



THE UNIVERSITY OF  
WESTERN AUSTRALIA

*Achieve International Excellence*

SCHOOL OF AGRICULTURAL &  
RESOURCE ECONOMICS

# **Agricultural Productivity Growth in Africa: Is Efficiency Catching-up or Lagging?**

*Amin W. Mugeru & Andrew Ojede*

*AARES 2011 Conference, Melbourne, Victoria*

# Is Efficiency Catching-up & Converging?

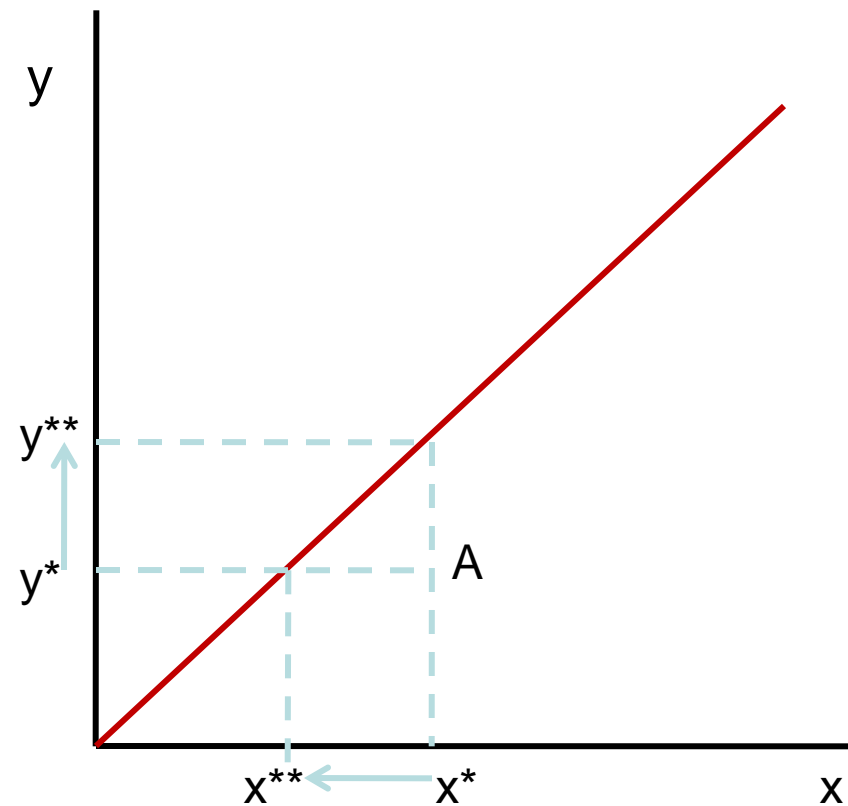
- Agricultural Productivity (Alene 2010; Nin-Pratt and Yu 2008; Nkamleu 2004; Fulginiti et al. 2004)
  - ❖ Rural and urban welfare, engine for economic growth
  - ❖ Food security and poverty reduction
  - ❖ Sources of productivity growth, factors that influence productivity growth (Political/Institutional, R&D, Trade reforms)
- Investigate technical efficiencies in 33 African countries from 1966 to 2001 (recent advances in DEA)



# Productivity Revolution in Smallholder Farming

- Fully exploit available resources to produce output
- Reduce input quantities without changing output level
- Produce **MORE** output with **LESS** inputs

## ILLUSTRATION



# Literature Review

- Empirical Studies (Alene 2010; Nin-Pratt and Yu 2008; Nkamleu 2004; Fulginiti et al. 2004)
  - ❖ Productivity gains in the 1960's
  - ❖ Poor aggregate performance in the 1970's and early 1980's
  - ❖ Recovery since mid 1980's
- Total Factor Productivity = Efficiency Change + Technical change
- Mixed results: What are the sources of productivity growth?



