

# Lectures in Growth and Development

(M. Ghatak, LSE, 2018-19)

Ec428

## **Topic 8: Land & Property Rights - Evidence**

These notes are not guaranteed to be error free. If you spot one, please let me know.

Also material marked with \*\* means optional material.

## Introduction

- Now we look at empirical evidence on the topic.
- Our main focus will be on agriculture
- In a reduced form sense, all of the theoretical channels identified above would suggest a link between the level of output and property rights.
- In all cases, the level of investments, in the stylized model  $e$ , is (weakly) higher when property rights are more secure.

- However, as we showed in the example of guard labor, there can also be a re-allocation of effort to or from more productive activities.
- The two trade channels are quite specific in the way that they suggest that improved property rights will have an impact.
- In the first case, we should see a deepening in rental or sale markets for assets.
- In the second, we should see more use of credit among those whose property rights to collateralizable assets are improved.
- To investigate these ideas empirically requires going beyond looking solely at the effects on output (e.g., asset value)

- A second issue is concerning heterogeneous treatment effects
- To illustrate, consider the basic freedom from expropriation argument:

$$\frac{\partial e^*}{\partial \tau} = -\frac{(1 - \tau) A^2}{2}. \quad (18)$$

- This implies that factors that make  $A$  heterogeneous across producers such as wealth, access to other inputs and/or markets will tend to affect the marginal effect of an improvement in property rights.
- The third key issue whether in micro or macro data is how to identify the causal effect of changes in property rights on investment or productivity.

- Macro-evidence tends to look at countries as units of analysis, sometimes regions within countries.
- Micro-evidence looks at the effect of property rights using data on firms and/or households.
- The core empirical approach is to run some kind of regression of the form:

$$y_{it} = \alpha + \beta r_{it} + \gamma x_{it} + \varepsilon_{it} \quad (19)$$

- $y_{it}$  is a measure of an outcome for cross-sectional unit  $i$  at date  $t$ ,  $r_{it}$  is a measure of property rights and  $x_{it}$  are appropriate controls and  $\varepsilon_{it}$  is an error term.

- Usual identification concerns: omitted variables could be driving a simple correlation between the two, such as better governance could be driving both secure property rights and a more investment-friendly environment.
- The other issue is that of reverse causality: investment itself could affect the nature of property rights.
- Exploit changes in rights over time and space which allow researchers to explore the implications of changes in rights before and after with an explicit time dimension.

## **Property Rights and Agricultural Productivity**

- Our main emphasis will be the effect of property rights reform in the agricultural context
- There are some important papers about how improving property rights allow (all of them are in the non-required part of the reading list):
  - People to migrate to the cities (e.g., the de Janvry et al 2015 )
  - Increase labour supply among urban slum-dwellers by not having to guard their property (Field, 2007)
  - Improve investment in residential property among urban slum-dwellers (Field, 2005 and Galiani and Schargrodsky, 2010)

- Our focus is on agriculture as it occupies a key place in the economy of developing countries
- There may be many trajectories for development but one feature is common to all.
- It must involve a major reallocation of productive resources, including labour and land, from agriculture to manufacturing and services.
- The historical experience of today's prosperous nations confirms this without exception.
- In the United States, the share of employment in agriculture (farming, forestry, and fishing) was 56% in 1850

