Is Small Still Beautiful?
The Farm Size-Productivity Relationship Revisited

Milu Muyanga & T.S. Jayne
Agricultural, Food and Resource Economics Department
Michigan State University, USA

Introduction

- Based on experiences from Asia, a smallholder-led growth strategy has been widely accepted as the pathway for achieving economic transformation and mass poverty reduction in Africa
- Since smallholders also constitute the majority of farms in Africa, it is generally accepted that a smallholder-led strategy also holds the best prospects for economic development in Africa

CONCERNS about the viability of a smallholder-led growth strategy in Africa

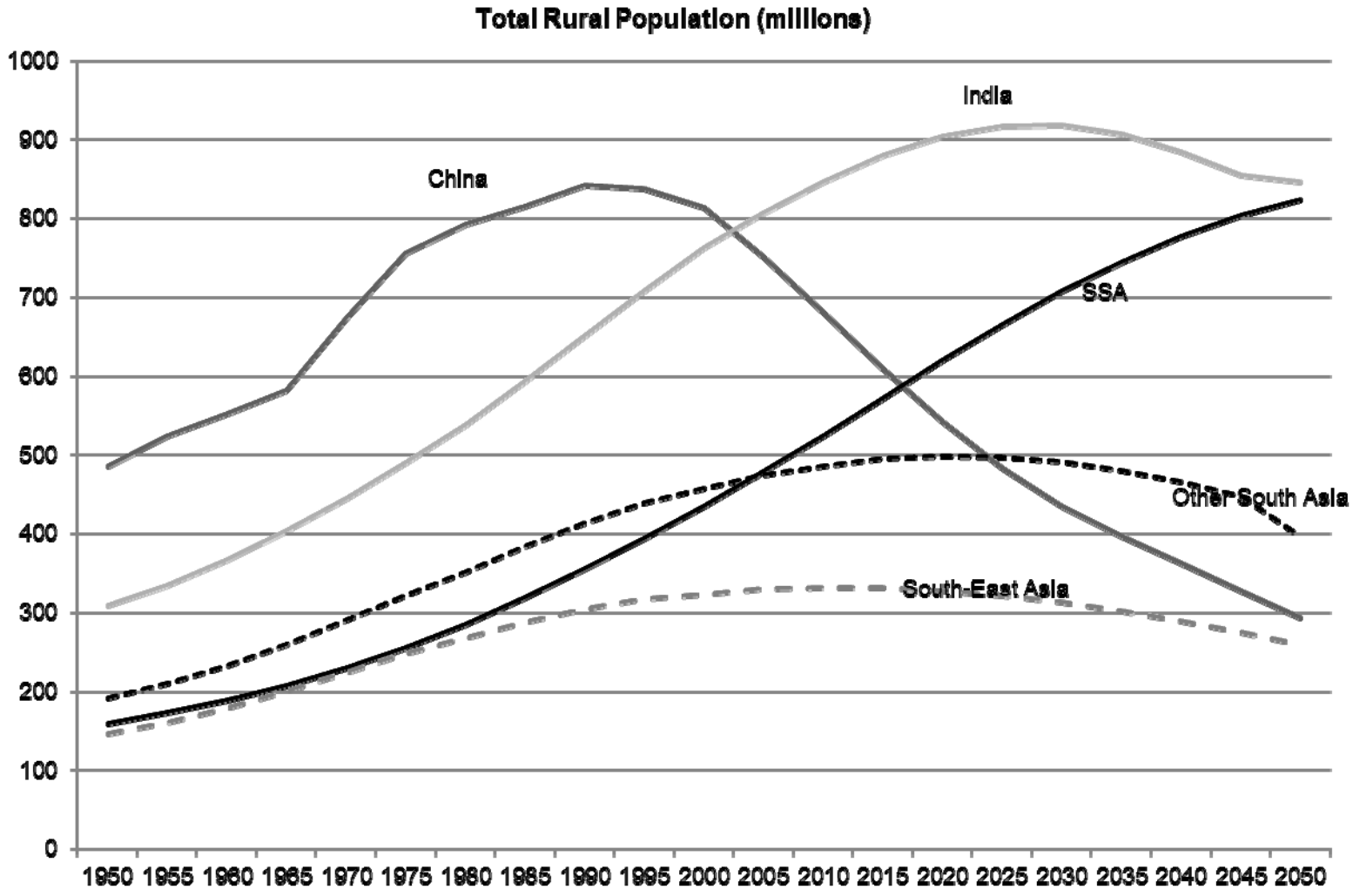
1. Small-scale farming in Africa has historically provided very LOW RETURNS to labor
   - Most rural Africans now appear to be seeking ways to improve their livelihoods away from farming
   - Diversifying into higher-return non-farm employment or getting out of farming entirely