# Methodology

- Parametric (SFA) vs. Nonparametric (DEA)
- Standard Data Envelopment Analysis (DEA)
  - ❖ Measurement errors?
  - ❖ Sensitive to outliers?
  - ❖ Point estimates (no variability measure)
- Bootstrap DEA (Simar and Wilson 1998;2000;2008)
  - ❖ Correct for bias (small sample)
  - ❖ Confidence interval

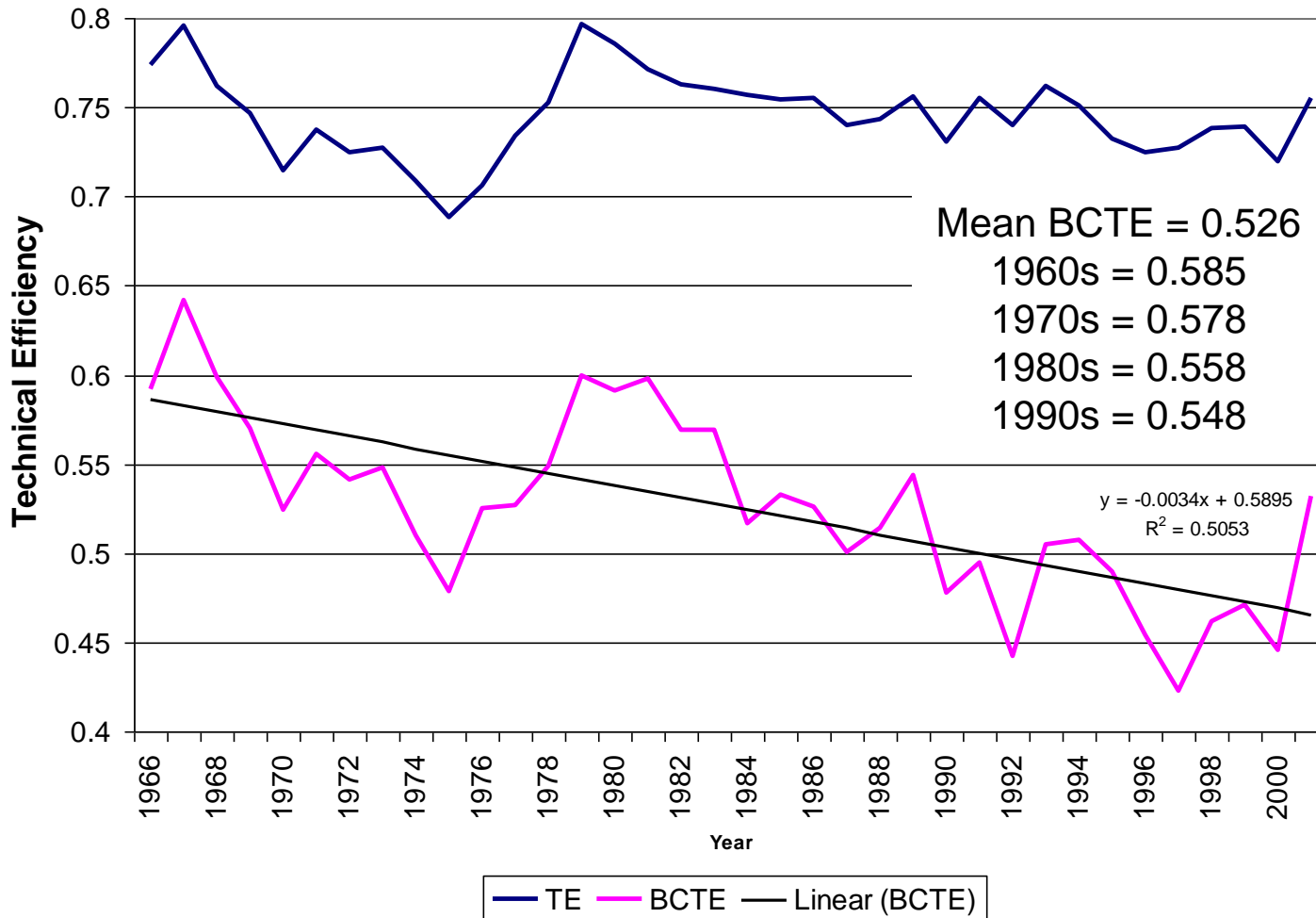


# Data Sources

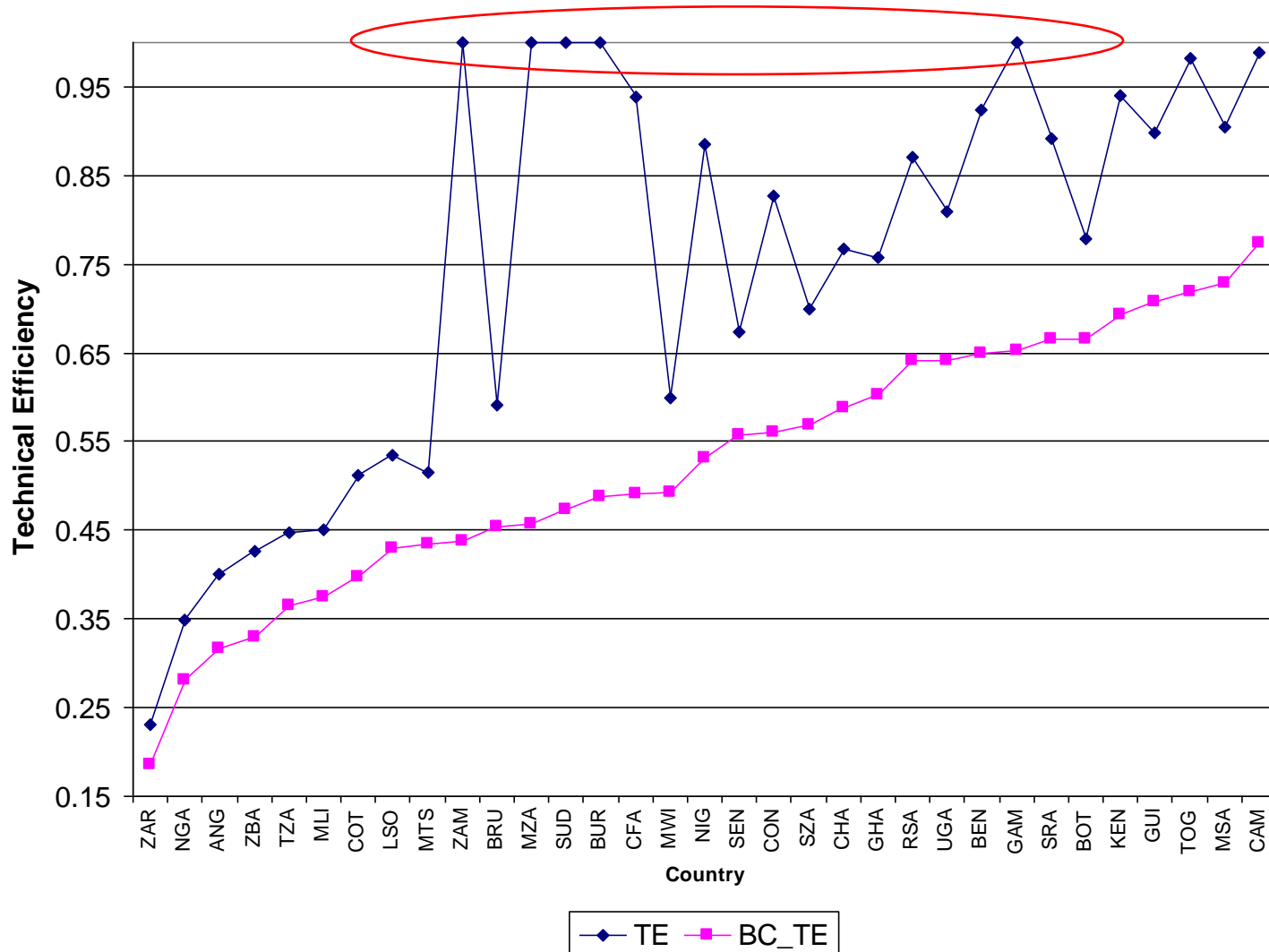
- **Source:** FAOSTAT and World Development Indicators
- **Output :** Volume of agricultural production (Valued in 1999-2001 International dollars)
- **Inputs**
  - ❖ Labor - total number of active population in agriculture
  - ❖ Fertilizer - tons of plant nutrients (nitrogen, potash, and phosphorus)
  - ❖ Capital - Farm machinery (number of tractors employed)
  - ❖ Agricultural land - size of arable land