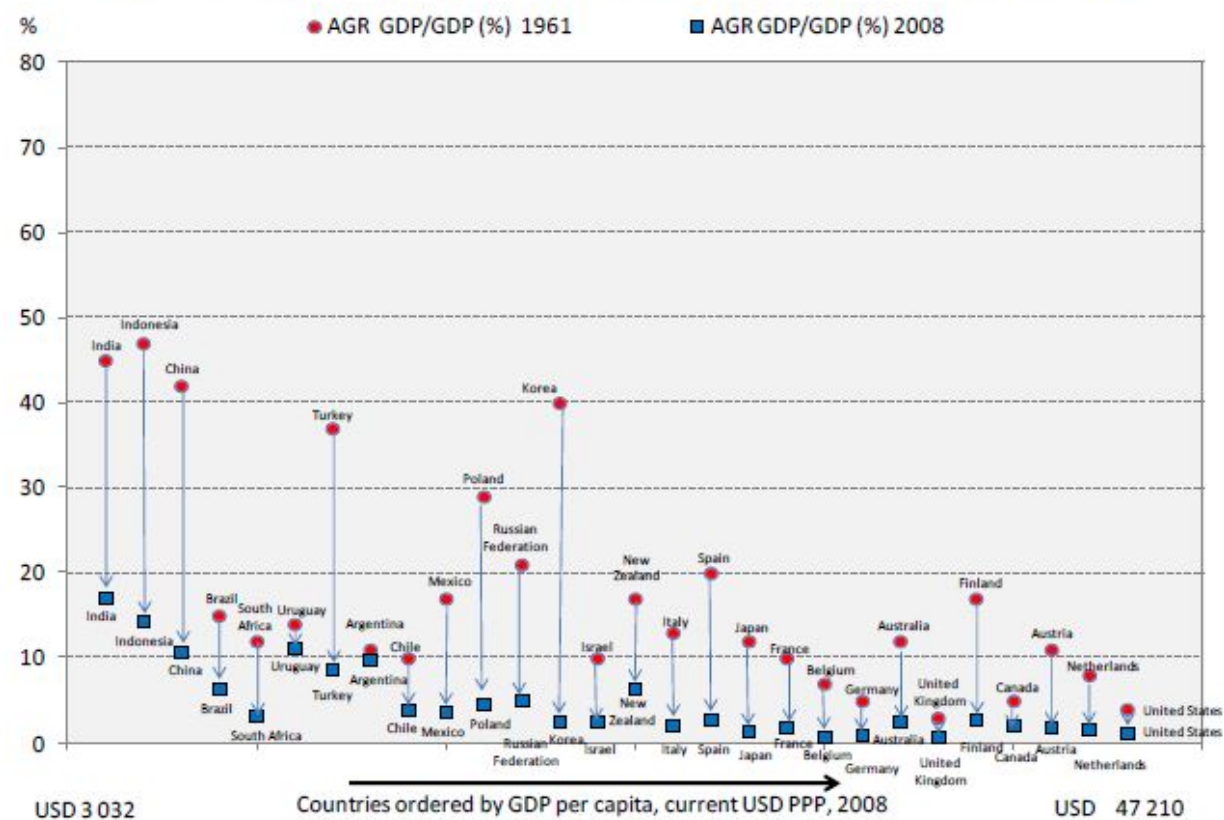
- Most recent figures put share of employment at 0.7%, while the share of agriculture in GDP is 1.1%
- In Britain, which was well into the industrial revolution by the mid nineteenth century, the employment share was already 22% by 1840
- Most recent figures put the share of employment at 1.3%, and share of GDP at 0.7%
- In contrast, agriculture still contributes to 17% of India's GDP and employs 50% of the population.
- For China, it is 9% and 33.6%

- The fact that Indian agriculture employs 50% of labour and contributes to 17% of GDP agriculture in India is relatively less productive with respect to agriculture in US
- Given that for the US the numbers are 0.7% and 1.1% respectively, implies agriculture in India is also relatively less productive with respect to non-agriculture (employs 50% of labour, contributes 83% of GDP)
- Yet it provides the livelihood of a majority of people in LDCs
- See Figure 1 below from a recent OECD report (Brooks, 2010)
- Figure 2 from same report gives evolution of employment share

- Table from Gollin, Lagakos, Waugh (AER Papers and Proceedings, 2014) confirms enormous difference in agricultural productivity
- A striking result arises when combining the left panel of Table 1 with the right panel.
- Combining an output-per-hectare difference of a factor of 2 (we will be conservative here) with a hectare per worker difference of a factor of 30 implies an output-per-worker difference of a factor of 60 between the richest and poorest 10 percent of countries.
- That is, cross country differences in output per worker of these staple grains are of the same (or larger) order of magnitude as the agriculture-sector gross output-per-worker differences reported above