CONCERNS about the viability of a smallholder-led growth strategy in Africa

2. Mounting POPULATION pressure and shrinking FARM SIZES

- Area expansion is increasingly difficult in areas where the land frontier has been reached
- While farm sizes are small and close to those in much of Asia, most African farms have little control over water, are prone to frequent droughts, and have only one growing season per year
- Can rural labor productivity can rise very much above poverty wage levels without massive shifts in the labor force from farming?

Total rural population projections



Source: UN Pop Council, 2013

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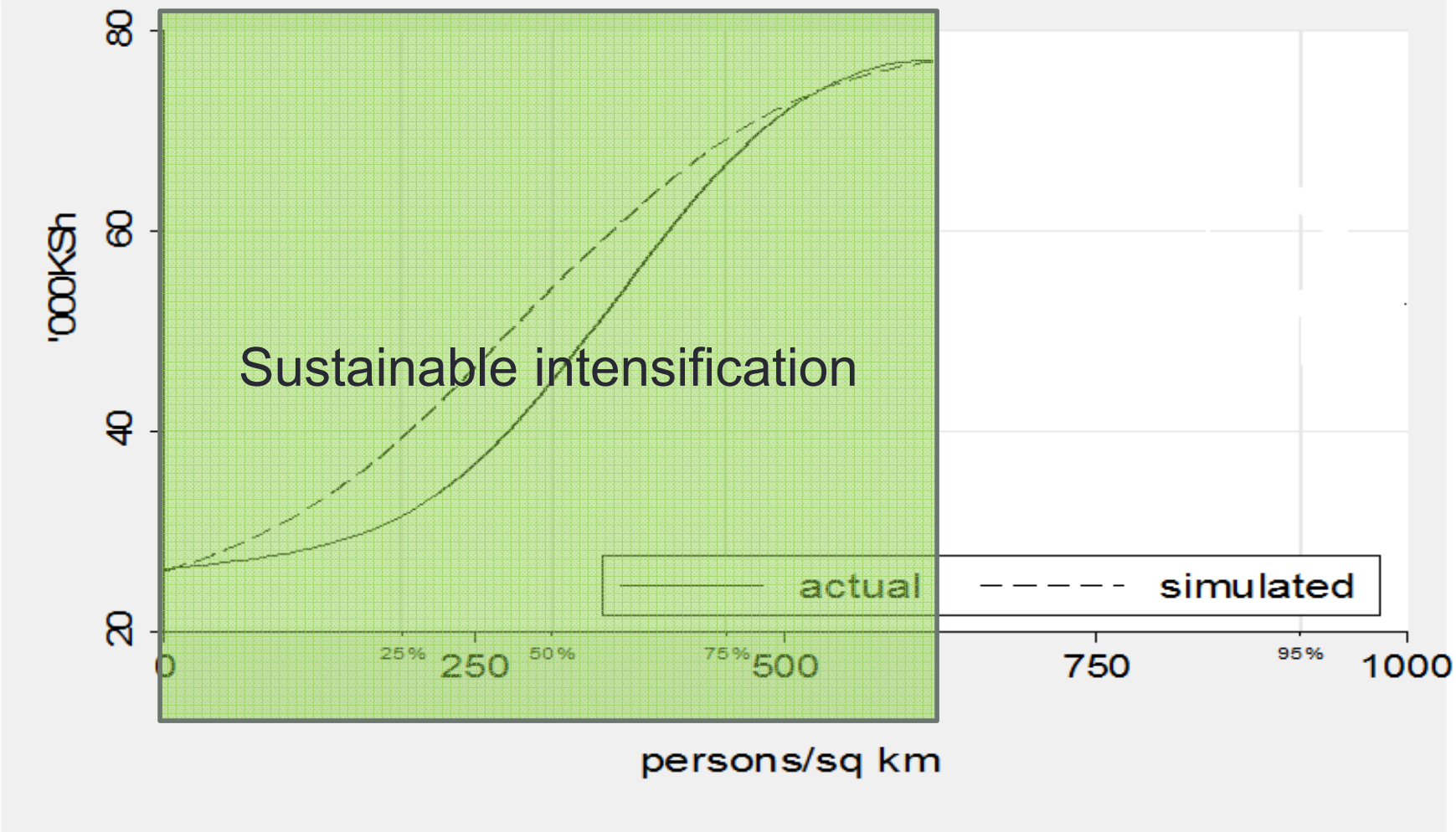
CONCERNS about the viability of a smallholder-led growth strategy in Africa

