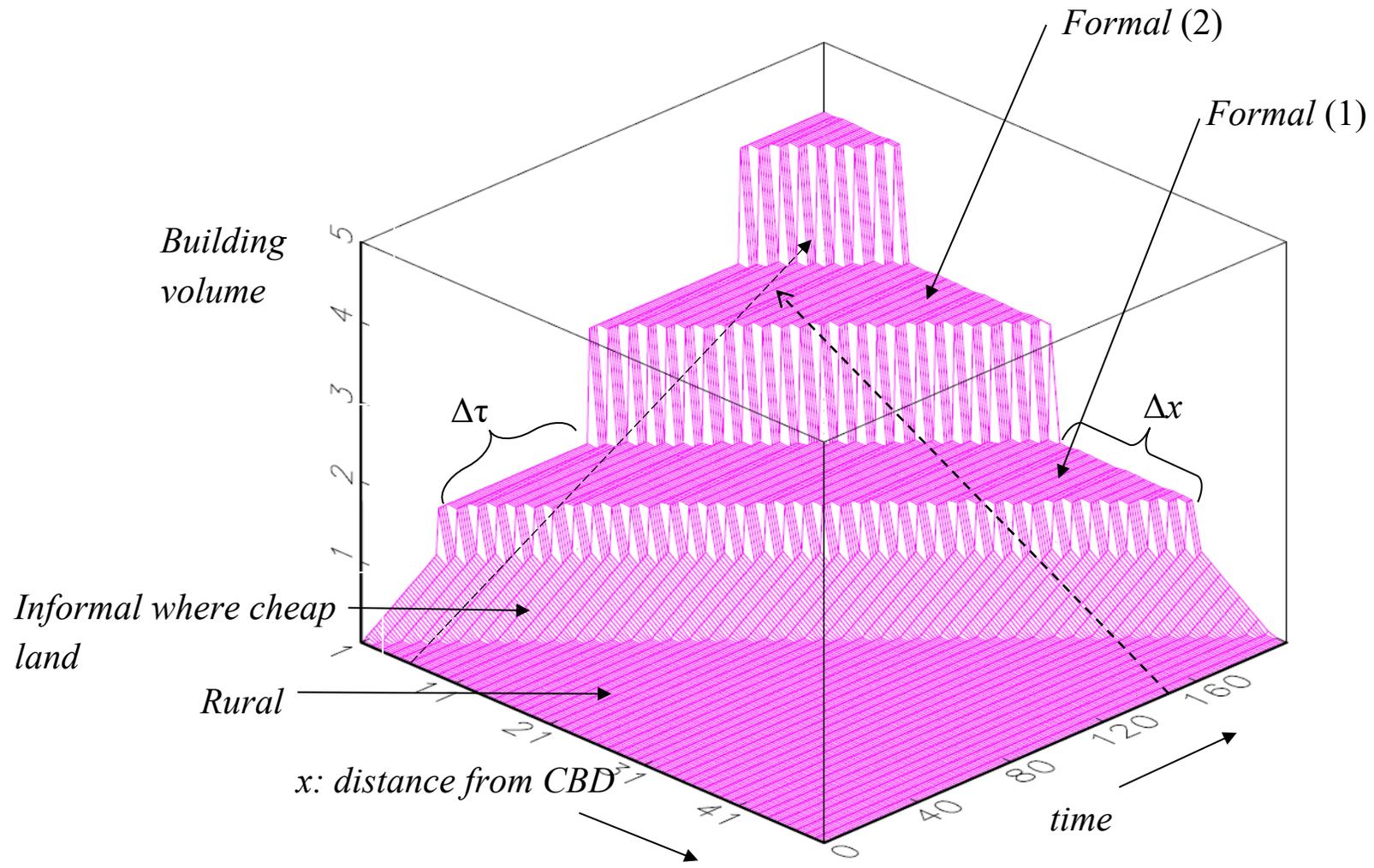
• Some other results

- The house value-to-rent ratio (Φ) and the time interval between redevelopments *are constant over time and space*

$$\Phi = \int_{\tau_i}^{\tau_{i+1}} [p(x, t) / p(x, \tau_i)] e^{-\rho(t-\tau_i)} dt = \int_0^{\Delta\tau} e^{(\hat{p}-\rho)t} dt = \frac{1 - e^{(\hat{p}-\rho)\Delta\tau}}{\rho - \hat{p}} \quad \Delta\tau = \frac{\gamma - 1}{\hat{p}} \ln \left[\frac{\gamma}{\gamma - \rho\Phi} \right]$$

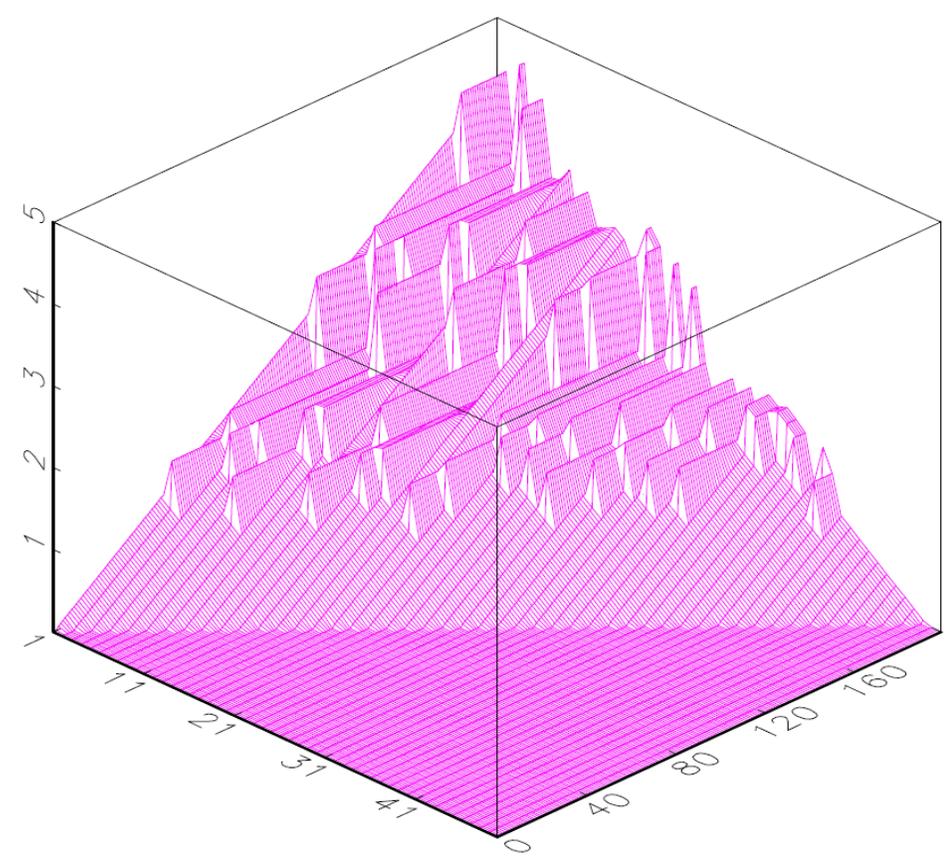
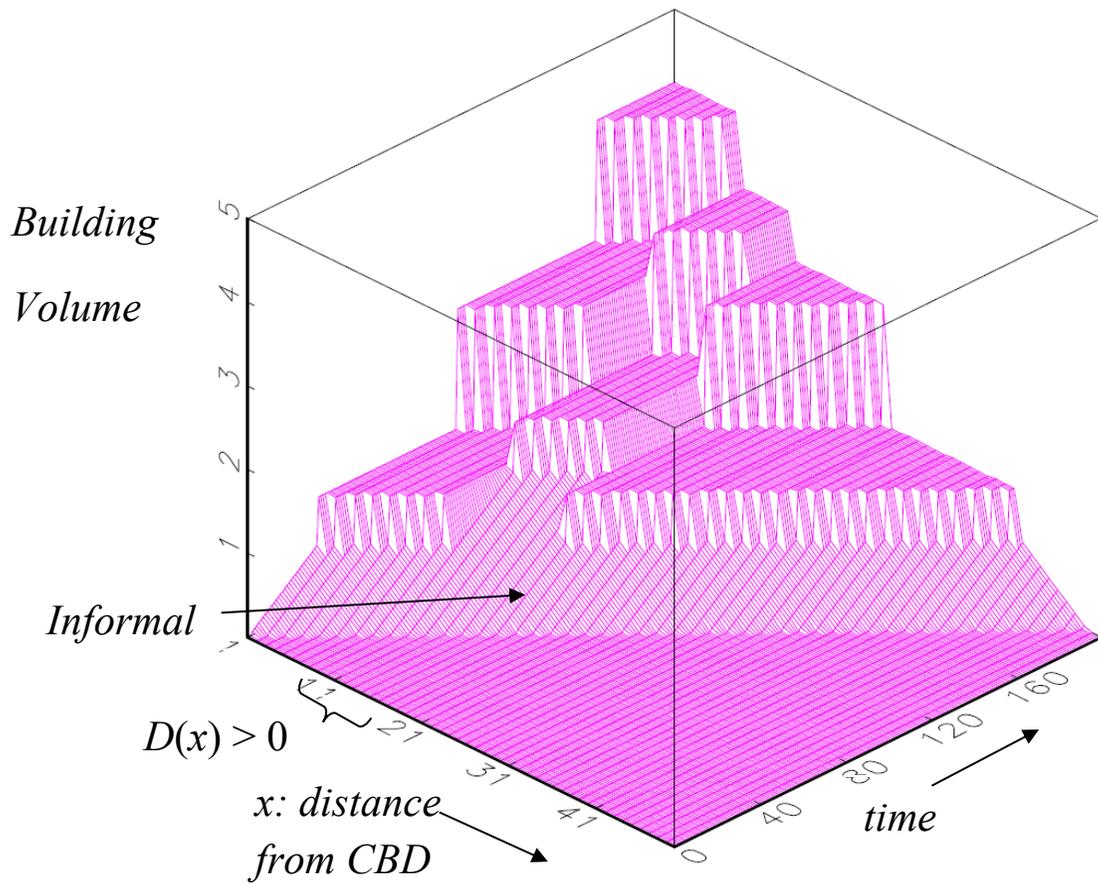
- Land price gradient:

