Definitions of "Rural" and "Urban" and Understandings of Transformation in Sub-Saharan Africa

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EVANS SCHOOL OF PUBLIC POLICY & GOVERNANCE

UNIVERSITY *of* WASHINGTON

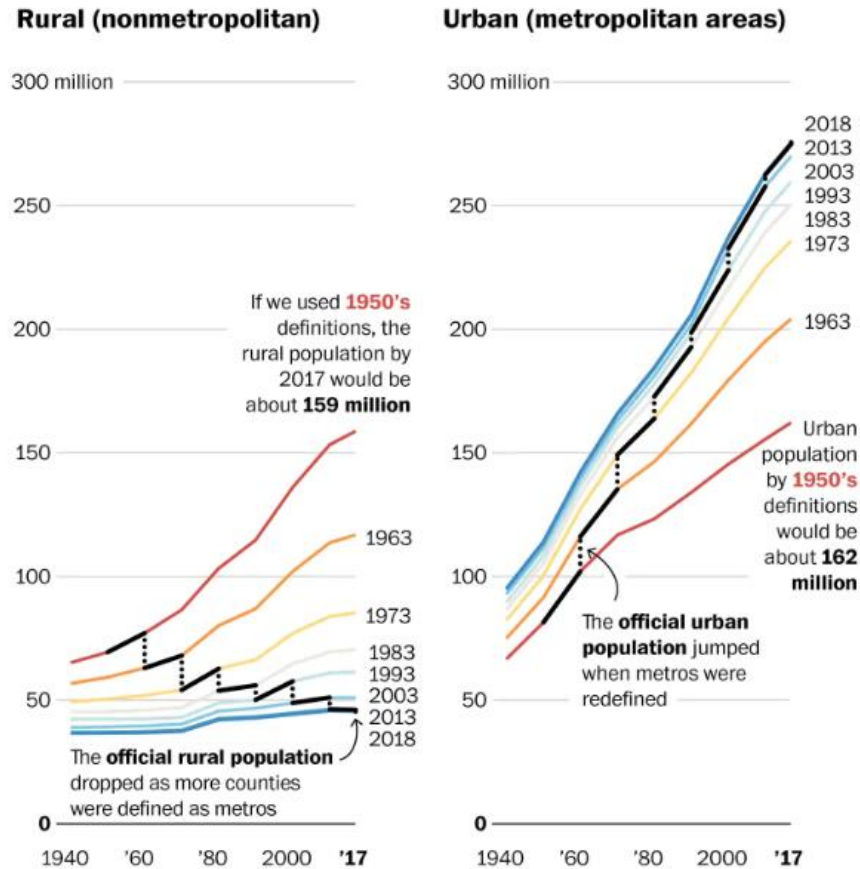Evans School Policy Analysis and Research (EPAR)

Motivation

No universal definition of "urban" (UN 2018; Potts 2017; Breckencamp et. al. 2017, Fox et al. 2018)

Rural and urban "boundaries" are used for tracking progress indicators & modelling outcomes, and allocating resources via public policy, regulations, and public and private investments: Rural Development Plans

The choice of urban definition can affect…

- our understanding of the level and rate of urbanization
- our understanding of urban and rural indicators such as poverty, patterns of rural-urban migration, energy consumption and CO_2 emissions, and the manner in which rural areas are transformed in the course of economic development
- Cross- or within-country comparisons of urban/rural areas (e.g. National level, EU, SDGs)

"The real...reason rural America is doomed to decline"

Rural (nonmetropolitan)

300 million

250

If we used **1950's** definitions, the rural population by 2017 would be about **159 million**

200

150

1963

100

1973

1983
1993
2003
2013
2018

50

The **official rural population** dropped as more counties were defined as metros

0

1940   '60   '80   2000   '17

Urban (metropolitan areas)

300 million

2018
2013
2003
1993
1983
1973

250

1963

200

Urban population by **1950's** definitions would be about **162 million**

150

The **official urban population** jumped when metros were redefined

100

50

0

1940   '60   '80   2000   '17

Note: This is an update of a chart published in "Rural America at a Glance" by the Agriculture Department's Economic Research Service.

Sources: Office of Management and Budget; Census Bureau via NHGIS

THE WASHINGTON POST

A. Van Dam, May 24, 2019. *Washington Post* from Goetz, Partridge & Stephens, *AEPP*, 2018

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Motivation specific to Rural Development & Bioeconomy

- " A new biobased economy opens an almost unlimited potential for regional and rural development. But it also leads to possible land use conflicts and a need for new regulations." (Funch, 2018)

- Spatial economic advantage in bioenergy production (sourcing and refining) moves to the rural regions with biomass & solar radiation (more evenly distributed spatially compared to fossil fuels). (Johnson & Altman, 2014)

- Increases rural labor demand (higher labor productivity in ag energy than fossil fuels?)

In this paper, we…

- apply different urban definitions in Tanzania and Nigeria and note new data/methods for these definitions

- ask how these definitions influence some common analyses of household survey data

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Background

Countries may base their urban definition on…

- settlement size

- population density

- economic characteristics (e.g., absence of agricultural employment) (UN 2012; Potts 2018)

Some definitions may overlook the existence of urban spaces within rural landscapes (Lazaro et al. 2017; Satterthwaite 2006).

- If urbanization occurs off the radar of government agencies, policies cannot be designed to address the challenges associated with urbanization (Muzzini and Lindeboom 2008).

Other definitions may conflate population density with urbanity, even where economic transformation has not occurred (Potts 2017).

Research Questions

1. Do different urban definitions affect estimated levels of urbanization?
2. How well are the administrative urban/rural categorizations aligned with other definitions?
3. How do different definitions affect welfare indicators in the rural population or agricultural indicators within the rural farming population?
4. How does this affect detected patterns of migration between rural and urban areas?
5. How does this affect patterns of current and future energy supply and demand?
6. Do different definitions affect resource allocations contrary to desired or expected policy outcomes?