3. UNSUSTAINABLE forms of agricultural intensification

- Shrinking farms are associated with increasing land intensification [Boserup, 1965; Tiffen et al, 1994]
- Soil fertility depletion
  - Low soil organic carbon/matter
- Soil acidification
  - Continued use of fertilizer without fallowing and soil testing

Intensification tends to plateau at about 500–600 persons/km²

Figure 4: Net crop income per hectare cultivated



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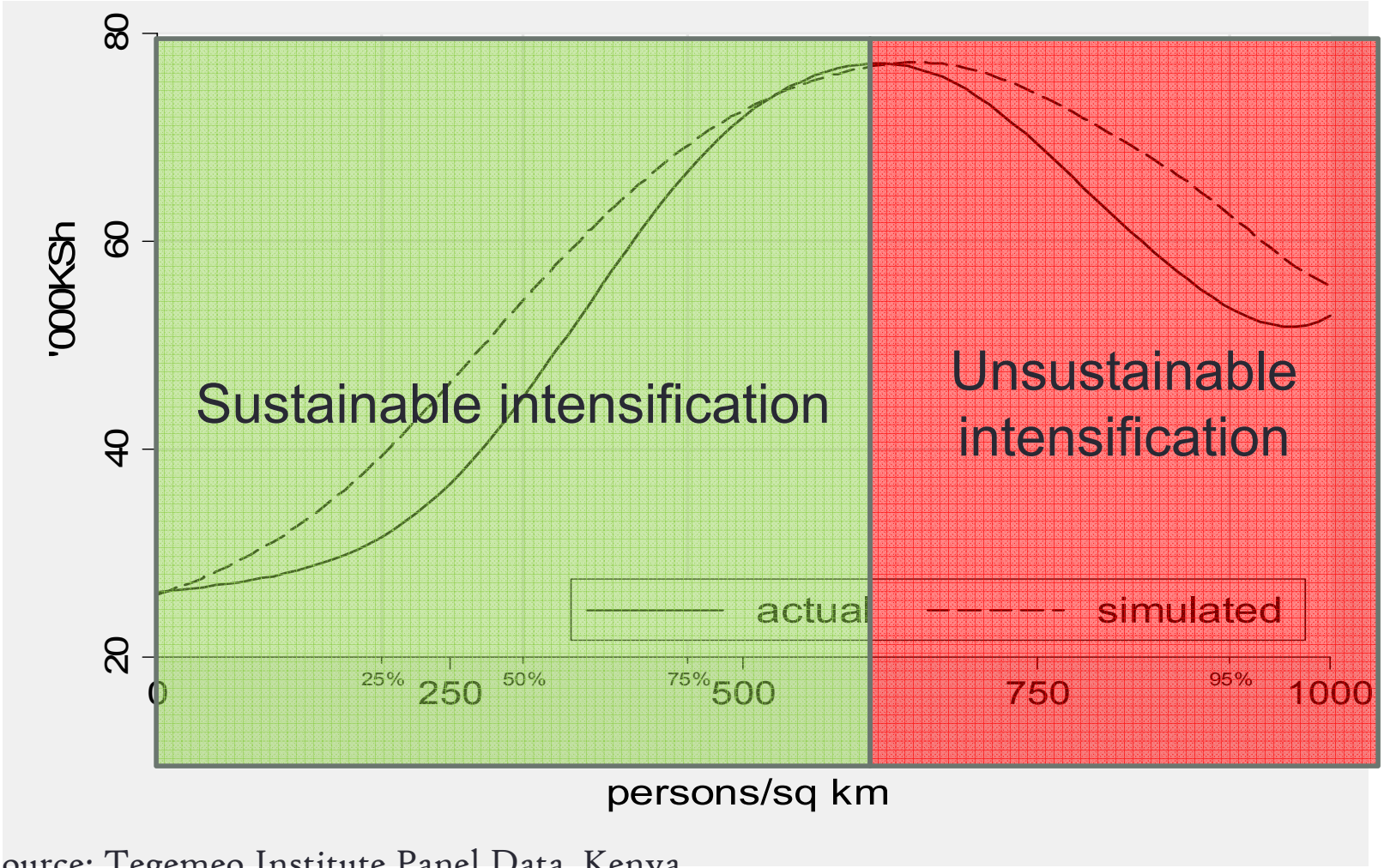