$$d \log P V / dx = \log R / d \log x = -\theta\gamma / (\gamma - 1).$$



Formalization costs; Two types

- **Geography** : steep slope, ruggedness, water. (important in Nairobi)
 - One-time fix-up when move to formal sector usage (“drain the swamp”; “grade the land”)
- **Land market institutional issues**
 - Formal sector development: need formal title/leasehold
 - Risk of expropriation of a permanent large-scale building
 - Required for financing to offer land as collateral
 - Inheritance
 - Formalization costs vary with specific history of land
 - Later will look at slums where there is “government ownership” in Nairobi, meaning the claims to the land are “in dispute”. Makes formalization very hard.
- Formalization costs of both kinds delay development: need prices to rise higher to recover formalization cost.
 - Unobserved: can calculate lower bound



The hodgepodge

- Random D 's, by distance from centre
- Implies at any instant there will be redevelopment in different parts of the city: Give height gradient:

$$d \log v / d \log x$$

$$= d \log h / d \log x = -\theta / (\gamma - 1)$$

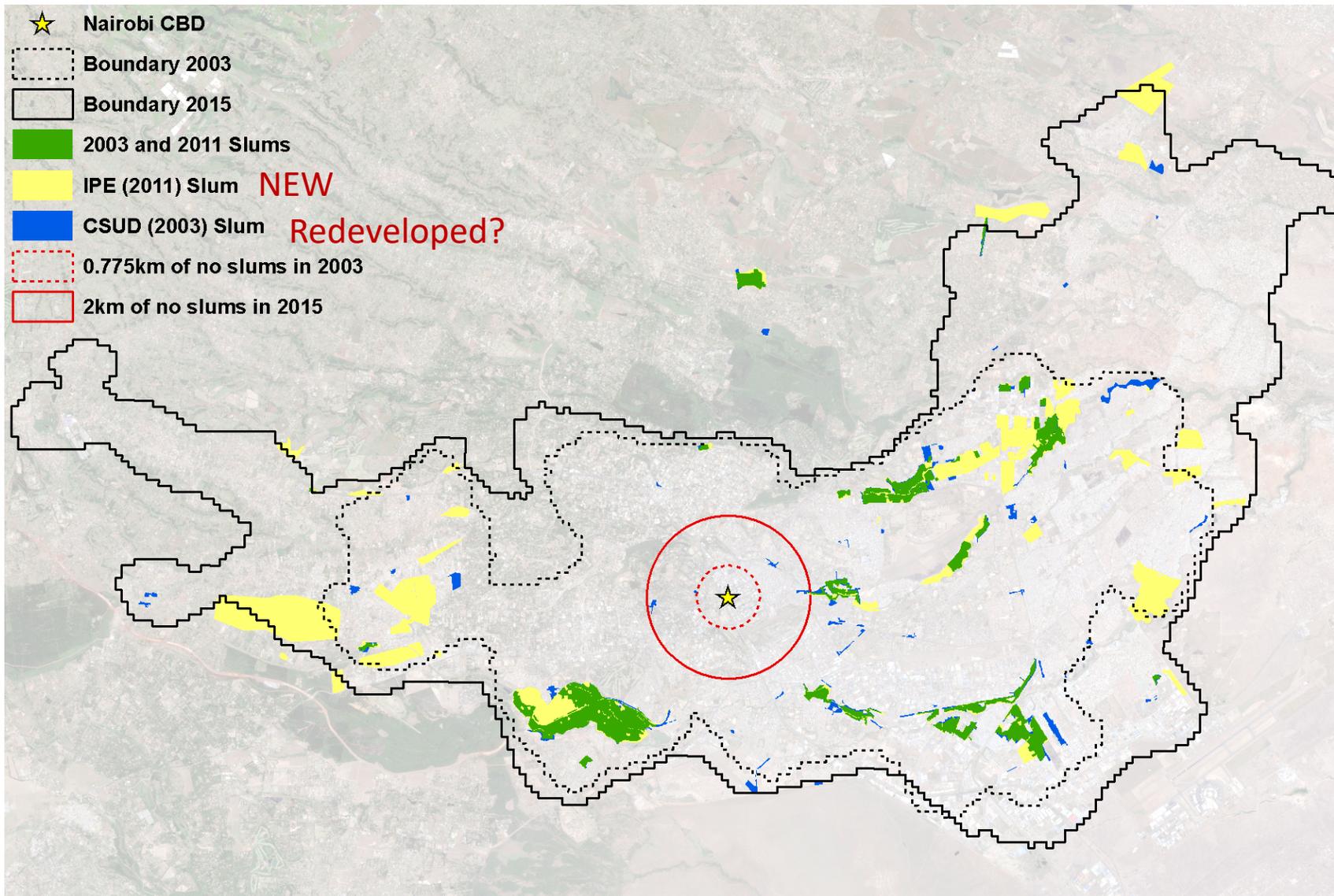


2020 Lectures on Urban Economics

Short Break – We are back in a few minutes

Empirical work: Nairobi data

- Changes in building footprints and heights over time (2003 & 2015)
 - Assess aerial photo (10-40 cm resolution) & LIDAR (0.3-1m resolution) data
 - Gives building footprint sizes for 2003 and 2015 and heights for 2015.
 - For 2003 height
 - Same for unchanged building
 - Teardowns: assigned based on avg heights of neighbouring unchanged buildings
 - Overlay building polygons in 2003 and 2015 to define redevelopment, infill and demolition
 - Define characteristics (eg, height) at 3mx3m pixels: aggregated to a grid with thousands of cells (6470 in 2003 area), which are 150m by 150m
- Also have land price data, SPOT data (roads), NORC 2012 survey for residential and slum house prices and attributes, slum maps (2003, 2011)
 - CSUD vs IPE