Data

Household Survey:

Living Standards Measurement Study – Integrated Surveys on Agriculture (LSMS-ISA) in Tanzania (2008 and 2014) and Nigeria (2010 and 2015)

Administrative:

Tanzania National Bureau of Statistics
Nigerian Bureau of Statistics

Spatial/Satellite Data:

World Pop, NASA GMIS, NOAA night lights, Google Earth & Africapolis

Urban definitions

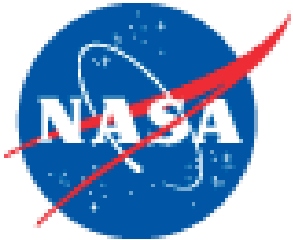| 1. | **Administrative definition** | The official designation in each country |

https://www.worldpop.org

- Resolution: ~100 m^2
- Estimated persons per grid square, Geotiff format
- Local average values in a radius of 2 or 5 km
- 2013
- Instructions in the appendix
- R-script available to readers

Urban definitions

1.	**Administrative definition**	The official designation in each country
2.	**Population density**	A household is categorized as urban if the local population density is at least 500 persons/km^2 (from WorldPop).

Global Man-made Impervious Surface (GMIS) Dataset From Landsat, v1 (2010)

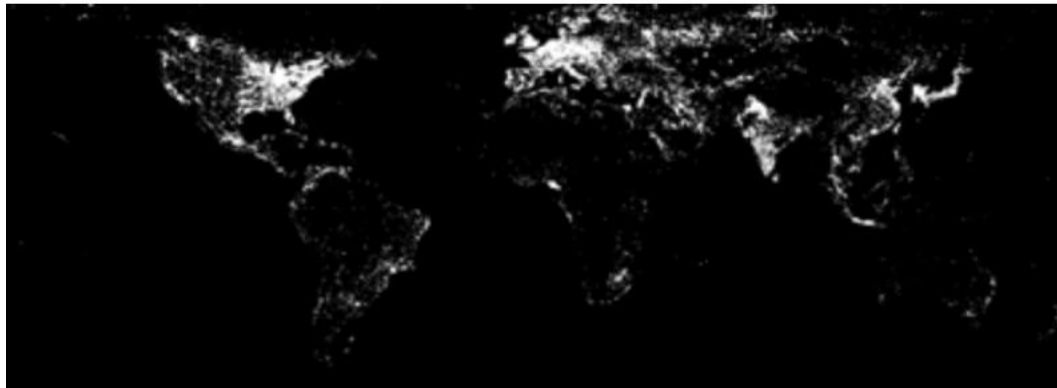Set Overview | Data Download | Maps | Documentation | Metadata

(Brown de Colstoun et al. 2017)

Urban definitions

1.	**Administrative definition**	The official designation in each country
2.	**Population density**	A household is categorized as urban if the local population density is at least 500 persons/km^2 (from WorldPop).
3.	**Impervious surface**	A household is categorized as urban if the share of impervious surface cover is at least 2% (from the GMIS data set of Landsat).

NOAA NATIONAL CENTERS FOR ENVIRONMENTAL INFORMATION
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

F15 2003 Nighttime Lights Composite

Urban definitions

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4.	**Night lights intensity**	A household is categorized as urban if the intensity of night lights is at least 8 on a scale of 0 to 63 (from the NOAA DMSP-OLS Nighttime Lights Time Series data set).

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Urban definitions

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5.	**Africapolis**	The designation of urban areas is provided by Africapolis, which bases its determination on the local administrative outline, the settlement population size ($\geq$ 10,000), and the distance between buildings.
6.	**Google Earth**	Subjective Assessment