Source: Tegemeo Institute Panel Data, Kenya

CONCERNS about the viability of a smallholder-led growth strategy in Africa

3. Signs of UNSUSTAINABLE forms of agricultural intensification

- While shrinking farms are associated with increasing land intensification, intensification tends to plateau at about 500–600 persons/km²
- Soil fertility depletion
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  - Continued use of fertilizer without fallowing and soil testing

CONCERNS about the viability of a smallholder-led growth strategy in Africa

4. Changing FARM STRUCTURE-- rising proportion of land among medium-scale farms
   - Rapid growth in the number and land controlled by "emergent" farm landowners
   - Few emergent farmers are growing from the ranks of the small-scale farm sector
   - Drivers:
     - Political economy and market forces
     - Land policies encouraging transfer of unutilized land to medium and large scale farms [Tanzania]

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Motivation

- These CONCERNS seem incongruous, at least on the face of it, with research findings that small farms are relatively more productive than larger farms
- Thus, renewed interest in the Inverse Farm Size-Efficiency Relationship (IR) among development economists
- Guiding land allocation policies for inclusive growth:
  - Are prevailing land policies promoting national goals of agricultural productivity, food security and poverty reduction?

Tests of the IR hypothesis take on even greater policy importance in light of recent studies questioning the viability and even the objectives of promoting small-scale agriculture in Africa

"Favouring small farmers, he argues, is romantic but unhelpful"

[Collier and Dercon, 2014]

Contribution [I]

- Explore the IR hypothesis over a much wider range of farm sizes - a statistically representative sample of farms between 1 and 100 hectares
  - Inform current policy discussions about how governments should allocate unutilized/underutilized land in order to achieve national equity and productivity goals
  - Unutilized/underutilized land is being claimed and transferred at a very rapid pace in some countries

Contribution [II]

- Number of studies have conventionally measured productivity as yield and or net value of crop production per unit area of land
- Our study is based on a wider set of productivity measures:
  - Net value of total crop production per unit of area planted (land productivity)
  - Total factor productivity
  - Productivity index (gross production/total production costs)
  - Net value of crop production per adult labor unit (labor productivity)

Contribution [III]

- Account for both variable and fixed costs when computing the cost of production.
  - Most of the prior studies typically ignored fixed and labor costs
  - Led to overstated productivity of farms with high fixed and labor costs

