Frontiers of urban economics Dynamics of land markets in developing countries: The physical city

Bread-IGC Virtual PhD course

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Urban economics & developing countries

- Initial work focused just on developed countries (like USA and Japan).
- As such, all work assumed "perfect" institutions in land and capital markets.
 - Land markets: All land for firms and residents privately owned with fully enforceable and transparent ownership
- Most work was/is static, so no irreversible investment in buildings with a life of many decades;
 - Little modelling of urban redevelopment (exceptions: Wheaton, Fujita, Braid)
 - Big issue in rapidly growing cities in developing countries

Urban economics & developing countries

- Most work assumes no public land and no reason for urban planning
 - Even QSM's with congestion and "road" investment (e.g. Allen and Arkolakis, 2022)
 - Yet, 40-50% of urban land in public use (roads, sidewalks, public spaces and buildings).
 - Exception: 1970's optimal control literature with the monocentric city model on the optimal amount of land to devote to roads as we approach the city center
 - Given as we move in towards center, we are accumulating (mechanically) more and more commuters subject to congestion want to have more roads. But land at center highly valued in private use.
 - That literature and notion was dropped by mid-1970's

This talk

- Land use planning: No modern economics literature on overall planning of cities
 - Literature
 - Cherry pick examples of bad regulations
 - Analyze how to identify the impact of regulations (Turner at al, 2014)
 - What we talk about: Why planning matters & greenfield initiatives in developing countries
- Property rights
 - Incentives to invest (de Soto)
- Dynamic model with slums, formal sector and capital investment

Land use planning

Land use planning matters

- Public land: Lay-out public infrastructure
 - Mainly roads and transit
 - Takes up 40-50% of land in cities (<u>Scruggs 2015</u>, <u>UN Habitat 2013</u>; <u>APA 1950</u>)
 - Sets the transport network: drives private demand for different locations by different actors
- **Plan/regulate** "private" land usage for the other 50-60%:
 - Objectives
 - Improve transport flows
 - Group like uses to mitigate negative spillovers ("obnoxious" uses)
 - Respond to demand
 - Increase green space consumption
 - Tools
 - Land use allocations: residential, commercial, mix-use, industrial, open space
 - Minimum lot size or building footprint
 - FAR/height regulation

Planning mattering and impacts persist: SSA example in Baruah et al (2021)

- Anglophone versus Francophone countries with 98 Francophone and 226 Anglophone cities in 29 countries
- In Anglophone countries (Crowder, 1964).
 - "Dual mandate"
 - Most of the city ("native" sections) unplanned
 - Anglophone not even planning maps until the 1940's or 50's.
- Francophone Africa: had early plans (1900-1920)
 - Covered whole city; grid-iron layout out (4-way intersections)
 - Expansion *should* involve contiguous uses (no leap-frogging)
- Examine the impact : Colonial era planning (and persistence of planning norms) on cities today:
 - Have grown multi-fold since the end of the colonial era

Example and findings

- Underlying grey: Open street maps out to 5kms
- Pink/orange circa 1965

General findings on Francophone compared to Anglophone cities

- Less land area for same population; higher density of development near the city center
- Less leapfrogging & less sprawl
- Twice as much grid-iron structure



Figure 3a: Persistence of road blocks in Accra



Figure 3b: Persistence of road blocks in Bamako

One strategy to correct lack of planning (and regulation): Greenfield (de novo) urban planning

- Historically from 1960's to 1990's World Bank financed Sites and Services projects to help the situation in many countries.
 - *Titled* and *planned* neighbourhoods where people self-build
 - Many countries: Tanzania, Indonesia, Vietnam, Myanmar, Uganda, Kenya, Nigeria, Ethiopia, Egypt, and India, as well as Latin America
 - Abandoned the program in late 1980's: poor repayment rates, not serve poor

World Bank Sites and Services

- Sites and services took large tracts of vacant land: that requires farmland at city edge and beyond
- Fast growing cities that after 30-40 years have overrun these places
- New local programs in Tanzania
 - 20k project from 2000-2005: about 36k plots in Dar es Salaam alone.
 - Now to be massively scaled up.
 - Also, Rwanda, Ethiopia, Uganda
 - Corresponding but different programs in Addis and in Brazil
- Key: Offer planning and property rights and some infrastructure

"Planning" (also upgrading)