Google Earth images
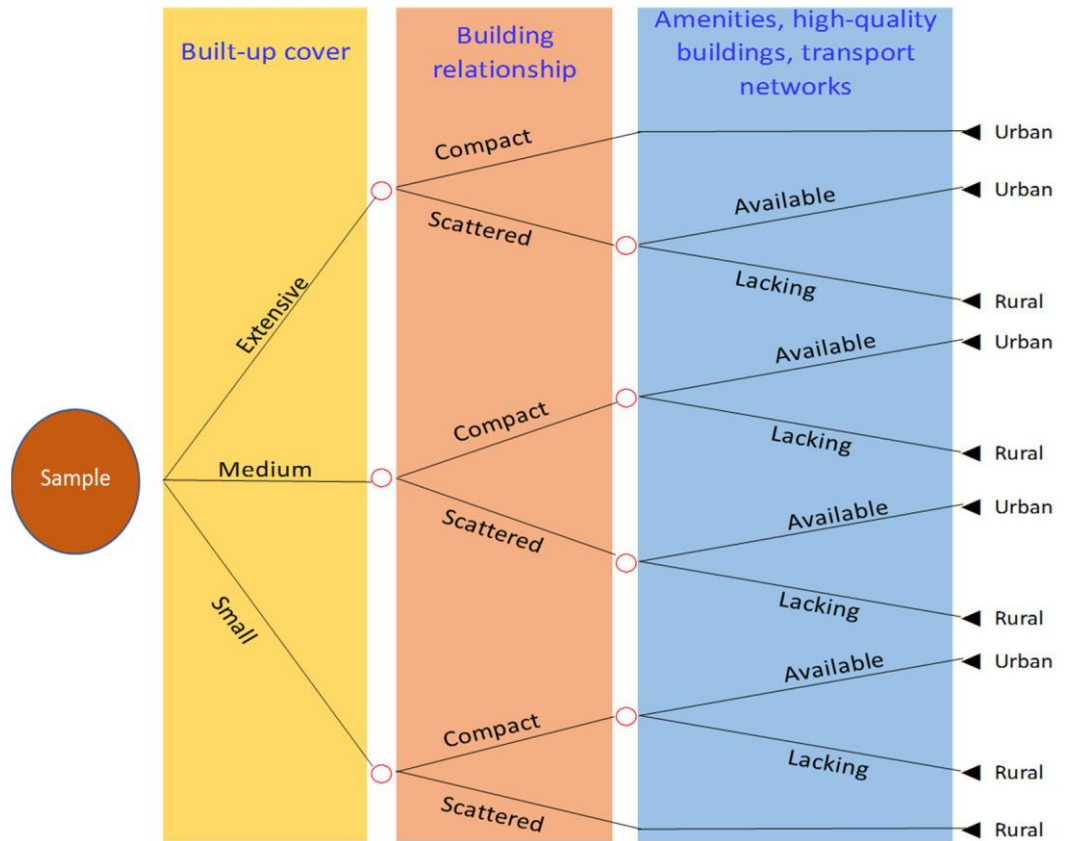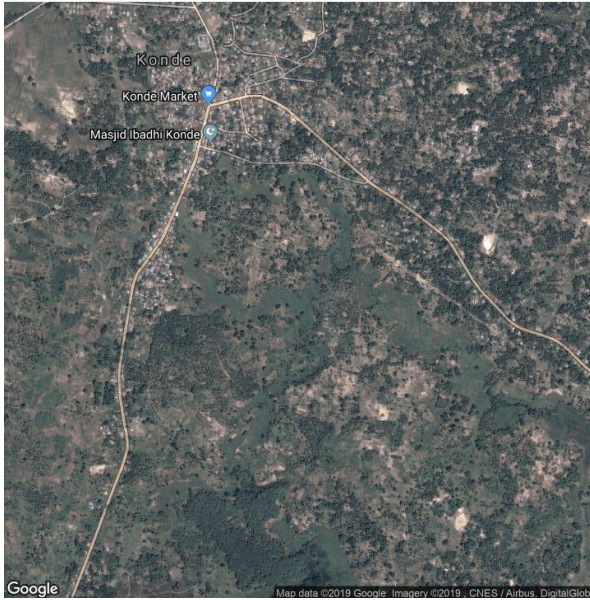
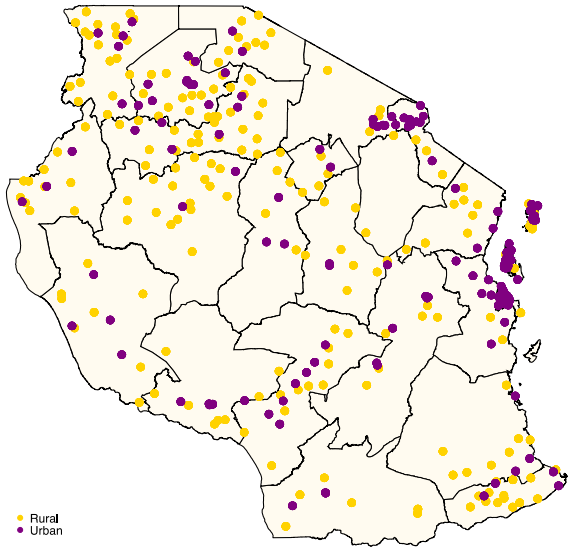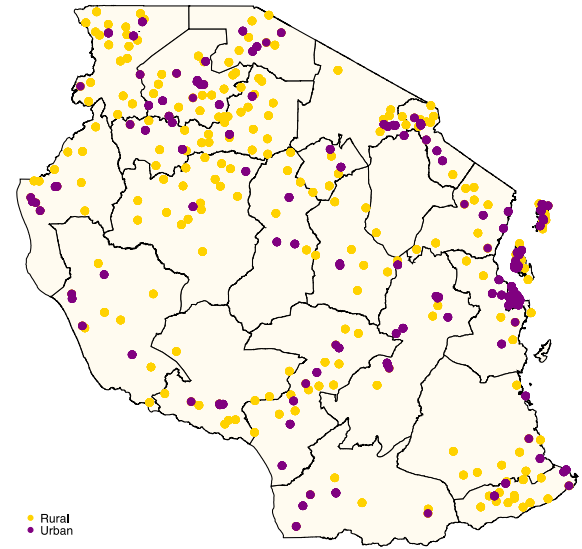*Source: Copied directly from Galdo et al. (2018)*

Administrative Definition
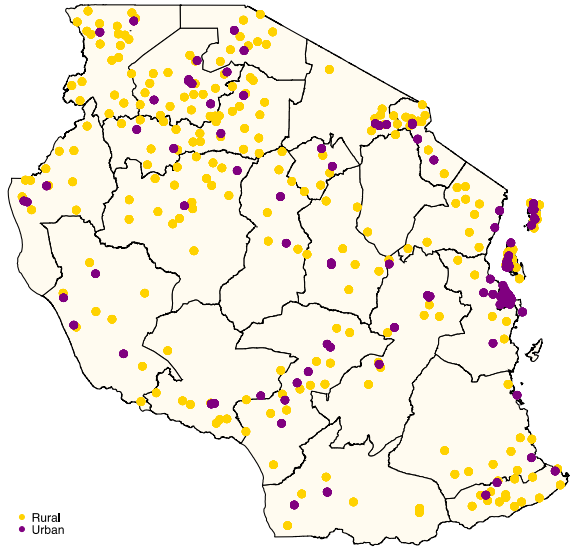
GMIS
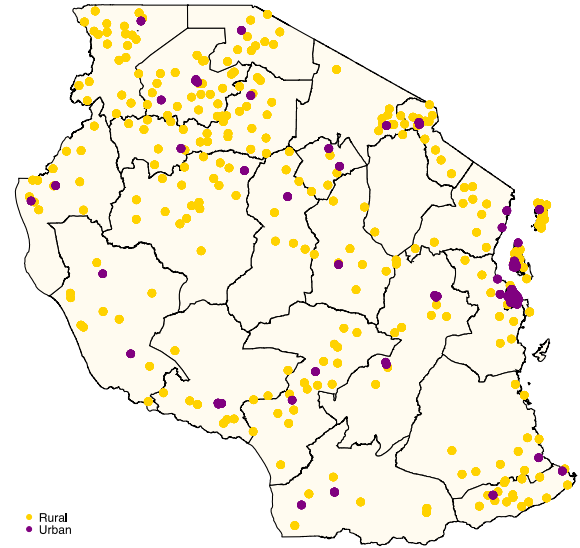
Subjective Assessment