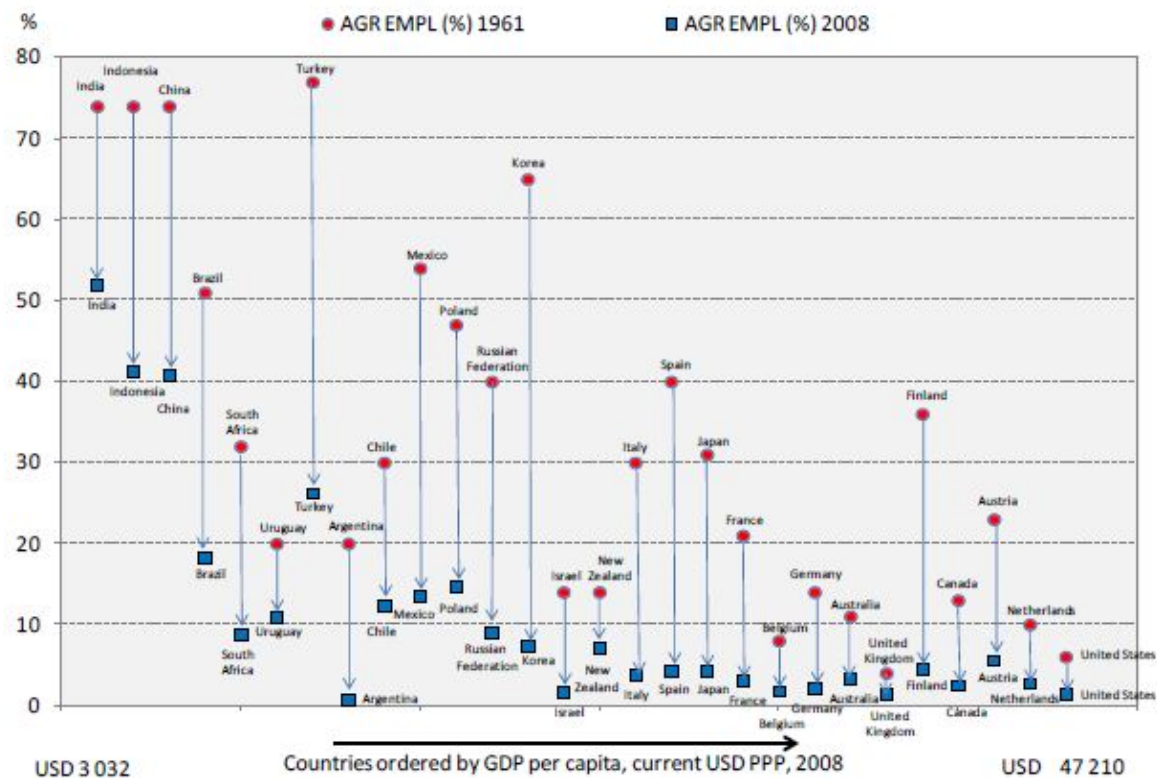
- The gap in per capita GDP figures is less than this
- Also, recent work by Rodrik (QJE 2013) that shows strong convergence within manufacturing across countries
- Aggregate convergence fails due to the small share of manufacturing employment in low-income countries and the slow pace of industrialization.

Figure 1. Evolution of agriculture's share of GDP in various countries (1961 to 2008)



Source: FAO, 1999; WDI, 2008; IMF, 2008.

Figure 2. Evolution of agriculture's share of employment in various countries (1961 to 2008)



Source: FAO, 1999; WDI, 2008; IMF, 2008.

TABLE 1—TONS PRODUCED PER HECTARE AND HECTARES PER AGRICULTURAL WORKER

	Tons produced per Hectare			Hectares per worker
	Maize	Rice	Wheat	
Top 10 percent	9.2	8.1	4.9	44.6
Bottom 10 percent	2.0	2.9	2.0	1.4
Ratio of top to bottom 10 percent	4.7	2.8	2.5	31.2

*Notes:* Land is measured as hectares of arable land. Workers are agricultural workers and are measured as the total number of economically active persons involved in agriculture.

*Source:* FAO.

## Reasons for Low Productivity in Agriculture

- Backward technology, infrastructure, "bad policies" one sets of reasons (but they afflict other sectors too)
- Also, if trade in agricultural products were allowed (which is prevented by protectionist policies in the developed world, the gap in agricultural productivity would be less since demand would go up for developing country agricultural products
- Insecure property rights, transactions costs, and inefficiencies of agricultural organization constitutes another set of factors.