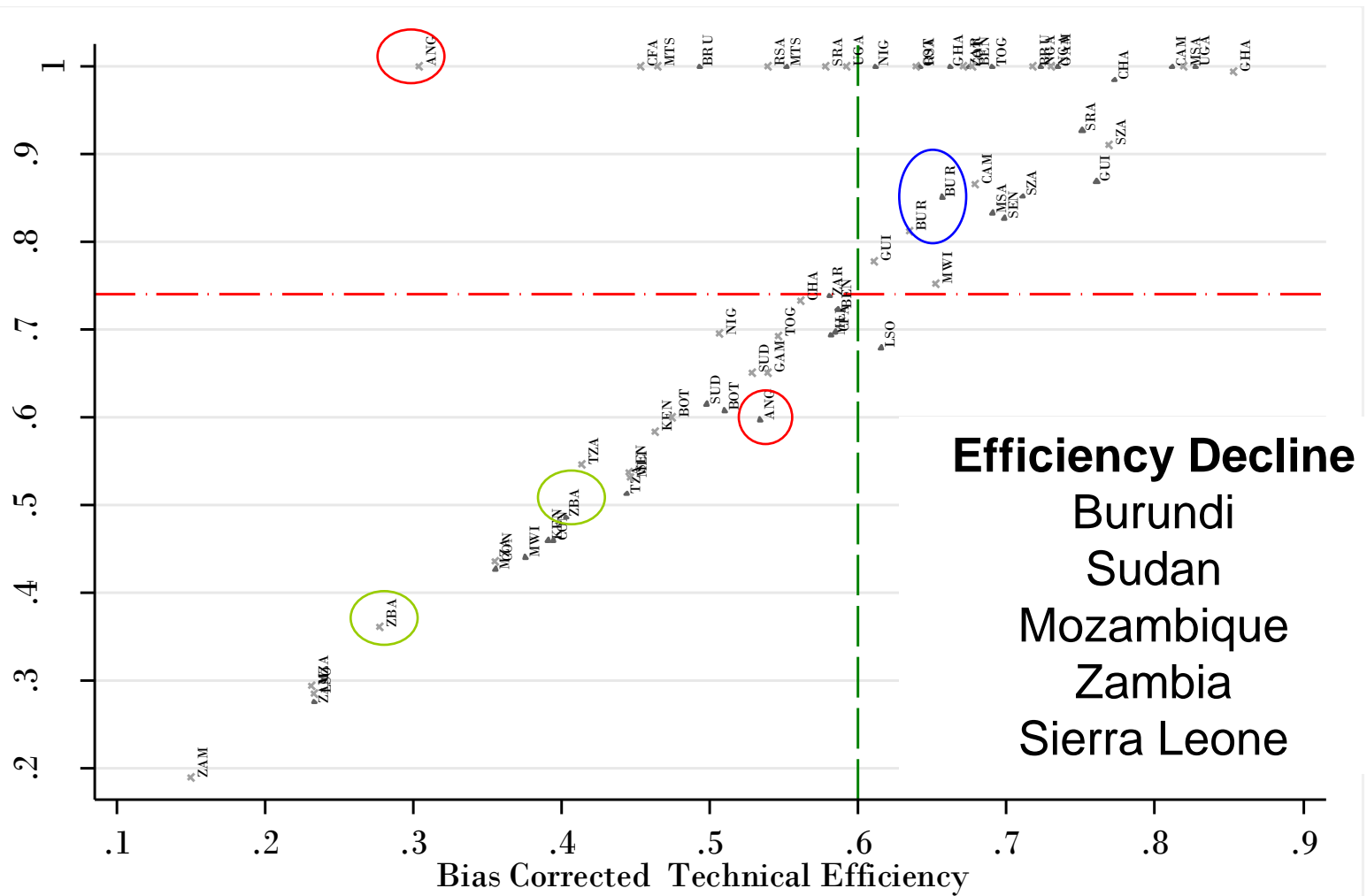
# Average Technical Efficiency, 1966-2001