Local Nonfarm Economy

Rural
Urban

Results

Urban population share

% Urban (Tanzania (2014), Nigeria (2015)) across categories: Administrative definition, Population density, Impervious surface, Night light, Africapolis, Local economy, Subjective assessment
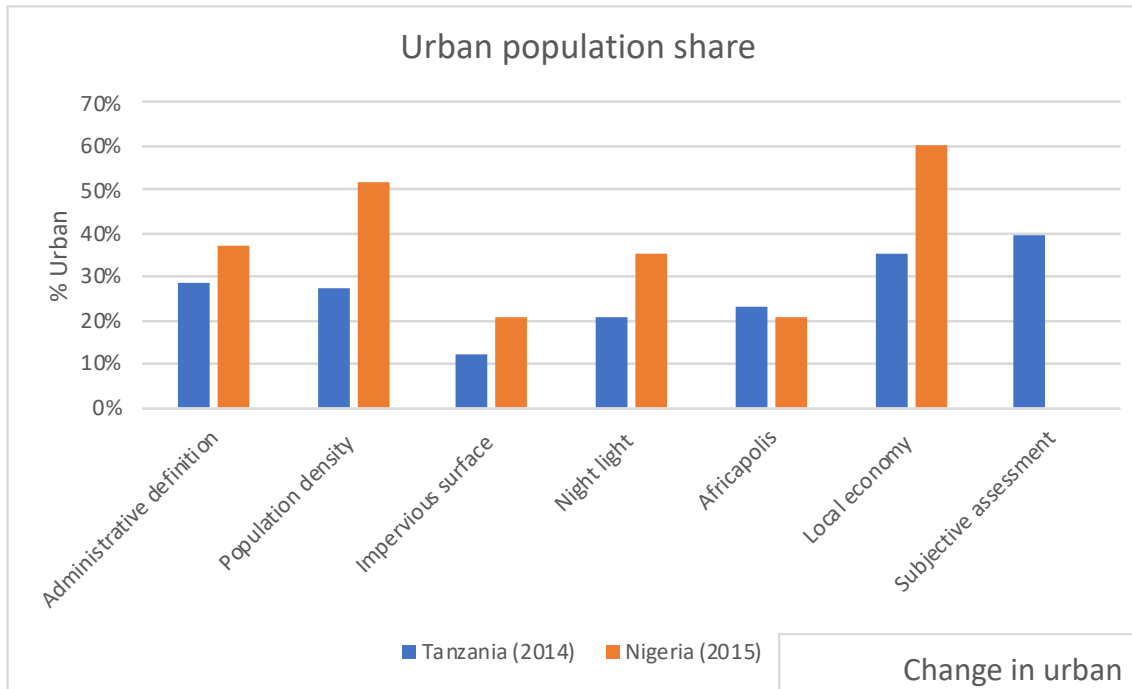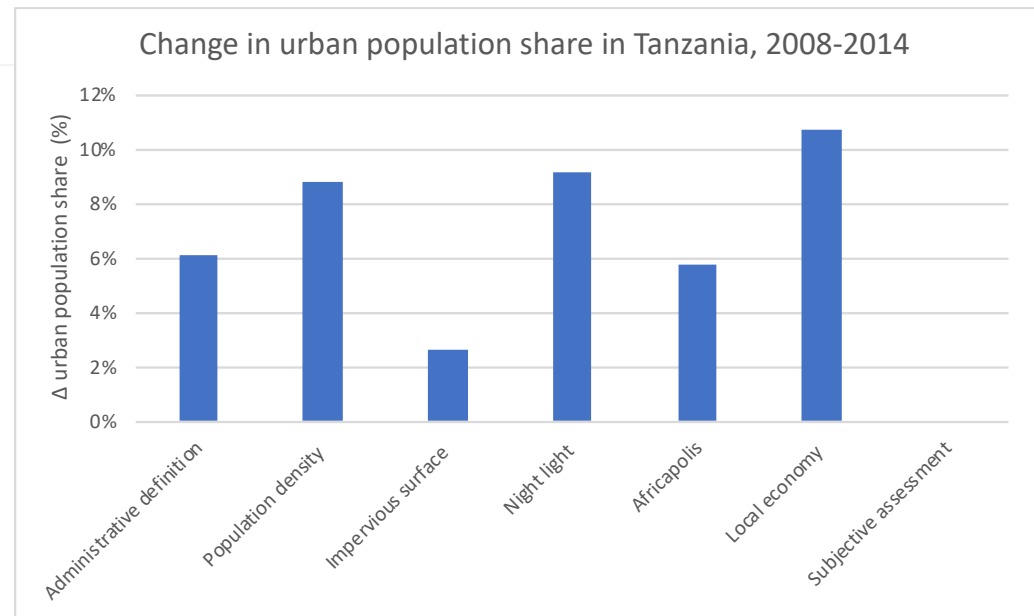
← Order of urbanization levels is reversed with Africapolis

…Why is there less consistency in Nigeria?

Change in urban population share in Tanzania, 2008-2014

Results

Cross-tabulation of rural and urban categories

		Tanzania (2014)	
		Administrative definition	
		Rural	**Urban**
Population density	**Rural**	62%	6%
	Urban	5%	28%
Impervious surface	**Rural**	66%	19%
	Urban	0.3%	14%
Night lights	**Rural**	66%	10%
	Urban	1%	23%
Africapolis	**Rural**	63%	10%
	Urban	4%	23%
Local economy	**Rural**	57%	2%
	Urban	9%	32%
Subjective assessment	**Rural**	54%	2%
	Urban	13%	32%

Results

Rural population share, Tanzania (2014)
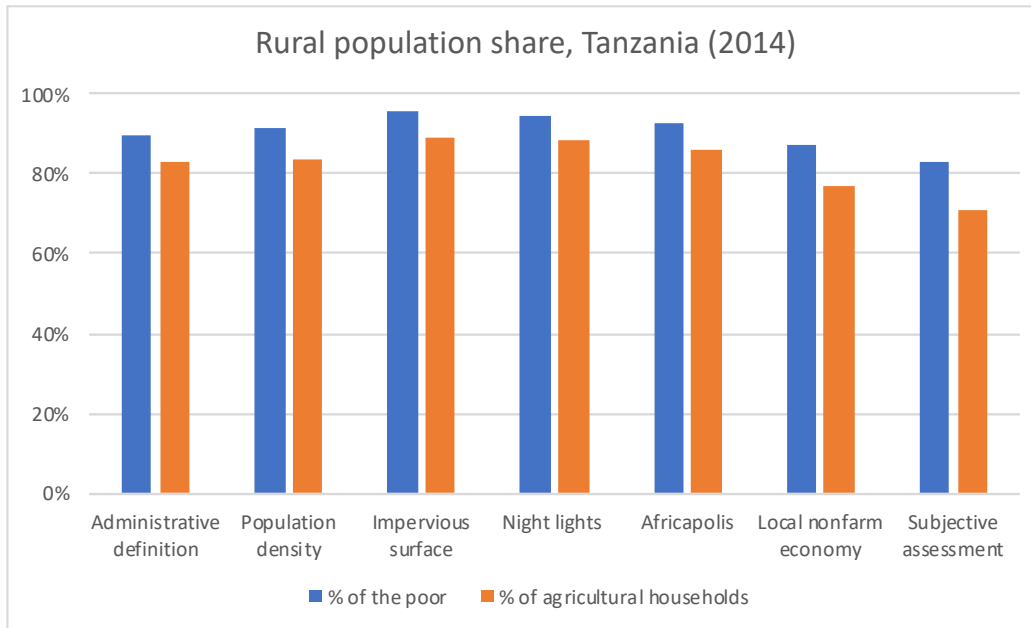
Degree of concentration of poverty in rural areas is more variable across urban definitions in Nigeria