- Bounds on north and south
- 2 classifications of slums
 - Use 2011 definition of slums
- Look just at private sector use
 - **Remove grid squares where centroid in permanent public use (but not roads): 11% of grid squares**

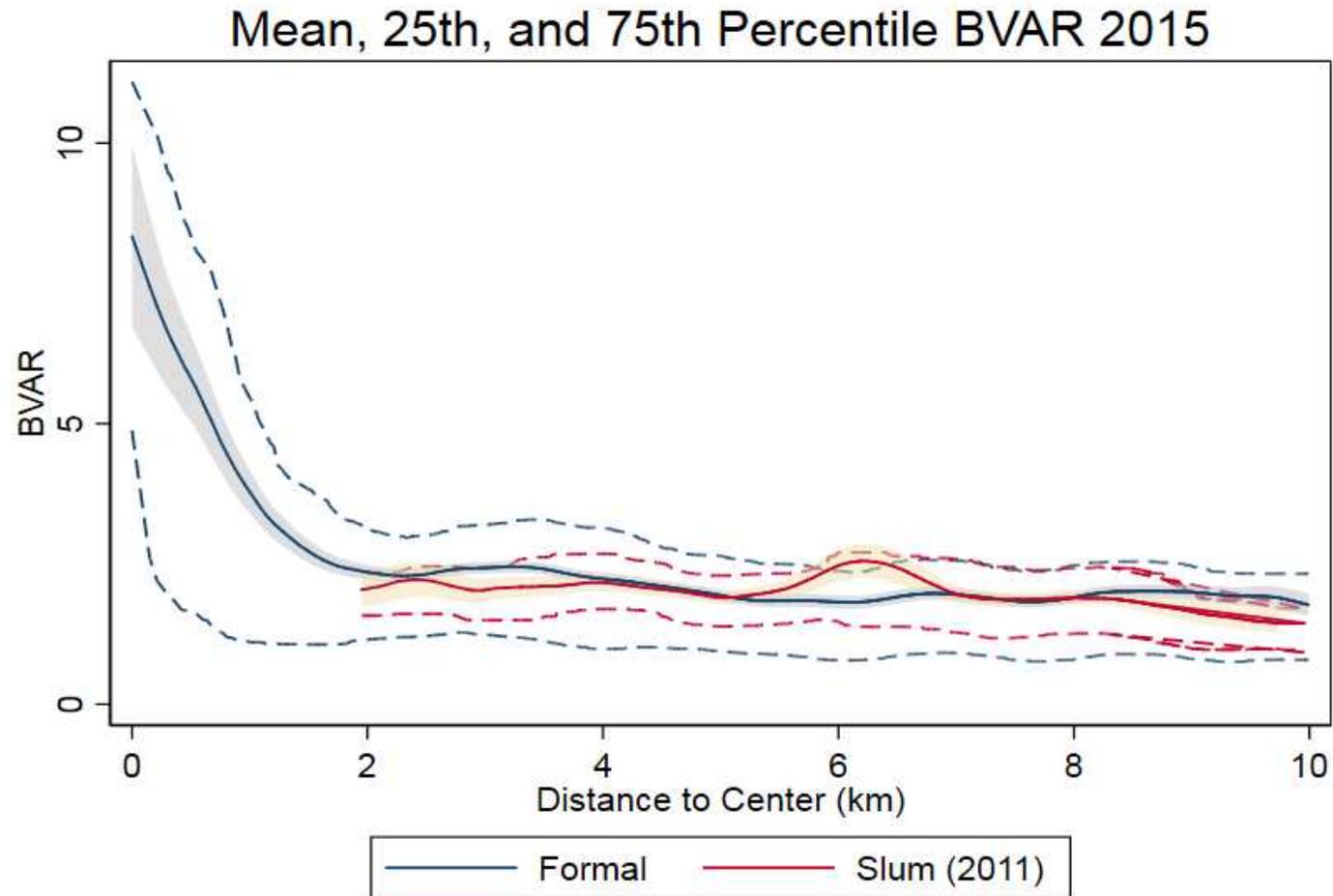
Basic cross-section results: 2003 city in 2015

- Look at **gradients**: consistent patterns as move away from centre (x), but heterogeneity within rings (out to 10kms in figures)
- Estimate gradients
 - Gives us key parameters from slope of land price gradient, height of newly developed buildings, and slum volume (=cover)

$$\log(y_i) = b_1 + \beta_1 x_i + \beta_c Z_i + \epsilon_i.$$

- A few facts:
 - Land price at centre 5.5 fold higher than at 10km
 - **Check assumptions**:
 - Constant CAR in formal
 - Constant height in slums
 - Spatially invariant slum rent gradient: as move to city center price premium offset by decline in quality (crowding)