- We will focus largely on the last one.
- In particular, in this lecture we will focus on institutional reform, in particular, concerning, property rights

- The following types of **property rights reforms** that have been studied in the literature in the agricultural context
  - **Land reform** - redistributing land from the land-rich to the land-poor
  - **Tenancy reform** - Giving tenants greater rights in a landlord-tenant context
  - **Titling** etc that improves security of tenure, reduces need for guard labour, facilitates rentals and sales, and creating collateral (studied in Topic 7)
- We will mainly study the last element as there is more recent research on that, including some RCTs
- Briefly discuss below the first two channels

## Property rights reforms - land and reform

- Some key stylized facts about agricultural organization in developing countries are
  - Small farms are more productive than large farms - inverse farm-size productivity relationship (Berry & Cline, 1979)
  - Sharecropping is an important form of agricultural organization, even though it is less productive than owner-cultivation or fixed rent tenancy
- These two facts would seem to suggest that land reform - other than promoting equity - can also raise productivity

- Indeed, there is some evidence that land reform, tenancy reform policies have improved productivity
- One explanation for the first fact is diminishing returns to land
- But land market should take care of it.
- One explanation for the second fact is agency costs
- But once again, why does not the land market get rid of these inefficiencies?

- Consider a producer
  - Values consumption and leisure  $u(c, l)$
  - has some land and labour endowments  $\bar{L}, \bar{T}$  and production technology  $y = f(L, T)$
- Wage rate is  $w$  and rental rate is  $r$
- His profits are  $\pi = y - wL - rT$

- His problem is:

$$\max_{c,l} u(c, l)$$

subject to

$$c = \pi + w(\bar{L} - l) + r\bar{T}$$

or,

$$c + wl = f(L, T) - wL - rT + w\bar{L} + r\bar{T}.$$

- Notice right away that in his choice of  $L$  and  $T$  his preferences or endowments do not matter
- Could hire in labour or hire out, same for land

- Separation of profit maximising behaviour as producer, and utility maximizing behaviour as consumer
- If this breaks down, then farms with lower  $\bar{T}$  will have different productivity than farms with large  $\bar{T}$
- With frictionless markets, factors will be efficiently allocated and farm sizes will adjust endogenously

- What creates frictions in the land or labour markets?
- Agency costs (arising from informational problems) and transactions costs (arising from problem of commitment and enforcement)
- This is similar to what we saw for credit markets (Topic 5)
- Will turn to tenancy later in this lecture - Banerjee, Gertler and Ghatak (2002) & Burchardi et al (2018)

## **Property rights reforms - formalizing land titles**

### **1. Property Rights and Investment Incentives in Ghana (Besley JPE 1995)**

- Ghana is in a transition between a traditional system of land rights (which emphasizes claims of the community) and a modern one (which emphasizes

the claims of the individual and grants ability to transfer the land without needing a community sanction.

- Compares two regions on Ghana
- The first is a cocoa growing region-Wassa in the west of the country

- Here, he investigates the decision to plant trees.
- Most of the land is owned, rather than leased or rented.
- The second region is Anloga in the extreme southeastern part of the country, where farmers specialize in growing shallots (a small type of onion) on very small plots of land.
- Farmers here make a number of different land improvements which is what the study takes as measures of investment (e.g., drainage, irrigation, tree plantings, manuring, land excavation)
- The land rental market is quite active in Anloga, and a good deal of the land is not owner-operated.