Data sources

- Rural household surveys
  - Ghana
  - Kenya
  - Zambia
  - Tanzania

Results

Kenya

Descriptive results

Figure 1: Land productivity

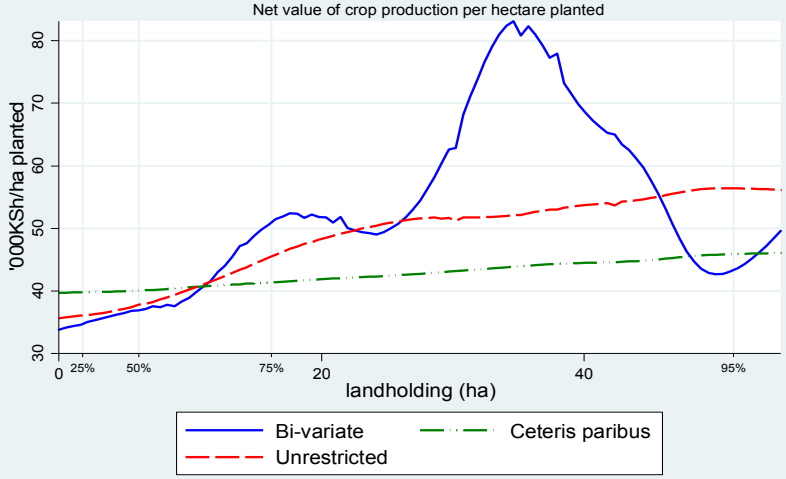


Figure 2: Total factor productivity

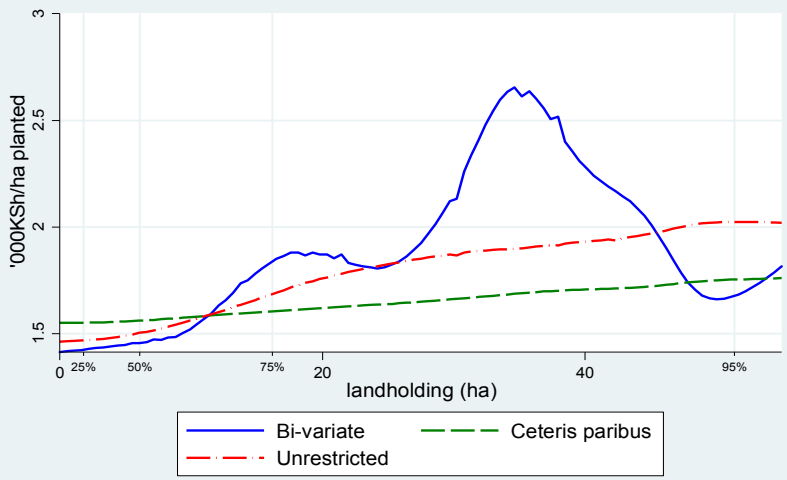


Figure 3: Crop productivity index

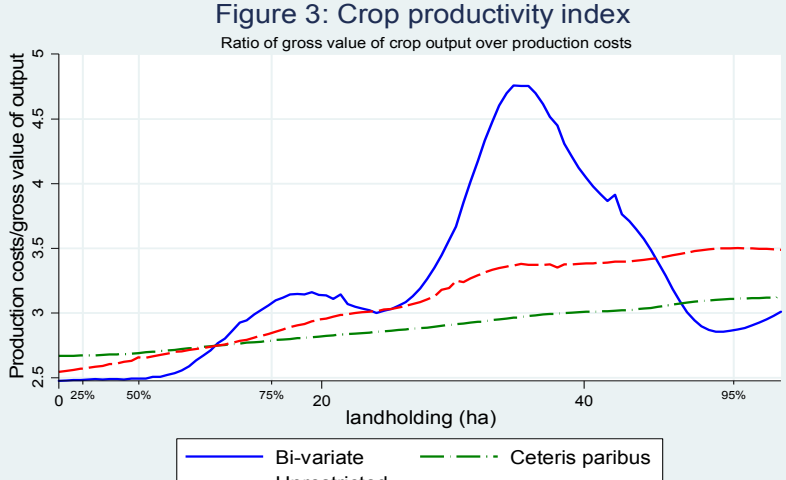
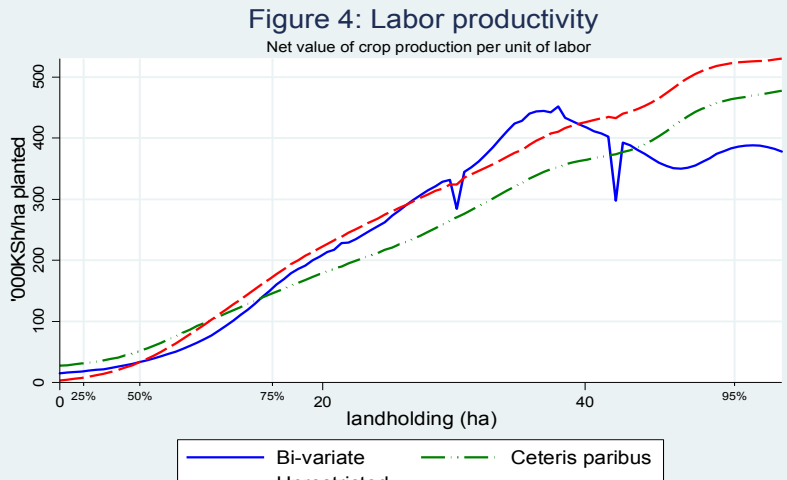