- Michaels and team (JPE, 2021): Tanzania
- Have de novo development under sites and services program
 - 1970's and early 1980's: looking 40 + years later
 - Roads and utilities laid out, plots demarcated, title given. Self-build
- At the time sites and services were done in Tanzania also had:
 - Other new developments (to be compared to sites and services at border)
 - Existing slums, not upgraded
 - Existing slums, upgraded
- Outcomes
 - Sites and service golden (but major sorting)
 - Middle class
 - Upgrading no better (slightly worse) than other slums (new or old)



Border of planned and titled do novo vs. unplanned For 20k project

Our work on the 20k project: Residents value both planning and titling

- 71% premium relative to neighboring unplanned and untitled areas
 - 0.27 to "planning"
 - 0.47 for titling



Specification in Michaels et al

- Grid the data (50mx50m); 7 cities.
- Trace buildings from satellite data and neighborhoods (footprint; roof painted)
- Also, survey data: covers a sub-sample gives more building information (e.g., height)
- Estimate sites and services ("de novo") vs control (non sites & services de novo). Grid squares within 500 m of boundary (spatial regression discontinuity)

 $y_i = \beta_0 + \beta_1 Denovo_i + \beta_2 Dist_i + \beta_3 Dist_i \times Denovo_i$

+ β_4 Nearest_Denovo_i + β_5 Dist_CBD_i + β_6 Controls_i + ϵ_i ,

• Outcomes: average of plots/buildings whose centroid falls in the grid square

Base results



TABLE 1 DE NOVO REGRESSIONS USING IMAGERY DATA FOR ALL SEVEN CITIES

	(1)	(2)	(3)	(4)	(5)	(6)
	A. 500-m Bandwidth					
	Mean Log Building Footprint Area	Share of Buildings with Painted Roof	Mean Similarity of Building Orientation	Mean z-Score	Share of Empty Blocks	Share of Area Built Up
De novo	.114 (.051)	013 (.012)	2.821 (.722)	.168 (.057)	152 (.037)	.094 (.013)
Observations Mean (control)	$6,562 \\ 4.457$	6,500 .184	6,562 -8.669	6,562 .042	8,440 .306	8,440 .155

Results from survey data

(1)(2)(3)(4)(5)(6)(7)Share of Share of Share of Share of Mean Log Building Buildings Buildings Buildings Buildings Mean Log with Good Connected with Sewerage Hedonic Footprint with Multiple Mean Stories Roof to Electricity or Septic Tank Value Area z-Score A. 500-m Bandwidth .081.342De novo .405-.010.226.142.446(.039)(.091)(.091)(.081)(.070)(.066)(.008)Observations 2,0091,9752,0092,0092,0082,0092,0094.739.096 .984.466.381.033 17.234Mean (control)

TABLE 2 DE NOVO REGRESSIONS USING TSCP SURVEY DATA FOR MBEYA, MWANZA, AND TANGA

Huge demand by middle class: generates price premium

Property rights

Role of property rights

- Ownership with informality
 - Risk: Landowner losing land (and anything on it) through:
 - (1) encroachment,
 - (2) seizure by government,
 - (3) invasion,
 - (4) deception (other people have "deed" to your property)
 - Lack of property rights inhibits redevelopment of land into high order use:
 - Risk of expropriation rises with value of asset
 - Can't get financing & insurance
- Economists: Need full formality to generate intensive investment

Tale of two cities: Intensity of investment Building high with private property rights

- Nairobi: about 90% of all land "privately owned" (excludes public buildings).
 - About 75% of residents on land with private title
- Dar es Salaam: < 10% of residential plots have private title (CRO's)





Dynamics: Macro view of a city

- Monocentric city
 - Dynamics of building a fast-growing city: Nairobi
 - Compared to QSM's: simplify space

Basic idea

(Henderson, Regan and Venables (Science 2016, RES 2021))

Context

- African cities growing very fast
- Growth increases demand for space: shift up rent gradients at a strong rate.
- Urban (Lego) models say:
 - Increase building heights to conserve on land
 - Rising rents imply needed densification
- *However*, capital in formal buildings is durable (irreversible) and nonmalleable. Therefore:
 - Extensive densification requires demolition of existing buildings and reconstruction into taller buildings
 - Construction decisions are based on expectations about future rents.



Rings at 2 and 4 kms from centre

Hodgepodge



How to think about slums in Africa?