# Average Efficiency Scores by Country



# Technical Efficiency, 1966 and 2001

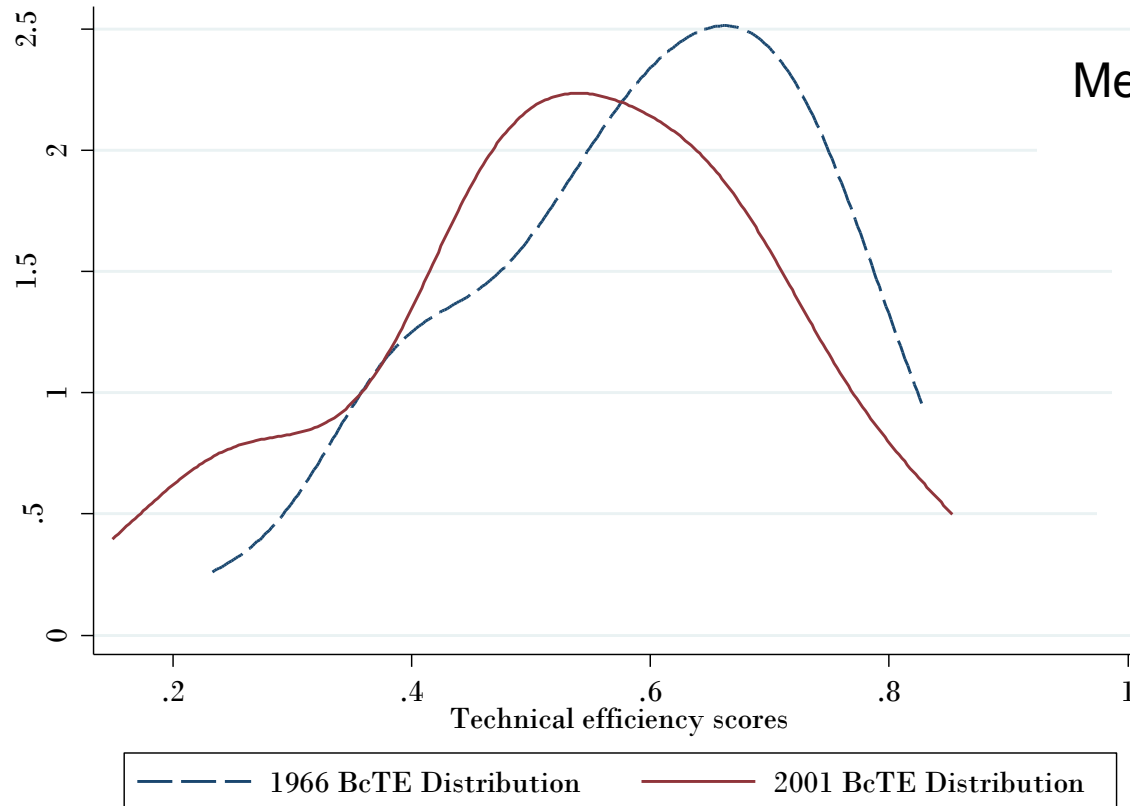


▲ 1966    × 2001

# TE Coefficient of Variation, 1966-2001



# Kernel Distribution of Bias-corrected Efficiency Scores, 1966 and 2001



Mean Technical Efficiency

- 1966 (0.592)
- 2001 (0.532)

Efficiency Change

- + 10 countries
- 23 countries

Unimodality Test

- Rejected



# Conclusion

- Efficiency lagging behind in general
- Efficiency gains/losses for some countries
- Evidence of “club” convergence
- Policy implication
  - ❖ Adoption of available technologies (fertilizer, mechanization, plant breeds)
  - ❖ Effective extension (public and private)
  - ❖ Education and training of farmers
  - ❖ Input supply and credit systems
  - ❖ Accessibility of inputs and credit (market prices, microfinance)



Thank You