Figure 4: Labor productivity



Descriptive results

Figure 5: Total production costs per hectare planted

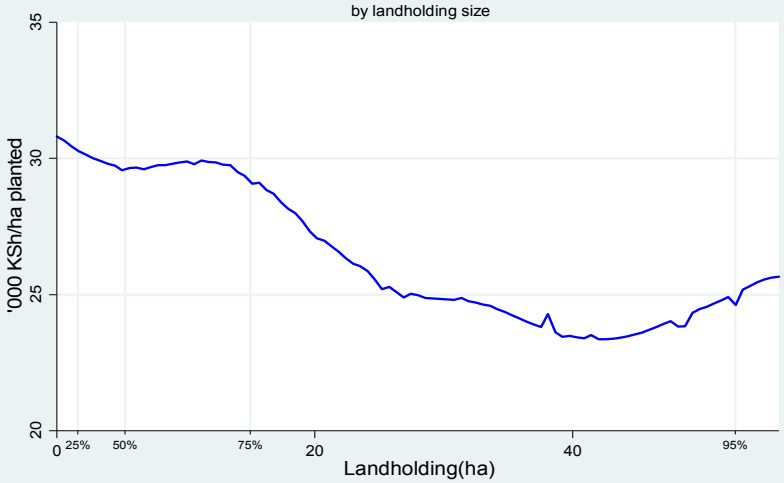


Figure 6: Production costs per hectare planted by landholding size by input category

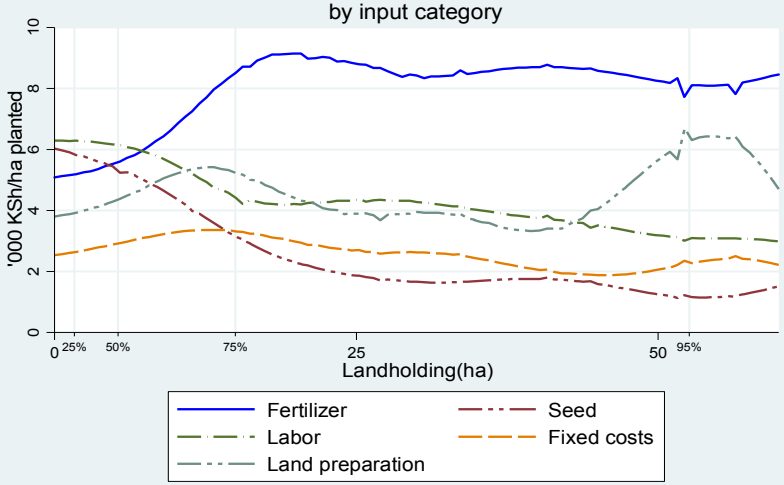
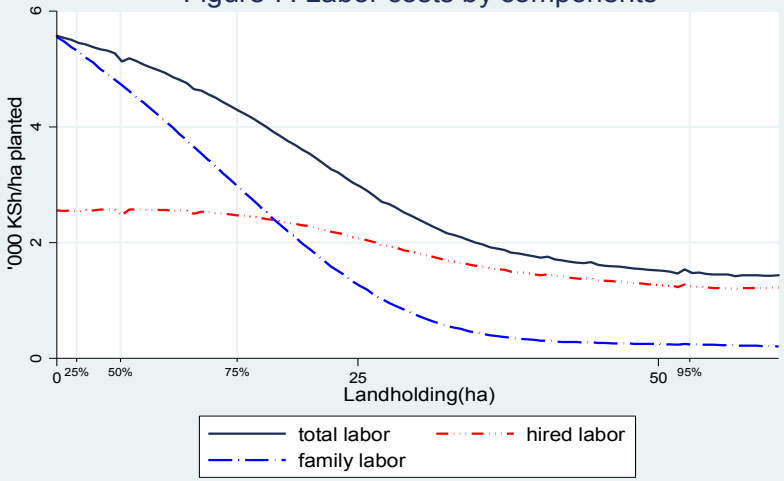