1. A technology issue

- 90% of formal housing built with stone, brick, or cement blocks: load bearing.
 - Can have high height and intensive capital investment, but irreversible until demolition
- Informal built with corrugated iron sheets or mud /mud mixture.
 - Land intensive. 85% under 4 m in height.
 - New slum development where land is cheap: city edge
 - Includes slums on private, fully titled land
 - Moveable or of short life

2. A property right issue

- Two components to cost of converting land to formal use
 - Main item: Obtaining clear title
 - Overcoming poor geography to be able to do weight-bearing heavy buildings
 - Levelling slope (so stable foundations)
 - Draining swamp (to bear heavy weight)

Model elements

- Landowners making investment decisions to maximize the present value of profits over 'infinite horizon'. Profits are annual flow of land rents.
- City growing. Real housing prices rising at 1% a year; population at 3-4%
 - Landowner in agriculture
 - As city rumbles up to them at city edge, they construct (land intensive) slum housing
 - Intensify slum development over time as prices rise (Meccano sets)
 - At some point, land prices high enough, more profitable to have high formal sector buildings
 - Fixed in height and volume for life of building
 - Can require one-time cost to strengthen property rights or overcome geography
 - Later as housing and land prices rise, want to rebuild to higher height: must demolish and built from scratch

Stylized city with no formalization (D) costs



The hodgepodge

- Stochastic costs of formalization
 - Here by distance from the city center



Empirical work: Nairobi data

- Redevelopment and slums in Nairobi: 2003/04 vs 2015
- Use aerial photo (10-40 cm resolution) & LIDAR (0.3-1m resolution) data. Plus land and housing price data
- Estimation: Recover all model parameters (except discount rate)
 - E.g. land's share (vs. capital) in formal sector housing: 0.41 vs informal: 0.75

Building heights



- Formal redeveloped: new structure built over old one.
- Over 2003-15, expect each year heights rise- dotted blue is an average
- Expect height of new building is 3-times that of old
 - Usually, bigger footprint as well as higher

Formal Volume Change 2003-2015





 USA (for 2009-2013) nationally the corresponding amount would be about 6%.

Infill: Greenfield development: no building there in 2003/4

Welfare issue: Nairobi

- Older slums near city center
 - On extremely valuable land where building high is optimal
 - Lack of property rights: can't sell for redevelopment
- Gains from redevelopment
 - "Government owned" slums near center
 - Rental units: Majority operated by government officials
 - Have no ownership claim to land
 - Very corrupt and profitable
 - Opposed to redevelopment: lose their profitable businesses

Perspective

- At 3-4 or 4-5 kms:
 - Value of land under a slum household
 - If remain slum land "forever": \$10,600
 - If convert to formal sector= \$26,800 (*additional* 16,200).
- A lot of surplus to play with: Tenants pay about \$600 700 a year in house rents
- The situation is a corrupt mess



Moves to mass formalization

- Gradualism approach as in Dar es Salaam. UN "sustainable development goals"
 - Very slow progress
 - Intermediate forms of land claims not valued (Manara & Regan)
 - People want true title
 - But majority are "owner-occupiers"
- Nairobi: Reforms in 1990's
 - Public lands ("unlawfully") assigned with "legitimate title" to politically favoured holders (Southall)
 - Land grabbing and land cartels
 - Corrupt process to achieve privatisation
 - Over 85% of people rent

Regulation can matter, if enforced

- Formal sector regulations as excessive
 - British colonies; imitate UK Planning Acts (30's and 40's)
 - Dar es Salaam: Excessive minimum building footprint regulation (375 sq m)
 - 90% of buildings (slum or not) in violation
 - Brazil and Kenya: minimum lot size zoning (500 sq m):
 - Brazil national law in 1979/1980

Nairobi: distribution (pdf) of plot sizes around min (500 sq m) In formal sector



Dar es Salaam: Min footprint size (375 sq m). Fraction in compliance in orange by

distance from centre



Implications of poor regulation

- Can ignore regulations?
- Vs. Imposes quasi-(il)legality if violate?
 - Don't have to supply public services; Brazil 1980's before democratization
 - Get "illegal" permissions for exceptions: bribes? (rent seeking)

Evidence on property rights

- Granting rights in slum areas
 - Labor force participation (Field 2007)
 - Housing investments (Galiani and Schargrodsky 2009, Field 2005)
 - Other outcomes: satisfaction, private investments
- Poor low willingness-to-pay relative to fees (Manara and Regan 2022)
- What about for whole cities: those with and without formal rights?
 - Examples only