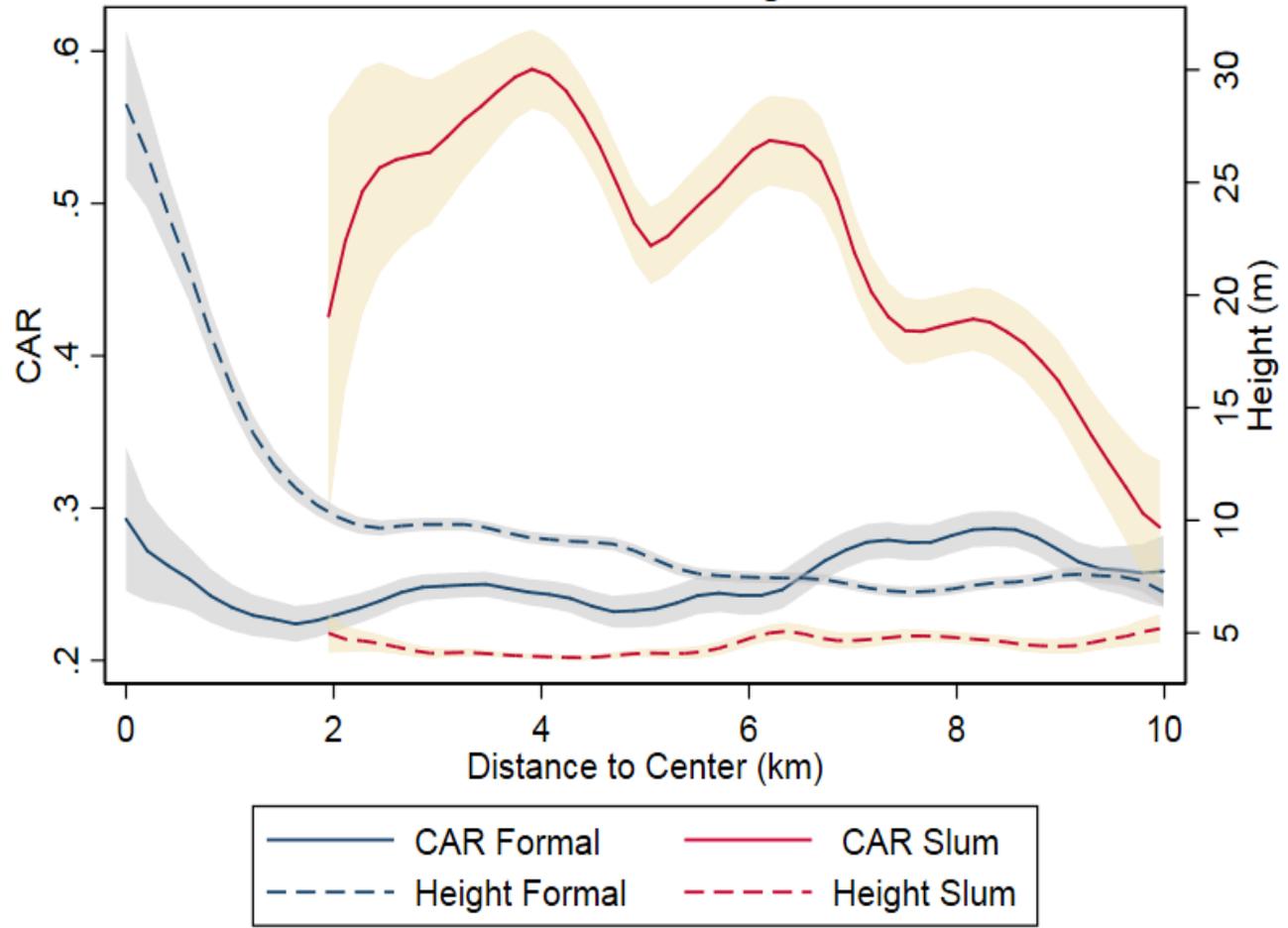
Built volume per unit land



- Slums and formal deliver similar volumes per unit area
- Do so in very different ways

- Confidence intervals on (smoothed) mean
- Spread of data

Mean CAR and Height 2015



- 5% of buildings at centre over 16 stories (50m)

- **Slums**: constant height(-----), declining CAR (____)
- **Formal**: the opposite

Table 3: Model parameters**a. Model parameters from gradients**

Gradients:	Formal:	Slum:
Volume m ³ , per m ² land.	$\frac{dv_F(x, \tau_i)}{dx} \frac{1}{v_F} = \frac{-\theta}{\gamma-1} = -0.101$ Eqn (21); Table 1 col. 4	$\frac{dv_I(x, t)}{dx} \frac{1}{v_I} = \frac{-\theta\alpha}{\alpha-1} = -0.0948$ Eqn (4); Table 2 col. 1
Land-price per m ² land.	$\frac{dR_F(x, \tau_i)}{dx} \frac{1}{R_F} = \frac{-\theta\gamma}{\gamma-1} = -0.172$ Eqn (21); Table 1 col. 6	

Solutions: $\gamma = 1.703$, $\alpha = 3.983$, $\theta = 0.071$

a. Levels of variables and further parameters

Volume m ³ , per m ² land.	$v_F(x, \tau_i) = \left[\frac{p(x, \tau_i)}{\gamma} \cdot \frac{\Phi}{\kappa_F} \right]^{1/(\gamma-1)} = 6.80$ $= \exp(3.315) \times 0.247$ Eqn (10a); Table 1 col. 4 for height, times median formal sector CAR = 0.247	$v_I(x, t) = [a_I p(x, t) / \kappa_I \alpha]^{\alpha/(\alpha-1)} = 3.58$ $= \exp(1.275)$ Eqn (4): Table 2 col. 1
Space-rent per m ³ volume,	$p(x, t) = 23.29 = \exp(3.148)$ Table 1 col. 7	$p(x, t) a(v_I(x, t)) = \kappa_I \alpha = 6.593 =$ $\exp(1.886)$ Eqn (6): Table 2 col. 4

Solutions: $p(x, t) = 23.29$, $a_I = 0.734$, $\kappa_I = 1.655$, $\kappa_F / \Phi = 3.554$.

Levels evaluated at $x = 0$, $t = \tau_i = 2015$, in \$US

Interpretation

- $\alpha > \gamma$ Implies slums on outskirts
- **Land rent shares:**
 - **Formal** $1 - 1/\gamma = 0.41$; like Case (2007) on USA vs. Combes et al, 2017 .
 - **Slum** $1 - 1/\alpha = 0.75$. Very land intensive production;.
- **Slope of house price equation** of -0.071; (Combes et al 2018 for France)
- $r_F(x = 0, 2015, 2015) = \64.91 , $r_I(x = 0, 2015) = \$17.70$
 - Gap: inefficiency: To overcome have to overcome D
- Slum quality at centre would be 50% of that of slums at 10km
- Formal sector unit construction costs at centre are 100% higher than at 10kms

Parameters for dynamic environment

Present value of land rents

$$PV_F(x, \tau_i) = r_F(x, \tau_i, \tau_i) \Phi / \left[1 - e^{-(\rho - \hat{p}\gamma/(\gamma-1))\Delta\tau} \right]$$

Value to rent ratio, over life of building

$$\Phi = \left[1 - e^{(\hat{p} - \rho)\Delta\tau} \right] / (\rho - \hat{p})$$

Length of life of building:

$$\Delta\tau = \left((\gamma - 1) / \hat{p} \right) \ln(\gamma / (\gamma - \rho\Phi))$$