Figure 7: Labor costs by components



Post-estimation simulations

	Case	Small-scale			Medium-scale		
		Mean	[95% Conf. Interval]		Mean	[95% Conf. Interval]	
Land productivity (‘000KSh per hectare planted)	I	53.27	52.00	54.54	52.29	49.79	54.78
	II	41.59	40.32	42.86	63.25	60.76	65.74
Total Factor Productivity (‘000KSh)	I	1.90	1.88	1.92	2.00	1.94	2.06
	II	0.41	0.39	0.43	3.13	3.06	3.19
Productivity index	I	2.86	2.84	2.88	3.51	3.35	3.68
	II	1.35	1.33	1.37	4.57	4.41	4.73
Labor productivity (‘000KSh per resident adult)	I	19.18	18.63	19.74	266.41	219.36	313.46
	II	-35.66	-36.22	-35.11	259.89	212.85	306.94

Policy implications

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1. Production efficiency, while relevant, should not be the ONLY factor in guiding agricultural and land policies
   - Which scale has the largest multiplier and employment effects?
2. All depends on the government's development objective:
   - Production for domestic food self sufficiency and export market?
   - Broad based growth for reduced food insecurity and poverty reduction?
3. In in all, the changing farm structure is going to continue in the next 5-10 years
   - Drivers: political economy factors and market forces

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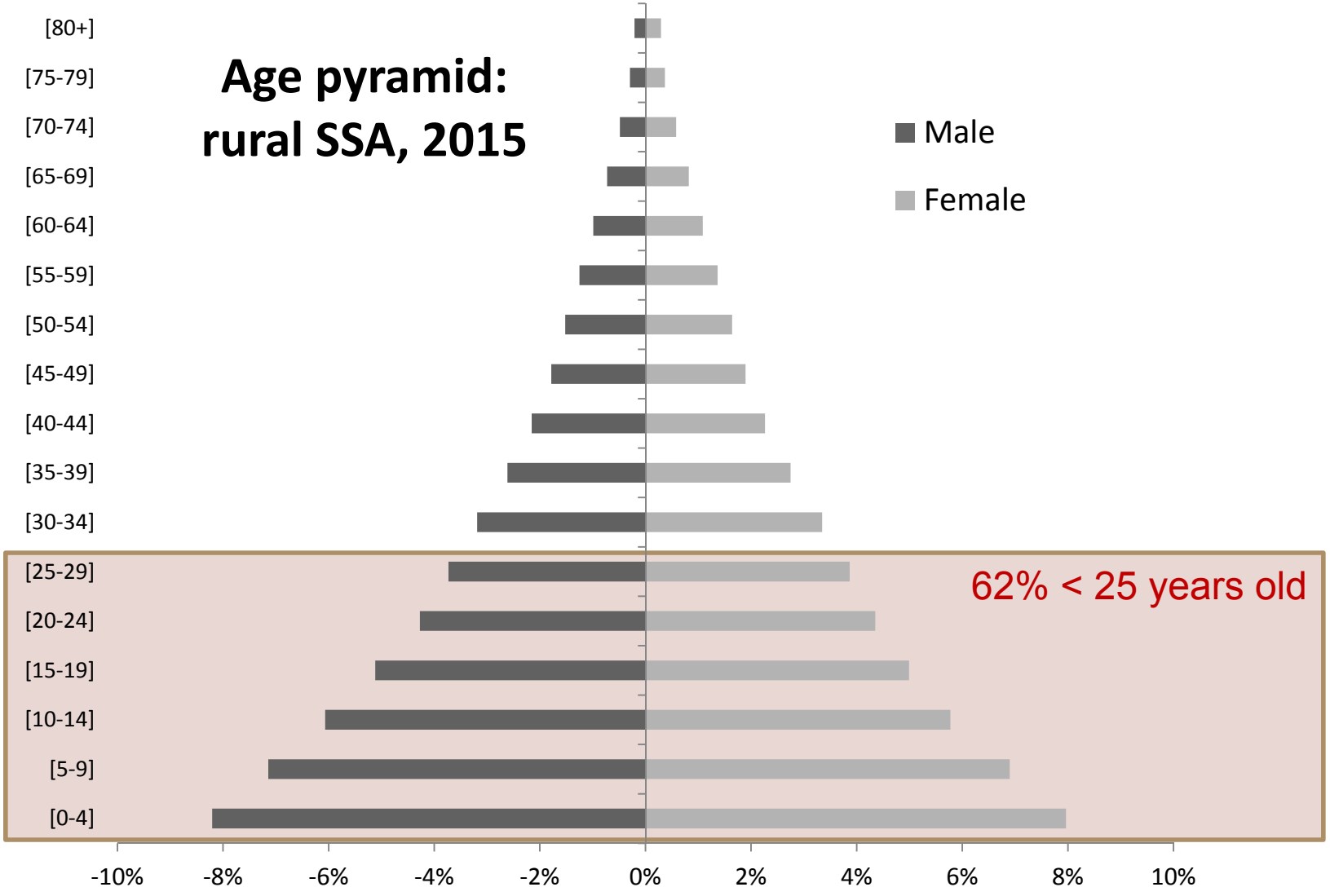
Looming employment challenge in SSA