Rural population share, Nigeria (2015)
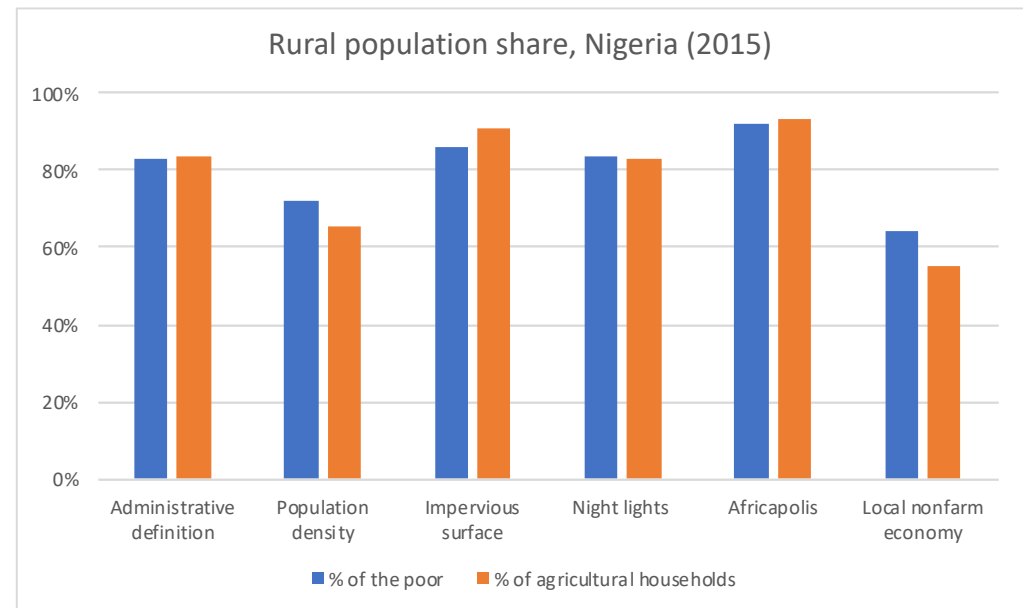
Results

Indicators of welfare in the rural population in Tanzania

	Mean values, 2014			
	Administrative	Night lights	Africapolis	Local nonfarm economy
Value of consumption (1,000s TSh/AE/day)	2.60	2.78**	2.79**	2.48*
1= Poor (using national poverty line)	0.32	0.30	0.30	0.34
Proportion of food purchased	0.58	0.61***	0.62***	0.55**
Proportion of budget spent on food	0.76	0.75*	0.75**	0.77
1= Any member completed primary school	0.74	0.74	0.74	0.72
Time to access water in dry season (minutes)	50.67	49.40	48.39	53.03
1= Electricity	0.07	0.09**	0.11***	0.03***
Obs.	1,984	2,216	2,376	1,787

Rural (admin) → rural (Africapolis)
1,872 households

Rural (admin) → urban (Africapolis)
112 households
Wealthier than rural (admin) → rural (Africapolis)

Urban (admin) → rural (Africapolis)
504 households
Much wealthier than rural (admin) → rural (Africapolis)

Asterisks in columns 2, 3, and 4 denote the level of statistical significance for a t-test of equality of mean values in this column and column 1.
*** p<0.01, ** p<0.05, * p<0.1

Results

Indicators of welfare in the rural population in Tanzania (rate of change)

	Δ in mean, 2008-14			
	Administrative	Night lights	Africapolis	Local nonfarm economy
Value of consumption (1,000s TSh/AE/day)	0.15**	0.11	0.13*	-0.01
1= Poor (using national poverty line)	0.00	0.01	0.00	0.04**
Proportion of food purchased	0.10***	0.07***	0.09***	0.07***
Proportion of budget spent on food	-0.02***	-0.01***	-0.02***	-0.01*
1= Any member completed primary school	0.05***	0.02	0.03**	0.02
Time to access water in dry season (minutes)	-17.49***	-15.90***	-16.73***	-15.84***
1= Electricity	0.05***	0.04***	0.05***	0.01*
Obs.				

