IMPACT OF ICT-BASED MARKET INFORMATION SERVICE PROJECTS ON FARM INPUT USE AND PRODUCTIVITY IN KENYA

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AFMA 8th Conference, Nairobi, November 2012

Introduction

- The importance of info' for adequate functioning of markets has been a great concern in economic theory.
- Betwn1980s to early 1990s, many developing countries invested in MIS and other reforms to improve mkt linkage.
- Yet, situations of info' asymmetry still prevail in most developing countries & constrain performance of agric mkts

Introduction

- The search for new strategies for resolving the constraint of poor access to agric' info' has led to several ICT projects.
- In Kenya such projects include: M-Farm, KACE, NLMIS, ALIN, RATIN and DrumNet.
- DrumNet - link farmers to credit suppliers, agro-input dealers & buyers via an ICT-based platform to improve their productivity.

Problem Statement

- ICT-based MIS projects have been recently introduced to correcting info asymmetries & improve agric performance.
- Theoretically, projects are to reduce TCs, increase awareness of both input & output quality, facilitating access and adoption of superior production technologies, hence raise farm output
- Few empirical studies: Lio & Liu, Houghton, Kiiza et al (2011)
- However, there exists a dearth of empirical knowledge of the impact of such interventions on farm input use and productivity.

Purpose & Objectives

- The purpose of this study was to evaluate the impact of ICT-based projects on smallholder farm input use and productivity in Kenya.

The specific objectives of this study were:

- To assess the impact of participation in ICT-based MIS projects on the use of agricultural inputs.
- To assess the impact of participation in ICT-based MIS projects on land and labour productivity

Hypotheses

The tested hypotheses were that:

- Participation in ICT-based MIS project has no effect on the use of agricultural inputs.
- Participation in ICT-based MIS project has no effect on the productivity of land.
- Participation in ICT-based MIS has no effect on the productivity of labour.

Justification

- Contribution to pioneering literature on the impact of ICT-based projects
- Productivity-Increase has potential to enhance food security lift smallholder farmers from poverty.
- Improved agric performance crucial to achievement of Kenya Vision 2030

Study Context

- This study was part of a wider project carried by eARN-Africa
  - Evaluate the effectiveness of ICTs in smallholder farming

Study areas

- Kirinyaga, Bungoma and Migori counties
  - Some of the farmers had participated in ICT-based projects
  - Characterized with poor access to markets & reliance on agric
  - Diversity of socio-economic and cultural backgrounds and level of commercialization
    - Kirinyaga - export oriented agric (French beans, baby corn)
    - Bungoma - maize and some sugarcane
    - Migori - maize and some sunflower

Sampling Procedure

- Respondents were stratified by participation in ICT-based agric projects

- Multi-stage sampling technique:
  - 1st - identification of area with an ICT-based project in each county
  - 2nd – two separate lists (of all project participants and all non-participants) obtained in every area
  - 3rd – sampling of respondents from the two lists using probability proportionate to size sampling
- ✓ 144 participants and 231 non- participants (375 farmers)
- Data collection: personal interviews using pre-tested question'

Methodology- Theoretical Framework

- The fundamental problem of impact evaluation is the problem of missing data (missing counterfactual).
- Yet it is necessary to observe the counterfactual to assess the impact of "treatment" on any individual pop'n unit.
- Basic evaluation eqn. compares outcomes Y *across* treated and non-treated individuals *i*

$$Y_i = \alpha X_i + \beta D_i + \mu_i \qquad (1)$$

- This OLS approach is likely to generate biased estimates, it assumes that participation in ICT-based MIS projects is random

Methodology

- Assuming a risk neutral farmer, index function to assess participation is given by:

- $R_i = \gamma X_i + \varepsilon_i$ (2)

- Participation is when expected utility is greater

- PSM compares the outcomes of participating and nonparticipating households with similar propensity scores to obtain the program effect (Rosebaum & Rubin, 1983)