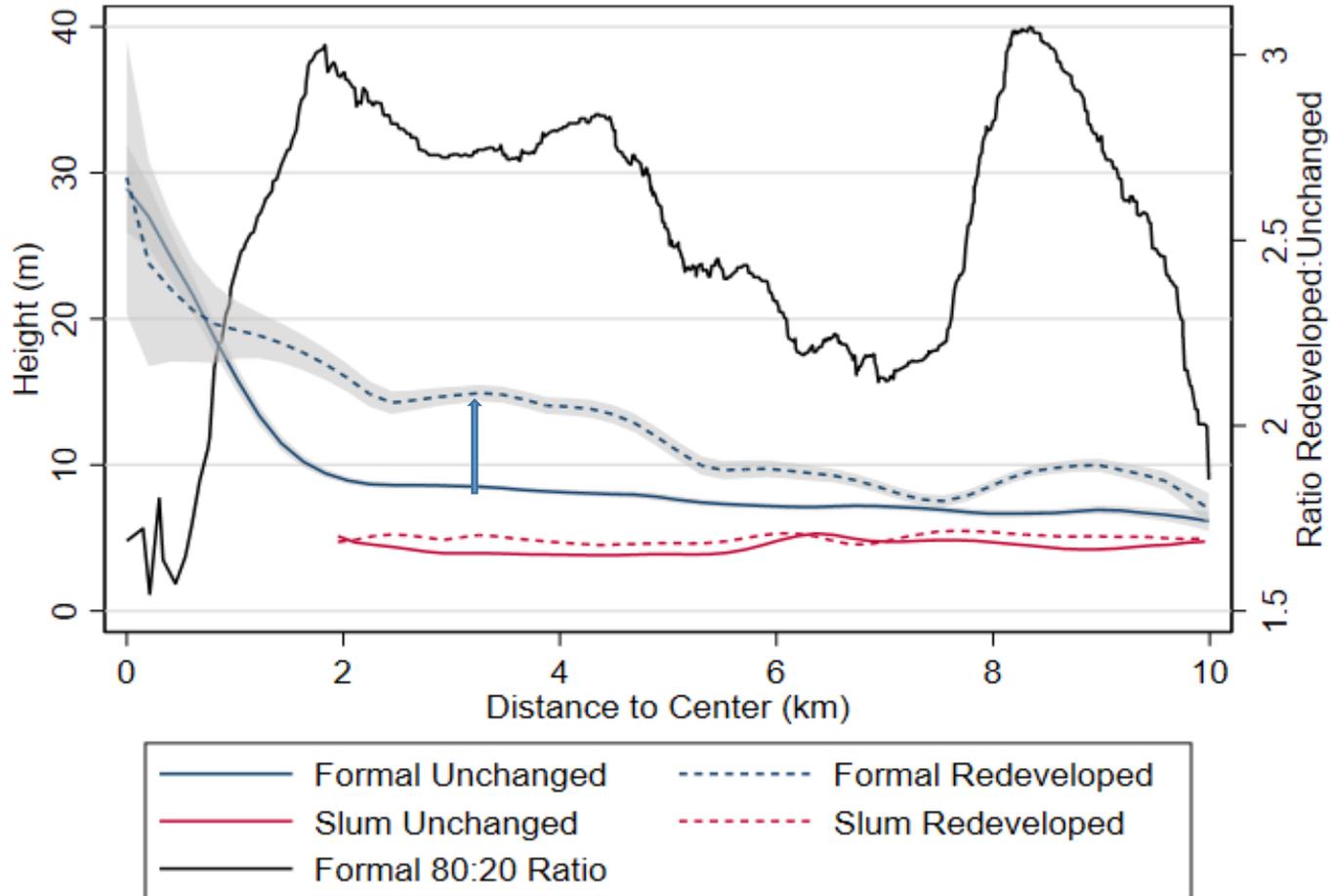
$$\hat{p} = 0.0092, \quad \Phi = 20.64, \quad \Delta\tau = 89 \text{ years.}$$

Data dynamics

Total volume (building capital) growth

- Overall for 2015 city, from 2003-2015: city 60% volume increase
 - Similar to population
 - Intensive margin within 2003 city: 47% increase (and 2/3 of the 60% increase)
 - Extensive margin is 120%
- Data and model predict (way out of sample) timing of first formal sector development and redevelopment at different distances from the city centre in absence of D 's
 - At city centre: formalize 1917; first redevelopment 2006
 - Model predicts waves of redevelopment

Redevelopment: Height changes



- Ratio of height at 80 percentile redeveloped vs 20 percentile unchanged is 2.75-3 from 2-5km

MODEL VALIDITY:

$$\frac{v_F(x, \tau_{i+1})}{v_F(x, \tau_i)} = e^{\frac{\hat{p}\Delta\tau}{(\gamma-1)}} = \frac{\gamma}{\gamma - \rho\Phi}$$

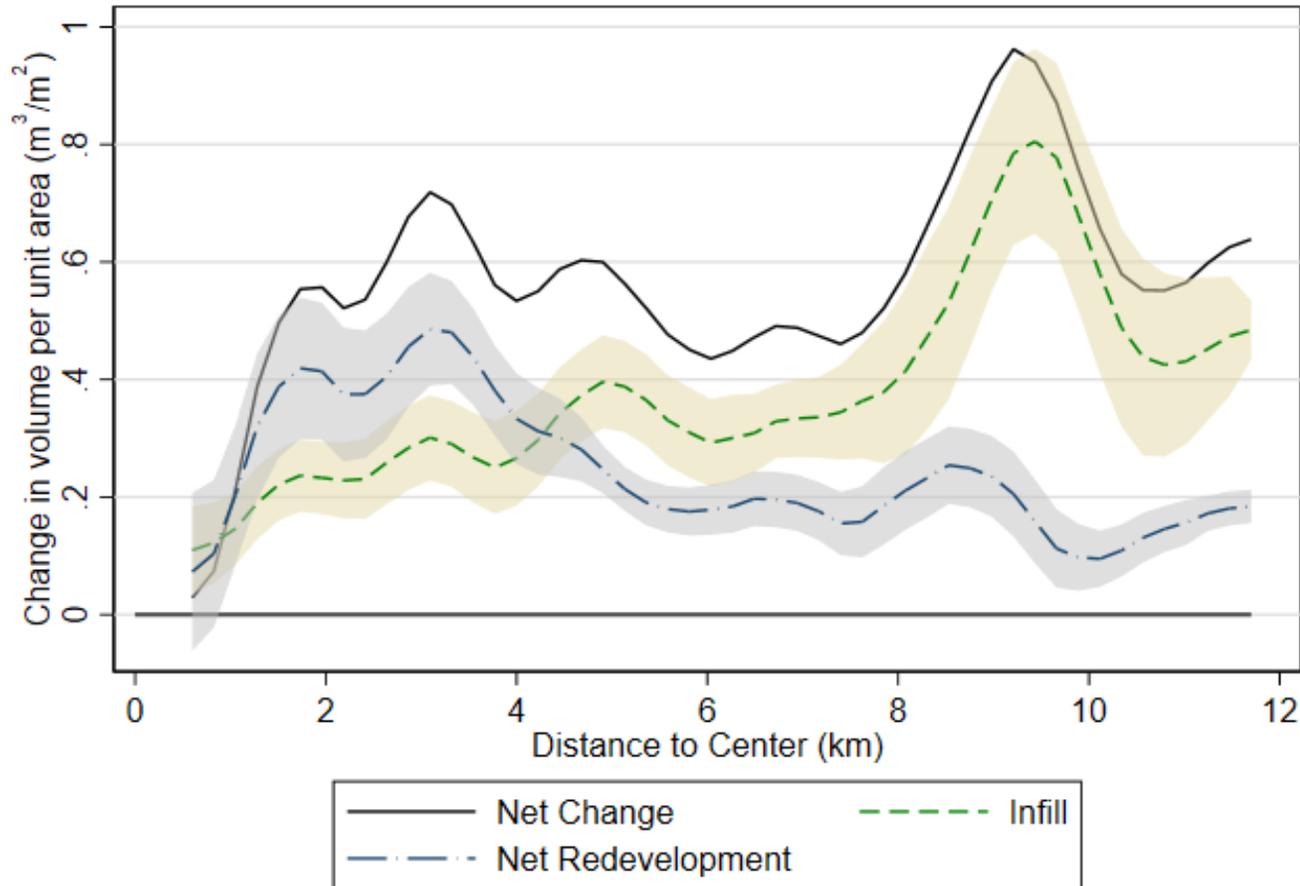
= **3.25** from parameters

- Grid square averages:
- Slums: no height change
 - Formal: large increases in avg. height

Volume changes

(vol change at x)/(total vol at x),

Two waves: first development and redevelopment



- **Model predicts wave of redevelopment**
 - There at 3km, despite heterogeneity

Enormous motion at 3km:

- 35% of buildings torn down
- USA for 2009-2013 nationally 12 year teardown rate would be 6-11%
- Half of 35% redeveloped (with a 100-200% increase in footprint)
- In 2003 city overall about 30% of bldg.'s torn down. Accounts for 10% of volume

Slums and extensive margin

- Some evidence of slum redevelopment into formal, *but small volume*
- Slum expansion at city edge
 - Much faster rate of volume growth in slums than formal sector at the city edge

Welfare issue

- Little evidence of formalization of older slums near city centre
 - Modest infringement; isolated small pockets
 - Stuck with high formalization costs
- Issue about development of slums into formal sector use
 - “Government owned” slums near centre
 - Rental units: Majority operated by government officials & politicians
 - Have no ownership claim to land
 - Very corrupt and profitable
 - Opposed to redevelopment: lose their profitable businesses
- *At border of slum areas, quality of land is not different from quality of land that has just been developed (from 2-6 kms)*

Example: Kibera

- Land grant by British to Nubians in 1911 (1000 acres)
- Claims revoked at independence
- ‘Govt. owned’, but claim of Nubians to land they occupy is ‘recognized’
- Slumlords operate (in quasi-(il)legal status).