Asterisks denote the level of statistical significance for a t-test of equality of mean values in 2008 and 2014, using the "rural" definition in a given column.
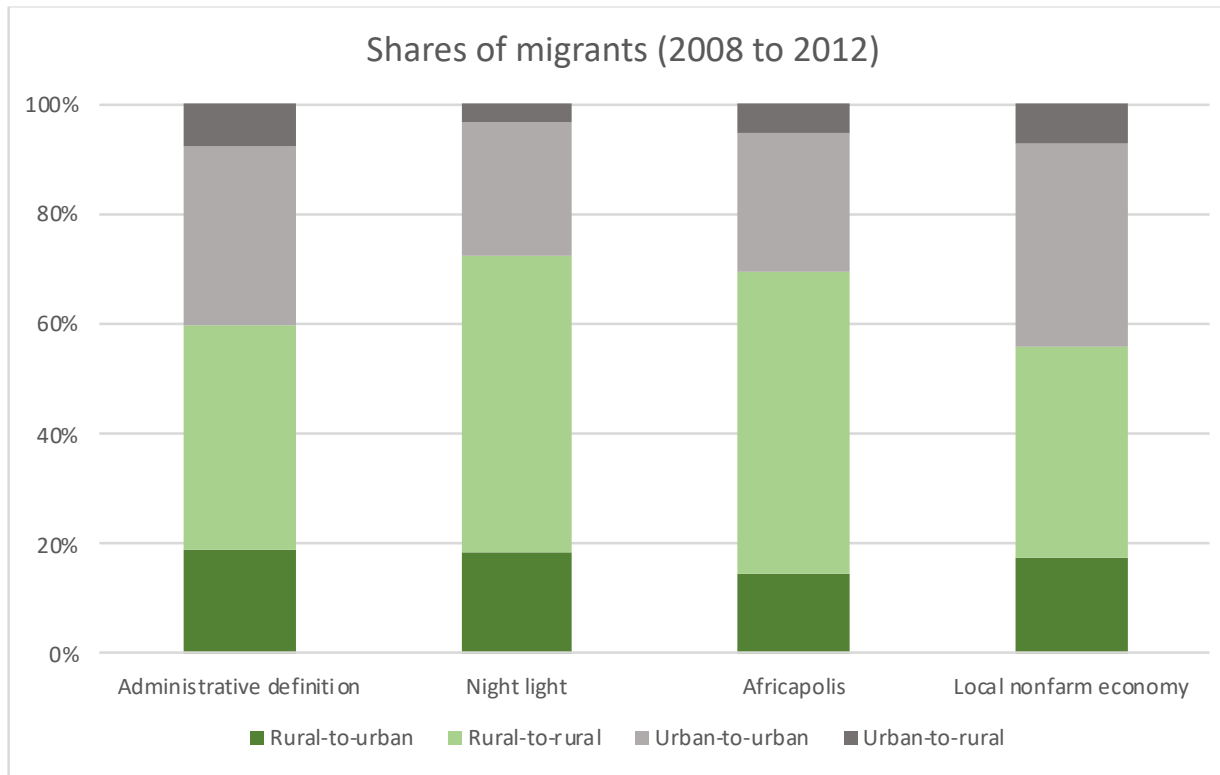*** p<0.01, ** p<0.05, * p<0.1

The local nonfarm economy-based definition produces a <u>dim</u> view of rural progress, as evolving spaces are continually recategorized as urban.

Results

Migration patterns between rural and urban areas in Tanzania

Conclusions

- The urban definition applied sometimes affects common analyses of rural populations and economic change.

- In Tanzania, the urban definition is not so consequential for studies of the rural farming population.

- We need to think about how "urban/rural" *ought* to be defined for resource allocation, planning and evaluation. The consequences of a binary classification as popn grows.

- A description of the data sources is available in our paper's appendix (and the code used in analysis is also available for dissemination).

Thanks!

Extra Slides

Results

Levels and rates of urbanization

	Tanzania		Nigeria	
	Urban population share, 2014	Δ urban population share, 2008 to 2014	Urban population share, 2015	Δ urban population share, 2010 to 2015
Administrative definition	28.4%	6.1%	37.4%	0.3%
Population density	27.6%	8.8%	51.7%	2.9%
Impervious surface	12.5%	2.6%	20.4%	-0.1%
Night light	20.7%	9.1%	35.1%	1.7%
Africapolis	22.9%	5.7%	20.5%	0.0%
Local economy	35.2%	10.7%	60.0%	12.4%
Subjective assessment	39.3%	N/A	N/A	N/A

Results

Characteristics of farm-households in rural areas in Tanzania

	Mean values, 2014			
Tanzania	Administrative	Night lights	Africapolis	Local nonfarm economy
1= Agricultural household	0.91	0.88***	0.86***	0.94***
Among agricultural households:				
Land size (ha)	2.52	2.46	2.47	2.53
1= Uses only family labor and own (not rented) land	0.23	0.23	0.22	0.23
Distance from largest plot to agricultural market (km)	10.13	9.87	10.17	10.21
Proportion agricultural production sold	0.43	0.42	0.42	0.43
1= Sell crops at farm gate	0.67	0.68	0.68	0.67
Obs. (agricultural households)	1,763	1,911	1,838	1,663

Asterisks in columns 2, 3, and 4 denote the level of statistical significance for a t-test of equality of mean values in this column and column 1. *** p<0.01, ** p<0.05, * p<0.1
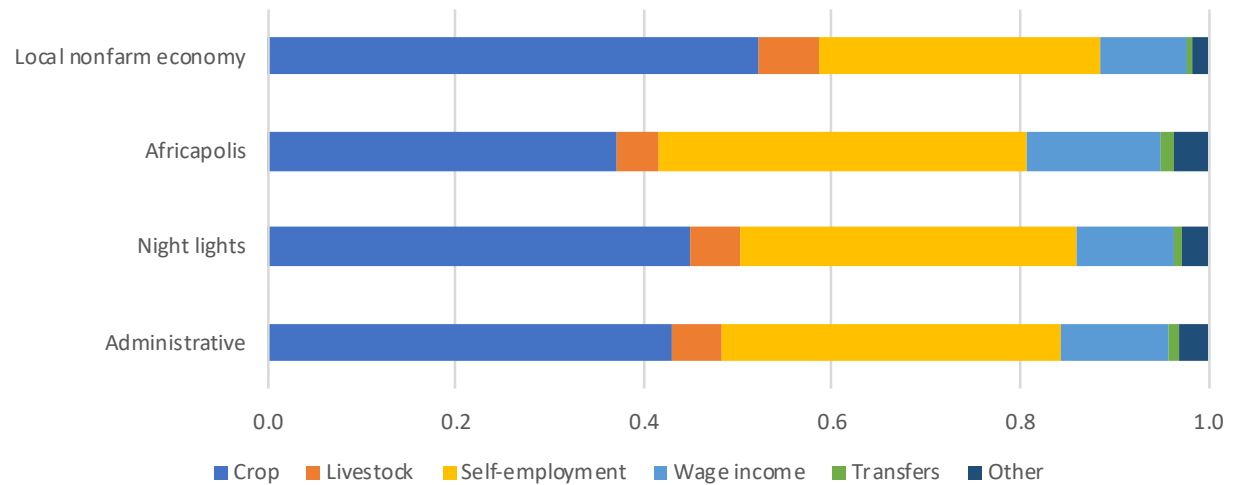
These definitions tend to paint a consistent picture of rural farms (at least in Tanzania).