Methodology

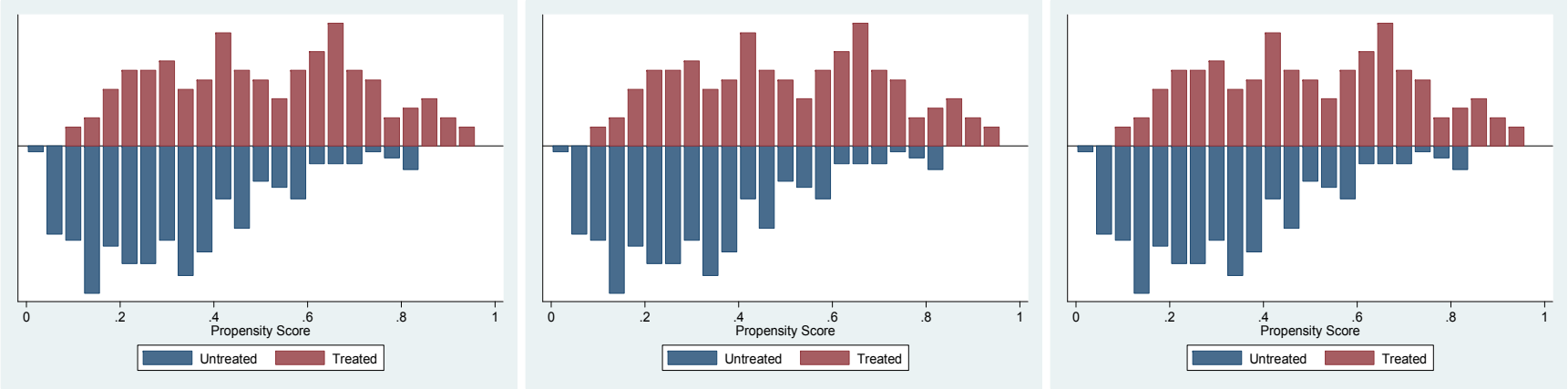
- PSM has 5 Steps: Baker (2000)
  - ✓ Obtain Propensity Scores – Logit model used
  - ✓ Undertake a matching quality test (NNM, RM & KBM used)
  - ✓ Identify common support assumption
  - ✓ Estimate the treatment effect: $ATT = E(Y_1 - Y_0 \mid D = 1)$
  - ✓ Sensitivity analysis to check if the influence of an unmeasured variable on the selection process is so strong to undermine the treatment effect.

Results and discussion
Logit regression results for P-score estimation

Dependent variable Participation in ICT	Coefficient	P-value
Age (years)	**0.12****	**0.035**
Gender	-0.01	0.984
Household Size	-0.03	0.690
Distance to local Market (Km)	0.10	0.184
Number of crops	**0.22*****	**0.007**
ICT tool (mobile phone) user	**1.01*****	**0.008**
Education (years of formal education)	0.01	0.760
Group Member prior to project	**0.58****	**0.041**
Land Size prior to project	**0.12****	**0.034**
Bungoma	**1.27*****	**0.000**
Migori	-0.14	0.696
Constant	-6.30***	0.000

Results and discussion

- P-value of the logit model = 0.000 model fit the data well



- Distribution of the propensity scores and the region of common support

Results and discussion

Impact of participation in ICT projects on input use and productivity-PSM results

Outcome	ATT (N)	T-stat	ATT (R)	T-stat	ATT (K)	T-stat
Seed /acre	359.21**	2.35	285.41**	2.25	282.45**	2.17
Fertilizer/acre	1035.10***	2.61	1009.86***	3.08	952.67***	2.84
Manure/ acre	33.79	1.01	20.12	0.59	19.92	0.57
Herb/pest /acre	-9.85	-0.14	-58.68	-1.10	-50.83	-0.91
Hired labour/acre	- 6.10*	-1.68	-6.11**	-2.16	-6.46**	-2.19
Family labour/acre	-13.49***	-2.99	-6.99**	-2.00	-7.95**	-2.19
Output / acre	8605.84***	3.30	7007.14***	3.31	7160.28***	3.28
Output / man-day	406.95***	5.25	367.46***	5.22	374.85***	5.24

Note: t-values are significantly different from zero at ***1%, **5% and *10% level

Results and discussion

- Positive and significant impact on use of purchased seed, fertilizer. Negative and significant impact on labour
- Positive and significant impact on land and labour productivity
- Results indicate – participation in ICT projects improves the use of non-labour inputs, labour and land productivity.
- However, participation in ICT project reduces use of labour.

Tests for robustness of results

	Mean bias b4	Bias after	% bias reductn	Pseudo R^2 b4	Pseudo R^2 after	P-value LRChi b4	P-value LRchi
NNM	29.60	5.11	82.7	0.156	0.011	0.000	0.978
RM	29.60	12.93	56.31	0.156	0.038	0.000	0.287
KBM	29.60	9.33	66.48	0.156	0.022	0.000	0.803

Rbounds Sensitivity Analysis to test for hidden bias

The critical levels of Γ- gamma at which the causal inference of a significant impact of participation may be questioned.

Lowest Γ- gamma values 1.15 – 1.20 , Highest 5.95 – 6.00
Results indicate that the impacts are robust

Policy implications

- Enhance coverage of ICT projects in rural areas to improve inputs use & productivity
- Promote access to information, besides yield augmenting technologies
- Improve infrastructure to enhance usage of ICT (especially mobile phones) in rural areas [e.g. improve mobile phone network coverage, rural elect' prog to allow access to power for charging ICT devices]

Thank You