Impact of land certification on tree growing on private plots of rural households in Ethiopia

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Introduction

- Sustained agricultural growth important for poverty reduction in Africa due to the significant role of the sector

- Performance of agriculture depends, among others, on appropriate investment

- Investment in turn depends on factors such as tenure security

Intro

- Land tenure given considerable emphasis recently
- For example, its importance has been noted by:
  - Commission for Legal Empowerment of the Poor
  - Commission for Africa (2005)
  - NEPADs Comprehensive African Agricultural Development
  - UN millennium Project (2005)
  - Poverty Reduction Strategy Papers of many African countries

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Intro

- In rural areas of Ethiopia a low-cost land certification and registration launched in four big regions since 1998/9

- The largest land certification program in the last decade in Africa and possibly in the world

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Intro

- There are limited studies on the impact of these programs on investment and agri. Productivity

- Holden et al. (2009): effect on soil cons., tree growing and agri. productivity in Tigray region

- Deininger et al. (2009): effect on soil conservation and agri. productivity in Amhara region

Intro

- Studies suggest results are not uniform (Deininger and Feder 2009; Place 2009)

- The impact of land tenure security/certification could depend on:
  - types of investments
  - available infrastructure, and
  - political setting of a region/country

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Intro

- Ethiopia:
  - Different measures of tenure in-security used in the past
  - Land certification may be different
  - Studies on impacts of land certification (especially on tree growing behaviour) are limited but growing

Objectives

- To assess how past tenure reforms contributed to tenure insecurity and disincentives to invest

- To examine whether land use restrictions have affected tree planting

- To analyze the effect of land certification on tree growing behavior on private plots of rural households

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Hypotheses

- Past tenure reforms in the form of land redistributions have created tenure insecurity

- Tenure insecurity has undermined investment in trees

- Restrictions on planting of eucalyptus on arable land have discouraged tree planting

- Requirements to plant trees on steep slopes have encouraged investment in trees

- Land certification has stimulated tree planting

Data (Amhara region)

- Panel data collected from Amhara region by the EfD center in Ethiopia (EEPFE) in collaboration with AAU and WB (in 2002 and 2007)

- 14 sites, over 1700 households

- Data on relevant variables collected in both rounds including:
  – certification and
  – tree growing decision as well as number of trees grown

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Data (Tigray)

- 16 communities

- Stratified by market access, population density, access to irrigation and agro-ecology

- 25 households from each community with information from all plots surveyed in 1998, 2001, 2003, 2006 and 2010

Methodology

- The rich panel data will allow us to control for time-invariant unobservable heterogeneity at different levels
  - village
  - household-plot

- We use a combination of non-parametric and parametric methods

Methodology

- Propensity score matching

- Household random and fixed effects and interval regression

Methodology

- Previous research on tree planting modeled farmers' participation in tree planting as a function of a number of variables including
  - economic
  - social
  - demographic
  - institutional
  - plot level and
  - others (e.g., agro-ecology indicators such as village dummies)

$$(4) \; I^P_{hpt} = \alpha_0 + \alpha_1 Q_{hpt} + \alpha_2 C_{hpt} + \alpha_3 I^F_{hpt} + \alpha_4 Z_{ht} + \alpha_5 Z_v + \alpha_6 \left(C_{hpt} - C_{hpt} \right) + \alpha_7 T_t + \zeta_h + e_{hpt}$$

where:

I^P_{hpt} is private investment on plot p of household h in period t,

Q_{hpt} is a vector of plot level time-varying biophysical characteristics,

C_{hpt} is the actual certificate variable,

C_{hpt} is the predicted certificate using alternative approaches,

$\left(C_{hpt} - C_{hpt} \right)$ is the certificate error variable with alternative approaches,

I^F_{hpt} is a public investment dummy on plot p of household h in period t,

Z_{ht} is a vector of household characteristics,

T_t is a time trend variable,

ζ_h is an alternative error component,

e_{hpt} is the transitory error component.

Results

Table 1. Descriptive statistics (Amhara)

Variable label	Mean	Std. Dev.
Total number of trees owned by hh	138.29	531.02
Number of plots with certificate	0.36	0.48

Table 2. Impact of certification on tree growing (PSM results) (Amhara)

Algorithm	Mean outcome		ATT
	Certificate	No-certificate	
Nearest neighbor matching	4.053	3.239	0.8138 (3.29)***
Kernel based matching	4.053	3.213	0.8400 (5.94)***

Table 3. Random effects model interval regression (Amhara)

Variable description	Coef.	Std. Err.	P-value
Household received certificate	4.42	0.19	0.00
Model chi-square	13745.6		0.00
Number of observations	2735		

Table 4. Descriptive Statistics for Key Investment Variables (Tigray)

Variable	Certificate			No certificate			t-test
	Mean	St.Error	N	Mean	St.Error	N	
Eucalyptus trees	5.05	1.26	924	1.37	0.71	168	>***
Indigenous trees	15.78	4.20	939	1.99	0.59	169	>***
Young trees	5.97	1.19	928	0.95	0.40	168	>***
Tree seedlings	9.08	1.18	933	3.86	2.01	167	>**

Table 5. Impact of Certification on Plot Level Investments in Trees (Tigray)

Variables	Eucalyptus trees	Indigenous trees	Young trees	Tree seedlings
Certificate	58.740**	135.873**	47.110**	57.308**
	(26.57)	(56.04)	(20.49)	(22.47)
Year	26.387***	91.987***	18.667***	0.464
	(4.23)	(10.60)	(3.68)	(4.18)
Public investment	-27.898*	-24.185	-37.428***	-34.055***
	(15.29)	(37.11)	(12.60)	(13.03)
Homesteadplot	66.740***	224.798***	73.061***	102.008***
	(16.85)	(44.60)	(14.21)	(14.85)

Concluding remarks and future work

- Positive effects of certification on tree growing

- Result holds even with tree planting restrictions on arable land

- Negative correlation between public investment in conservation structures and stock of trees (perhaps due to tree planting restrictions)

Concluding remarks and future work

- More trees on homestead plots (perhaps because of tenure insecurity and risk of theft)

- More work to refine results and use more recent data

- Need to look into comparability
  – between Tigray and Amhara regions and
  – across countries

Thank you!
Ameseginalehu!

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