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Asset, Property Rights and Forest Dependency: Evidence From Machine Learning Analysis - June 2019

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Introduction

- In many poor regions, the poor heavily depend on the income derived from the natural resource base, such as village forests, grazing land and fisheries

    - These resource typically managed openly, its lower entry costs relative to that of alternative income earning sources,

    - The poor often lack access to other income generating resources, such as land, human capital and physical capital.

    - Compared to alternative income sources, natural resource earns low yet less risky income (forests as insurance source)

    - Major cause of overuse (degradation) of the resource

Introduction

- In fact, the key hypothesis of the poverty-environment nexus
  - The poor are both agents and victims of environmental degradation (Wunder, 2001, Fisher, 2004 and Anglesen, 1999).

- Major implications
  - asset poverty alleviation ameliorates environmental outcomes, and vice versa
  - development of financial (credit and insurance) markets or lack of for reliance on forests
  - well-defined property right for breaking the poverty-environment trap by installing restriction and spurring incentives

Introduction contd

- Anecdotal empirical evidences of African and Asian studies on some of these propositions
  - Determination of the forest dependency level (Monica, 2004, Malmo et.al, 2008 and Cavendish, 1999)
  - Asset poor households depend on forest than asset rich households (Monica, 2004; Beyene and Koch 2011)
  - Education deters dependency of on forest (Garekae, 2017 and Jannat, 20018)
  - Forest dependency encourage participation in community forest management (Jumbe and Angelsen, 2007)
  - The rich collects more forest products than the poor (Adhikari, 2005)

Motivation

- Major gaps in this literature
    - Didn't accounted for asset heterogeneity
    - Rarely investigated the effects of credit constraint on forest dependency
    - Rarely accounted for typology of forest property right
    - Nearly all the studies suffered from weaker identification strategies and model uncertainty

Motivation

- In this paper, we respond to these paucities in literature as follows
  - We test the forest-dependency-asset poverty hypotheses while accounting for differentiated form of assets (liquid wealth, agricultural productive asset and human capital) and typology of forest property rights
  - We ascertain the impacts of credit constraint on forest dependency
  - Using machine learning approach we resolves the problems of model selection uncertainty and structural parameters identification
  - Our study is based on data collected from 377 randomly selected households (200 PFM and 177 non-PFM) and five villages for each

Econometrics

- Common property right as an endogenous treatment
  - Non-random assignment mechanism of the treatment
  - Model selection dilemma; which available to include in the model
    - as controls
    - as instruments
  - this question presents us with a difficult choice
  - researchers traditionally include all available variable ("kitchen sink" approach) or employ stepwise regression of progressively including or dropping variables
    - select few controls; model suffers from **omitted variable bias**
    - select too many variables; the model suffers from **overfitting**

Econometrics contd

- Recent years has seen machine leaning approach to resolve this problem

    - Least Absolute Shrinkage and Selection (LASSO) regressions method of machine learning, recently developed by Belloni et.al, (2012 & 2014), Belloni et.al, (2016) and Chernozhukov and Hansen, 2015)

    - These methods are increasingly being used as a practical solution to the problem of variable/model selection as well as controlling for endogeneity.

    - We followed this approach to resolve model uncertainty in our analysis

        - Selection of relevant determinants of forest dependency
        - Selection of instruments for endogenous treatment variable

Data

- Forest dependency: share of income derived from non-timber forest products (NTFPs),

- Different controls of forest dependency; household covariates; assets and demography, institutional (property right) and market access

- Assets; three majors asset categories

  - Agricultural productive assets
  - Human capital
  - Liquid/illiquid unproductive

Data

- Measures of assets.
  - index of household education; max education in a household and hh education,
  - index of agricultural asset; land holding and livestock holding
  - measure of liquid wealth (corrugated house ownership)
- Property right as an endogenous treatment
- Instruments; distance to PFM, collection action experience household age labour force, land holding and Menja

The data

Variables	Mean	sd	min	max
forest depend	0.1167	0.1644	0	0.859
treatment	0.582	0.494	0	1
dstpfm (minutes)	31.45	38.80	3	215
othpartcp	0.0713	0.257	0	1
hhage_b	36.24	13.55	22	62
fmlfrc_b	1.270	0.498	0	3
mlfrc_b	1.189	0.510	0	3
lndsz_b	1.946	1.401	0	4.5
offrm_b	0.0430	0.203	0	1
crdtdd	0.137	0.344	0	1
hhsize	5.531	1.822	2	13
menja	0.581	0.494	0	1
corr_roof	0.229	0.420	0	1
agric_cap	3.90e-09	1.105	-1.742	3.015
human_cap	3.39e-09	1.284	-2.347	2.804
human_cap_sqr	1.647	2.019	0.000196	7.862

Results

Variable	Common property	open_access
corr_roof	-0.0192	-0.0490***
	(0.0158)	(0.0143)
agric_cap	-0.00592	0.0600***
	(0.00429)	(0.00843)
human_cap	-0.0328**	-0.000115
	(0.0150)	(0.00332)
crdtdd	0.0324	0.0115
	(0.0251)	(0.0146)
sex	-0.00422	-0.0805***
	(0.0290)	(0.0192)
hhdstroadmin	0.000110	-0.00117***
	(0.000390)	(0.000185)
hhdstwnmin	-0.000814***	0.000353
	(0.000168)	(0.000226)
dstpfm	0.000313	0.000547***
	(0.000296)	(0.000134)
agea	-0.000968	0.000879***
	(0.00117)	(0.000300)
human_cap_sqr	-0.00133	-0.00459***
	(0.0152)	(0.00173)
ATT	-0.0453**	
	(0.0160)	
Constant	0.172*	0.126***
	(0.0896)	(0.0325)
Observations		532

Results

Variables	Lasso_IV
Treatment	-0.0659***
	(0.00917)
corr_roof	-0.0160**
	(0.00797)
agric_cap	0.0272***
	(0.00303)
human_cap_sqr	-0.00354*
	(0.00221)
credit_constraint	0.0513***
	(0.0118)
Constant	0.107***
	(0.00560)
Observations	375

Conclusion

- Observations
  - Forest dependency varies with asset types and property right regimes
  - Income risk in agriculture drives forest dependency both as part of income smoothing or consumption smoothing or both
  - Forests as source of liquidity signifying the importance of credit market imperfection in the region