Welfare measure

Open city model:

- Residents utility fixed at each instant
- Gains are in PV of land rents
- Consider present value of land at time s (like 2015) if in slum usage forever vs convert to formal sector now

$$\text{Remain in slum forever: } PV(x, s, \infty) = \underbrace{\int_s^{\infty} r_I(x, t) e^{-\rho(t-s)} dt}_{PV \text{ of land rents in slums forever}}$$

$$\text{Convert to formal now: } PV(x, s, s) = \underbrace{\sum_{i=0}^{\infty} R_F(x, s + i\Delta\tau) e^{-\rho i\Delta\tau}}_{PV \text{ of future land rents from (re)developments starting now}}$$

Welfare gain to converting (now) vs never: $PV(x, 2015, 2015) - PV(x, 2015, \infty)$.

Table 5: The value of land formalised at different datesPresent values in 2015 in \$2015 per m².

	Distance from centre, x						
Date of formalisation, z	0-1 km	1-2 km	2-3 km	3-4 km	4-5km	5-6km	6-7km
$PV(x, z = 2015)$	1297	1092	919	775	652	549	462
$PV(x, z = \infty)$	377	343	312	284	258	235	213
Slum land, km ² , 2011	0	0.0024	0.24	1.07	2.22	1.9	1.32
No. slum households, 2009	0	0	2920	29,070	45,810	33,100	28,390
Lower bound on D (15a)	493	395	314	284	194	150	113

Illustrate gains at 3-4 km:

- Pay-off illegal landlords at the 284 rate.
- Still left with surplus of 775-284=491 for a sq m
- Amount of surplus per family is about \$18000
- Families pay less than \$700 in rent a year
- A lot of surplus to play with!

If covert all slums out to 7km: *net* gain is about \$2.5bn: 45% of Nairobi's GDP

Views on slums and slum improvements

Two views on existing slums (nearer city centre)

- “Demolish & Rebuild”: Tear down, relocate residents, and rebuild much higher in a more efficient use
 - What happened in London or New York (over 100 years ago)
 - Route followed by China & model for Addis Abba
 - But huge numbers of people: relocation costs and social network losses
 - Vs. huge surplus to play with
- “Upgrade”
 - Improve tenants rights (or ownership rights)
 - Regularize lay-out and improve public utilities
 - **Problem:** locks valuable land near centre into low rent usage with low heights and impermanent materials for even longer (Harari and Wong, 2018)
 - Even upgraded slums have a limited shelf life

Evidence on upgrading: Kampong Improvement Program

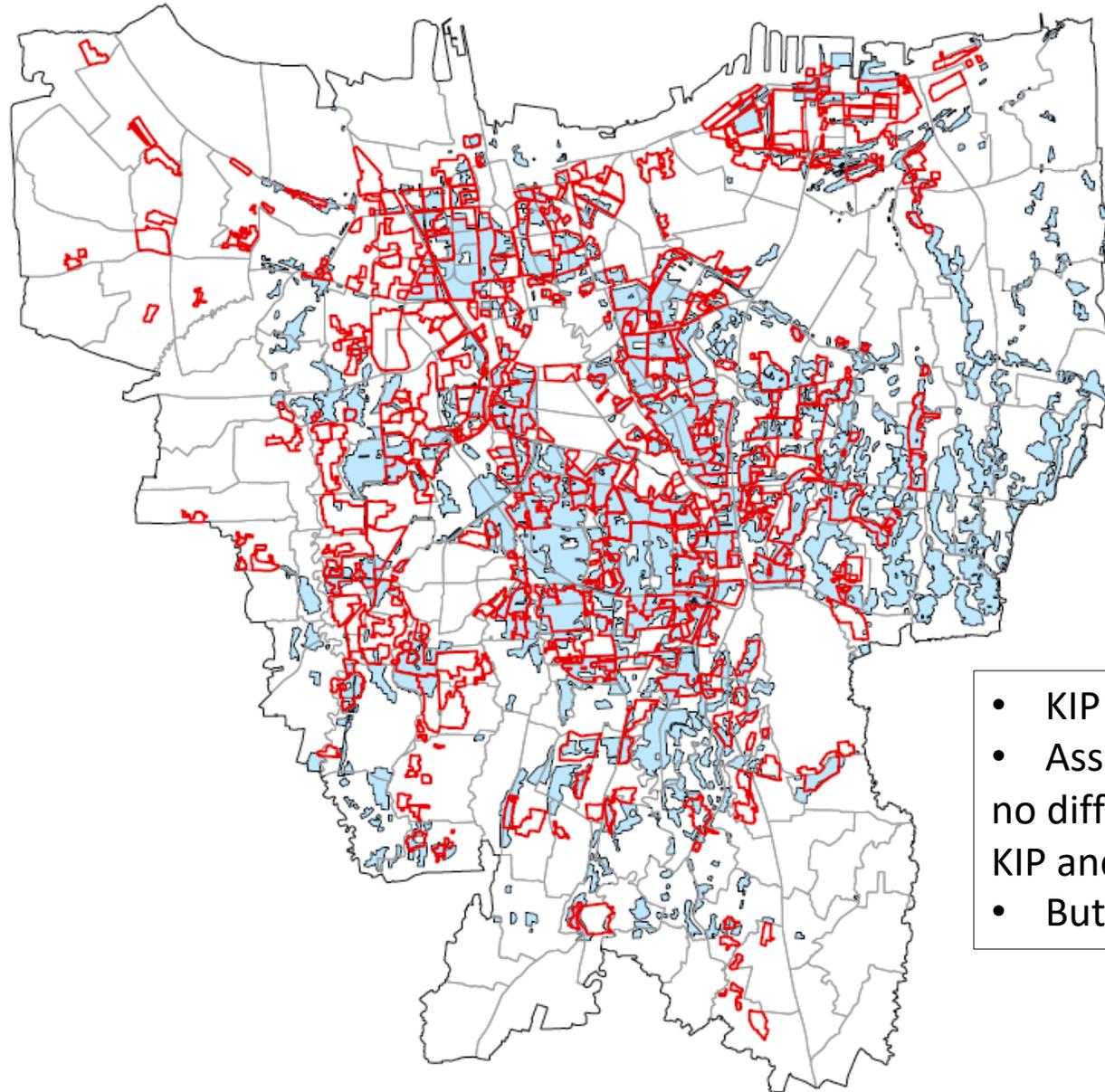
- Harari and Wong (2019): Jakarta
 - Slum upgraded areas (from the past) have lower property values and poorer quality than areas which were not upgraded
 - Especially nearer the city centre
 - Locked in upgraded areas as slums
 - Why?
 - Stay to enjoy initial benefits of upgrading
 - Gave sense of 'community'
 - **With enhanced land rights?– no eviction period.**
 - NGO's working to preserve.
 - **Locks in small irregular plots.**
 - Other areas more likely to be redeveloped and original residents to move on

KIP Improvements

- Jakarta
 - Early 1990's
 - Roads, walkways, drainage (undeniable immediate benefits)
 - Non-eviction (no titling) & lock into small units



Figure 1: KIP boundaries and historical kampungs



- KIP designed for worst slums
- Assumes at border
no difference between
KIP and non-KIP areas
- But what was comparison in 199X?