Results

Rural income shares, Tanzania (2014)

Categories: Crop, Livestock, Ag wage income, Self-employment, Non-ag wage income, Transfers, Other

Rows: Local nonfarm economy, Africapolis, Night lights, Administrative

Rural income shares, Nigeria (2015)

Categories: Crop, Livestock, Self-employment, Wage income, Transfers, Other

Rows: Local nonfarm economy, Africapolis, Night lights, Administrative

Urban definitions

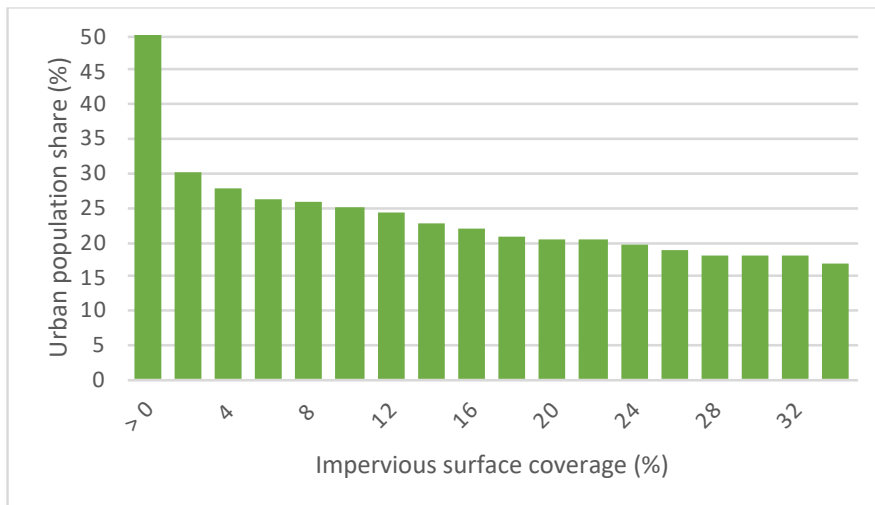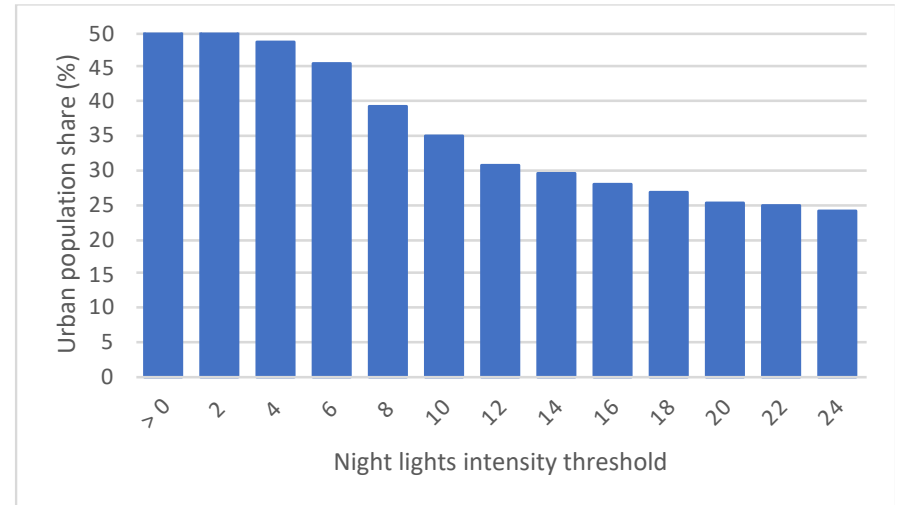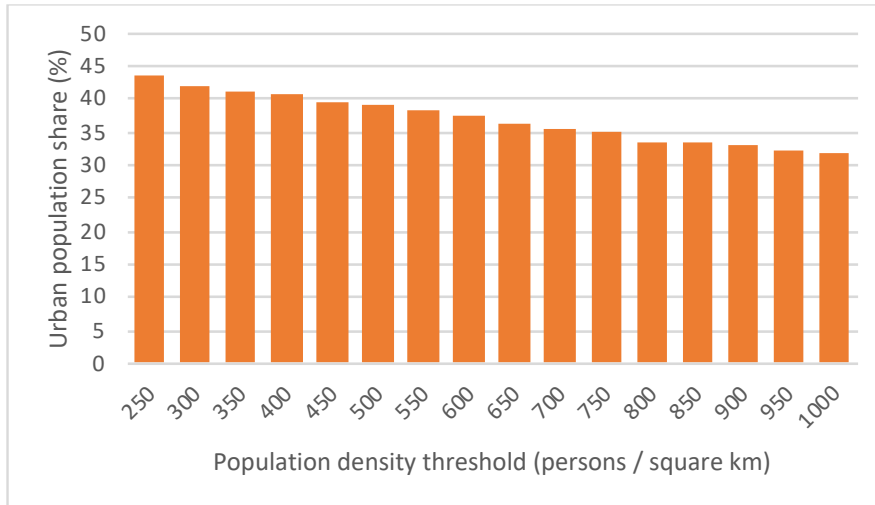|		
1.	**Administrative definition**	The official designation in each country