Conclusion

- Land policies will determine whether millions of rural Africans will make a decent livelihood
  - How supportive the land allocation and agricultural policies are to smallholders
- African leaders may soon realize that political stability will depend on how the remaining land is distributed and the profitability of family farming

Acknowledgements

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Changing farm structure- Zambia

Table 2: Changes in farm structure among small- and medium-scale farmers in Zambia (2009 - 2012)

Landholding size Category	Number of farms			% change (2001-2012)	% of total farmland		Share of landholding cultivated (2012)
	2001*	2009	2012		2009	2012	
0 – 2 ha	638,118	916,787	748,771	17.3%	24.1%	16.2%	91.2%
2 – 5 ha	159,039	366,628	418,544	163.2%	33.8%	31.7%	66.4%
5 – 10 ha	20,832	110,436	165,129	692.6%	20.3%	25.0%	49.5%
10 – 20 ha	2,352	35,898	53,454	2272.7%	12.3%	15.0%	36.7%
20 – 100 ha	--	9,030	13,839	53.3%**	9.5%	12.0%	10.9%
Total	820,341	1,438,779	1,399,737	70.6%	100.0%	100.0%	

Source: Ministry of Agriculture Crop Forecast Surveys, 2009, 2012. *2001 figures are land under cultivation. ** Growth rate computed from 2009-2012 only. “na” means not available.

OLS Regression results

		Full sample		Smallholder $ha \leq 5$		Medium-scale $ha > 5$	
Dep. var.:	Variable of interest:	Coef.	P>t	Coef.	P>t	Coef.	P>t
Land productivity -- net value of crop production per ha planted '000KSh	Landholding (ha)	0.15	0.06	-1.04	0.01	0.13	0.18
	Planted land (ha)	0.21	0.28	-0.94	0.67	0.23	0.36
Total Factor Productivity (KSh)	Landholding (ha)	3.90	0.04	-23.19	0.01	3.08	0.22
	Planted land (ha)	8.69	0.06	-29.05	0.58	7.07	0.26
Ratio of gross value of farm output to total production costs	Landholding (0 '000ha)	7.81	0.01	-21.50	0.29	4.75	0.26
	Planted land ('000ha)	12.16	0.10	-172.44	0.11	1.40	0.90
Labor productivity -- net value of crop production per unit of labor '000KSh	Landholding (ha)	7.68	0.00	-0.37	0.21	6.97	0.00
	Planted land (ha)	27.73	0.00	7.41	0.01	29.83	0.00