Harari and Wong

Table 3: Effect of KIP on land values and building heights

Dependent variable:	Log land values			Building heights		
	Historical kampung (1)	BDD 200m (2)	Full sample (3)	Historical kampung (4)	BDD 200m (5)	Full sample (6)
KIP	-0.12*** (0.05)	-0.13** (0.06)	-0.11*** (0.03)	-1.64*** (0.38)	-1.40** (0.64)	-1.25** (0.58)
N	3147	1345	19862	5280	1452	7104
R-Squared	0.73	0.81	0.85	0.32	0.52	0.43
Control group mean	11863	14069	11539	5.13	5.32	4.85
Distance	Y	Y	Y	Y	Y	Y
Topography	Y	Y	Y	Y	Y	Y
Distance to KIP boundary	N	Y	N	N	Y	N
Geography FE	Locality	KIP Boundary	Hamlet	Locality	KIP Boundary	Hamlet

Balance and robustness tests

* 0.10 ** 0.05 *** 0.01

Notes: This table reports results from OLS regressions with the log of assessed land values in a sub-block (column 1 through 3) and building height in a pixel (columns 4 through 6) as the dependent variables. The key regressor is the treatment indicator. Column 1 includes the historical kampung sample with 196 locality fixed effects. Column 2 uses observations within 200 meters from a KIP boundary, controlling for distance to the KIP boundary (and its square), and 124 KIP boundary fixed effects. Column 3 includes the full sample with 2,060 hamlet fixed effects. The heights analogous in columns 4 through 6 also controls for strata fixed effects and an indicator for pixels with no buildings. Distance and topography controls are defined in Table 2. The units of the control group means are thousand Rupiahs per square meter for columns 1 through 3, and number of floors for columns 4 to 6. Standard errors are clustered by locality except for the boundary analysis where we cluster by KIP boundary.

Slum upgrading

World Bank Sites and Services & up-grading programs in 1970's and early 80's

- Michaels and team (2017/19): Dar es Salaam
 - Have de novo development called sites and services (with title)
 - Roads and utilities laid out, plots demarcated, title given. Self built
 - Have other new developments (to be compared to de novo: at border)
 - Existing slums, not upgraded
 - Existing slums, upgraded
- Outcomes
 - De novo is golden (but major sorting)
 - Upgrading no better than other slums (new or old)

Other issues

- Slums as poverty traps
 - Heterogeneous population
 - A lot of overlap in slum and non-slum populations by education of HH
 - What about traps for migrants?
 - Changing conditions in slums
- Slums emitting negative externalities

Gradations of property rights & Renting vs. owning

- Missing topics on internal city development
 - Planning
 - Regulation
 - Overall governance
 - Taxation and expenditure
 - Transportation

Role of private property rights

- Economist presumption: Need formal property and *land* rights (leasehold or freehold).
 - Risk of expropriation (public or private); Obtain financing and insurance
- Literature: Micro scale: Titling in slums
 - “Natural experiments” in Peru and Argentina
 - Created by court cases or public policy implementation.
 - Jumps in private investment (Field; Galiani & Schargrodsky)
 - But not about redevelopment and truly intensive investment

Land rights: Gradualism approach [SDG]

- Communal/tribal rights → possessory/use rights (bill of sale, tax doc, neighbors or leader testimony) → “partial” formal rights → full title (free or leasehold)
 - Gradations of rights (Selod, Manara & Pani)
 - No uptake of “partial formal rights” in Dar es Salaam
 - Residential license (3-5 horizon, can be renewed; no legally recognized surveying)

Bill of sale: Dar es Salaam.

14/12/84

nim mawa June amon
nim kubali kumwaga ndugu
Lucas Lyimo. Schemu ya ujenzi
pamoja na migombi.
Kwanja Helio kumepakana na
ndugu kitiga upande wa
mshariki Jamani ya Kiwanja
nimemwaga kwa Sh 4000/-
malipo ametoa sh 3500/- last
Dum amebaki sh 500/- Hizo
ndugu atahozo dawa na nim
Shahidi alikuwepo
ndugu Ismail Kamatham
Shahidi ya Shahid Ismail Kamatham
Shahidi ya Mwanuzi Lyimo
Shahidi ya Mwanuzi Lyimo
Shahidi ya Mwanuzi Lyimo

Residential License: Dar es Salaam

Stamp Duty No. 111210
Stamp Duty Officer

Stamp Duty No. 111210
Stamp Duty Officer

HALMASHAURI YA MANISPAA YA TEMEKE
SHERIA YA ARDHI YA 1999
(NA 4 YA 1999)

LESENI YA MAKAZI NA. TMK039250
Chini ya fungu la 23 & 179

Ardhi Na. TMK/TDK/KLH2/85
Kata TANDIKA
Mtaa KILIMAEWA
Makisio ya Ukubwa wa Ardhi 186 (sqm)

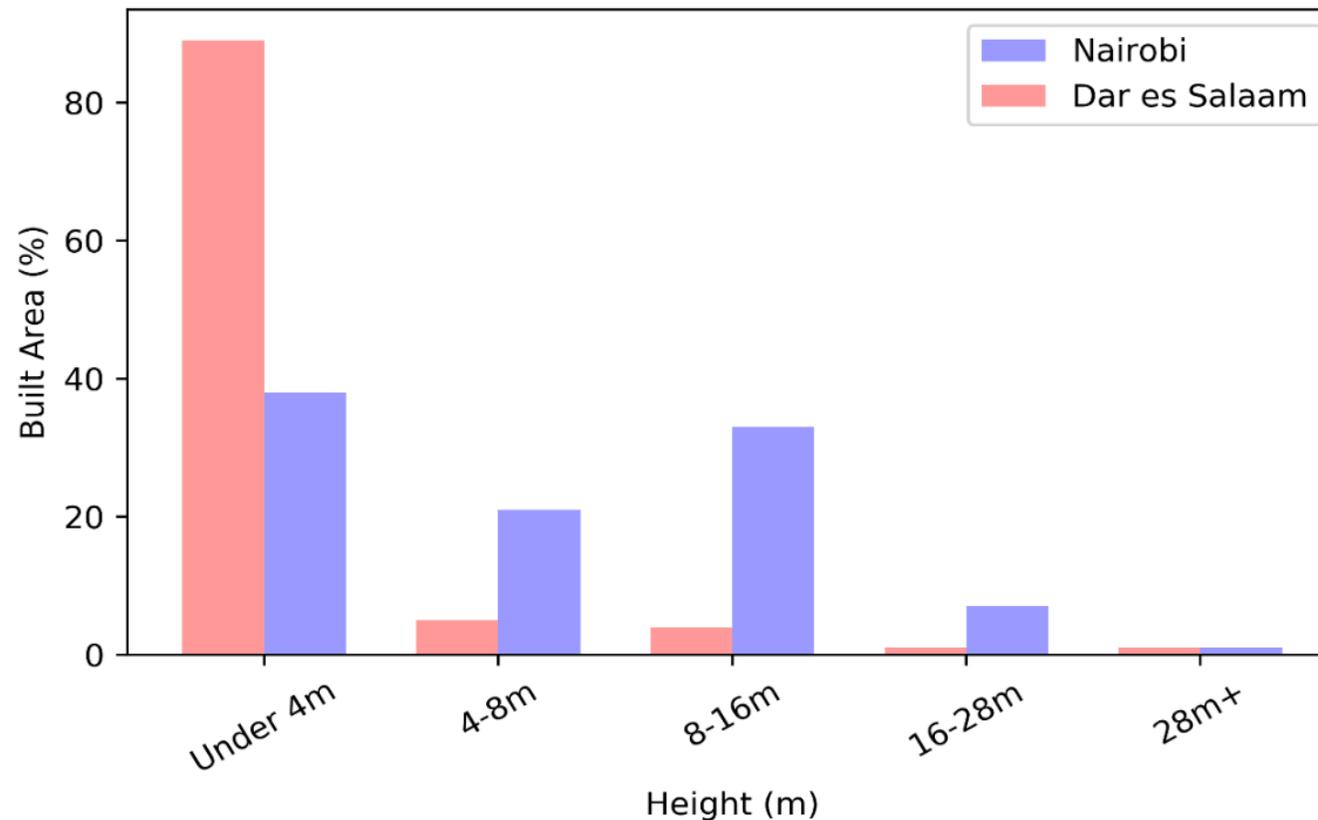
Halmashauri ya Manispaa ya TEMEKE kwa leseni hii inatoa kibali cha
MAKAZI kwa: RASHID SEIF HAMAD