Sensitivity analysis for thresholds used in urban designations (Tanzania)
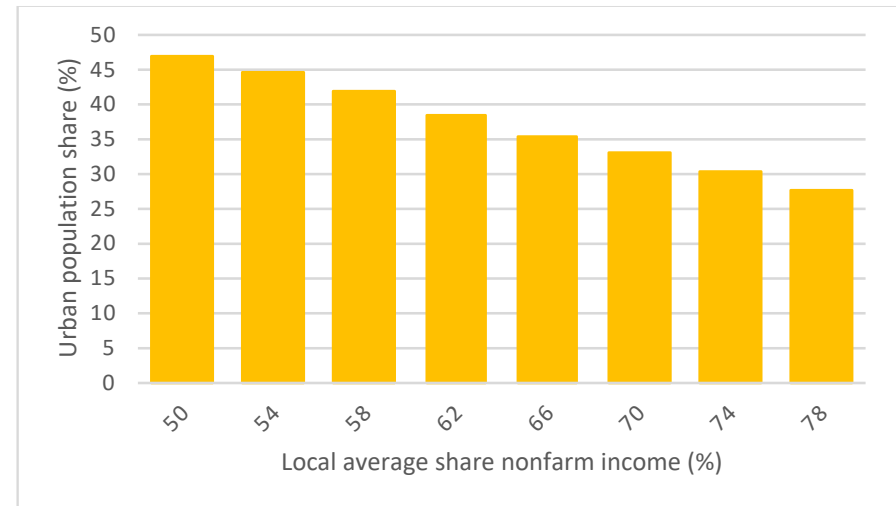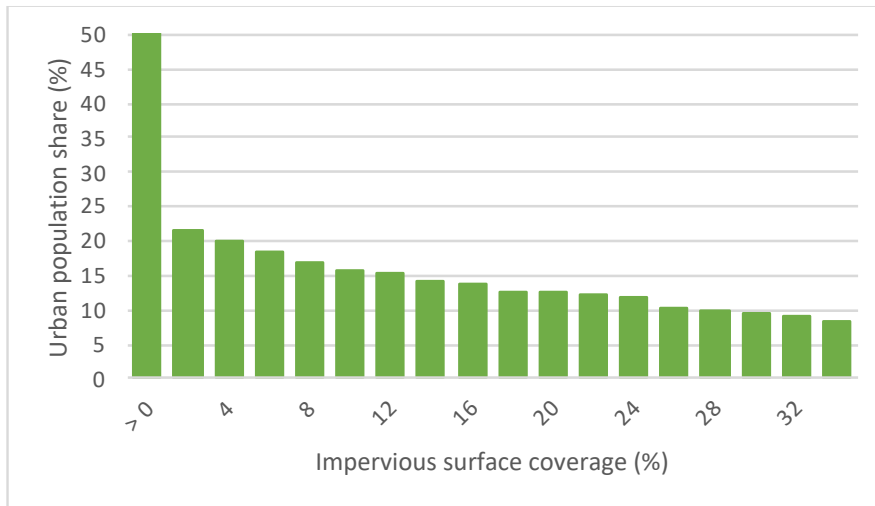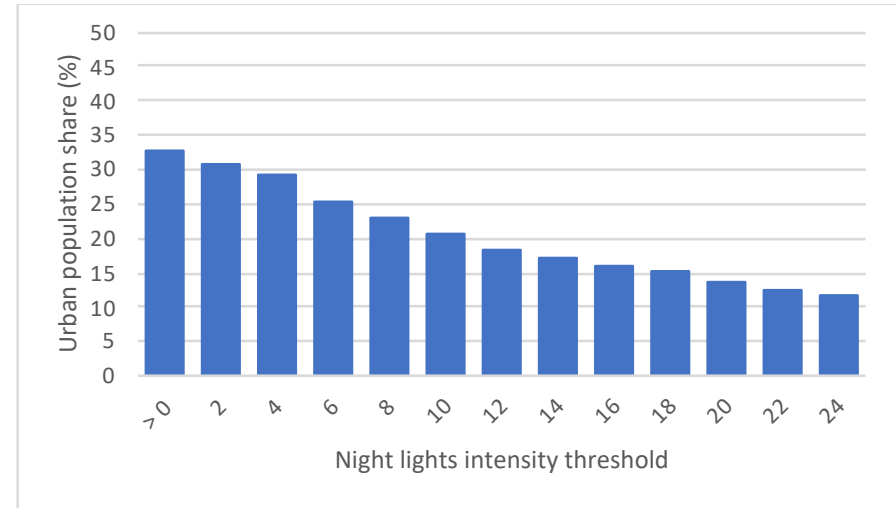
Sensitivity analysis for thresholds used in urban designations (Nigeria)
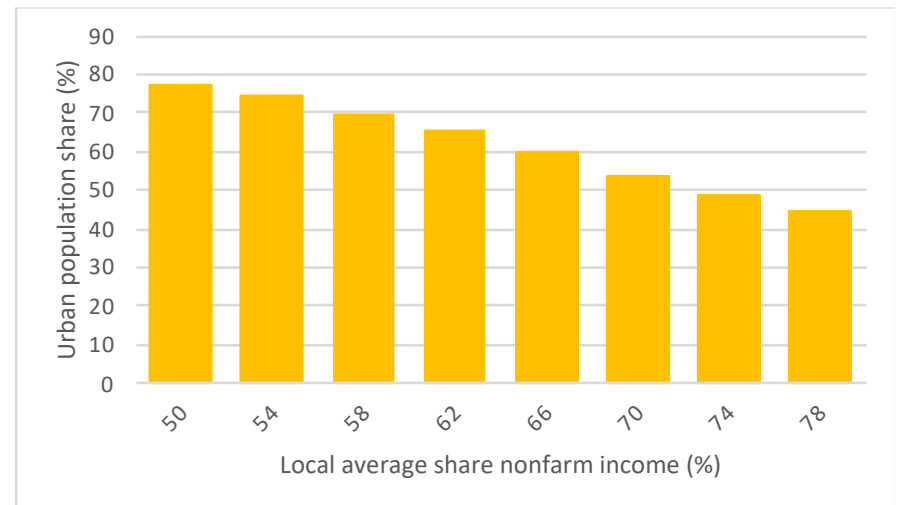
Results

Rural population shares / contributions

	Tanzania (2014)		Nigeria (2015)	
	% of poor households	% of agricultural households	% of poor households	% of agricultural households
Administrative definition	90%	83%	83%	84%
Population density	92%	84%	72%	65%
Impervious surface	96%	89%	86%	91%
Night lights	95%	88%	83%	83%
Africapolis	93%	86%	92%	93%
Local economy	87%	77%	65%	55%
Subjective assessment	83%	71%	N/A	N/A

Results

Characteristics of farm-households in rural areas (rate of change)

	Δ in mean, 2008-14			
Tanzania	Administrative	Night lights	Africapolis	Local nonfarm economy
1= Agricultural household	-0.07***	-0.05***	-0.05***	-0.03***
Among agricultural households:				
Land size (ha)	0.06	0.08	0.01	0.22
1= Uses only family labor and own (not rented) land	-0.09***	-0.09***	-0.10***	-0.09***
Distance from largest plot to agricultural market (km)	-0.30	-0.44	-0.28	-0.27
Proportion agricultural production sold	0.06***	0.06***	0.05***	0.05***
1= Sell crops at farm gate	0.11***	0.10***	0.11***	0.09***
Obs. (agricultural households)				