Juu ya ardhi kama inavyofafanuliwa kwenye leseni hii
Kibali hiki kinatolewa kwa masharti yafuatayo:

1. Muda wa leseni ni miaka mitano(5)
Kuanzia tarehe 27 Mwezi Agosti Mwaka 2010
Hadi tarehe 26 Mwezi Agosti Mwaka 2015
2. Kodi ya Ardhi ya shilingi 1,488.00 italipwa kila mwaka, chini ya kifungu
cha 23(3) (c). Kiwango hiki kinaweza kubadilishwa na Kamishna wa Ardhi
kwa mujibu wa Sheria.
3. Matumizi ni Makazi na shughuli nyingine zozote ambazo zinaendana na
makazi na hazitaathiri majirani kimazingira.
4. Ujenzi wowote juu ya ardhi hii au umogaji wa ardhi lazima upate kibali
cha Manispaa kupitia Kamati ya Mtaa ambayo ndiyo itasimamia kwa
karibu utekelezaji wa masharti haya na maendeleo ya ardhi ya eneo hili.
5. Mmiliki/wamiliki wataheshimu na kuhifadhi haki za njia zilizopo.
6. Muda wa leseni hji unaweza kuongezwa.

Intensity of investment: Building high with private property rights

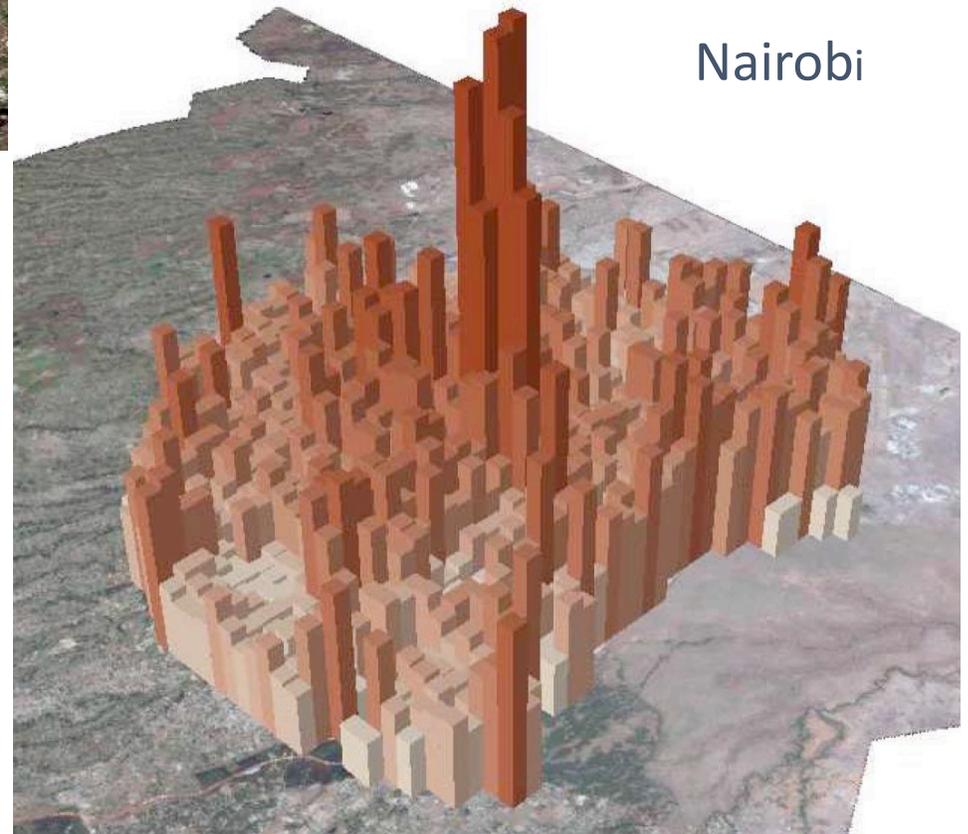
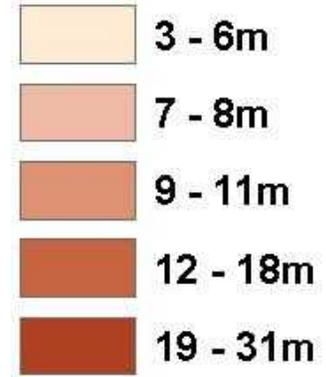
- Nairobi: about 90% of all land “privately owned” (excludes public buildings).
- Dar es Salaam: small fraction of residential plots have CRO’s





3-D images by grid squares

Average Height



Nairobi: Private property peculiarities

- Ministry of Lands: sole responsibility in all dimensions for land:
 - Titles, recording transactions, plot surveying
 - Some corrupt officials:
 - Titles recorded with incorrect plot numbers;
 - Titles not recorded;
 - Records changed & reassigned;
 - Fake titles.
 - Now on line (transparent) registry: so far only 30% of plots
 - *Implications for owner occupancy (vs renting)*
 - *Owners must employ firm to confirm the title on a property they are going to buy is legitimate. Economies of scale in learning the ropes.*

Wealth inequality: rent or owner-occupy

- “Owner occupy”: Dar es Salaam 51% vs. Nairobi 13-15%. Other cities below.
- Why has Nairobi so little owner occupancy?
 - Large land holders under 1990’s formalization: not relinquish?
 - High cost to ensure uncorrupted titles: specialized industry and investors

Country primate city	% own (IPUMS)
Nigeria	19 (Lagos)
Ghana, Uganda	32 (Accra, Kampala)
Mozambique	83 (Maputo)
Burkina Fuso	62 (Ouagadougou)
Ethiopia	40 (Addis)

Why matter? Equity issue

- Residential land: owner occupiers vs. renters
- As city grows property values rise
 - Rising demand for limited supply
- Who gets those capital gains?
 - Buildings and land : 60% of non-governmental capital stock of a nation
- Housing wealth concentrated in hands of a few who rent out housing
- Vs. widespread owner-occupancy.

The END