- The data used here display sufficient variation in the rights that individuals enjoy on different fields to test whether property rights matter for investment decisions.
- These are: to sell, rent, mortgage, pledge, bequeth, gift
- In some cases one has to take permission of village authorities to exercise these rights, in other cases that is not the case
- He refers to these as "Rights with Approval" and "Rights without Approval"
- For the most part, he uses the number of rights (with or without approval) as the key measure of property rights

- He has household specific information (such as average age, formal education of head of household, number of fields per household)
- He has field specific information on property rights, investments and some other information (e.g, how field was acquired, soil quality etc)
  - Let  $y_{ijk}$  be the investment of type  $k$  by household  $i$  (total  $N$ ), in field  $j$  (total  $m_i$  for household  $i$ ),
  - Let  $R_{ij}$  is rights enjoyed by household  $i$  in field  $j$
  - Let  $z_{ik}$  be household specific characteristics
  - Let  $x_{ij}$  be field specific characteristics

- He runs a regression of the following form:

$$y_{ijk} = \sum_{i=1}^N \alpha_{ik} z_{ik} + \beta_k R_{ij} + \sum_{j=1}^{m_i} \gamma_{ik} x_{ij} + \varepsilon_{ijk}$$

- Key concern: a reverse causation has commonly been suggested in which investments on a piece of land can secure the owner's rights to the land.
- Also, measure rights can capture omitted variables such as investment ability or knowledge by household  $i$
- A tighter specification - put in household fixed effects

$$y_{ijk} = \alpha_{ik} + \beta_k R_{ij} + \sum_{j=1}^{m_i} \gamma_{ik} x_{ij} + \varepsilon_{ijk}$$

- Use instruments: mode of acquisition, whether land has title deed, whether there was litigation on the field, and whether there were trees at the time of acquisition
- The assumption is they are correlated with property rights, but not with investment outcomes

- For Wassa (about 1074 field level observations, & 217 household level observations)
  - Looks at the investment decision to plant trees
  - Finds that an extra right with approval from lineage raises probability of investing by 2.5% and is significant at 5% level
  - With instrumentation, the effects go up.
  - With household fixed effects, with and without instruments, the results are robust
  - Investment is indeed increased by better land rights.

- In Anloga (494 field level observations, & 117 household level observations)
  - Without instrumenting and without household fixed effects, the effect of property rights on investment is positive
  - But putting in household fixed effects and/or instruments, the results lose significance
- Could be due to smaller sample or the fact the property rights are evolving very closely with investment, and so its hard to tease out any causality
- As to which mechanisms linking property rights to investment are at work, this study is unable to find strong support for any particular mechanism, but on the whole, the support is the weakest for the collateral-based view.

## 2. Formalizing Rural Land Rights in West Africa : Early Evidence from a Randomized Impact Evaluation in Benin (Goldstein et al, 2015)

- Presents early evidence from the first large-scale randomized-controlled trial of a land formalization policy. Specifically, we examine the link between land demarcation and investment in Benin.
- This study makes two central contributions to the literature:
  - first, exploits early evidence to decompose the process of formalization, and look at the causal effect of land demarcation on on-farm investment behavior;
  - second, overcomes the typical identification challenges in this literature by exploiting the first large-scale randomized controlled trial (RCT) of a land formalization program

# Motivation (I)

- Throughout much of rural sub-Saharan Africa, customary land tenure systems continue to hold sway
- Often characterized by high tenure insecurity & low investment levels
- Evidence on the primary policy response, land titling, is mixed in Africa (Fenske 2011)
- Need for more flexible policy tools to embed customary rights & stimulate investment

# Motivation (II)

- Growing body of evidence on relationship between women's tenure security & increased agricultural investment & productivity (Goldstein & Udry 2008) & land market participation (Holden et al 2011) in SSA
- Yet evidence on gender impact of land formalization & titling programs is also mixed (Lastarria-Cornhiel 1997, Ali et al 2011)

# Policy questions

- What is the Benin PFR's impact on tenure security, land market activity, agricultural investment, intra-hh decision-making, & income diversification?
- How do these effects differ by sex? Do customary land formalization programs like the PFR expand or reduce women's access to & control over land, relative to men?

# **PROGRAM OVERVIEW**

# Land in rural Benin

- Customary arrangements
- Tenure insecurity
- Low investment in land
- Conflicts over & unequal access to land
- Thin rural credit markets
- Land markets expanding in the south
- Women typically obtain secondary rights to land via husband



# Benin's

## *Plan Foncier Rural (PFR)*

- Hybrid approach to documentation & formalization of rural customary rights
- Offers community surveying, land adjudication, & land use certificates
- MCC-funded program aims to improve tenure security & stimulate agricultural investment in 40 of Benin's 77 communes

# The PFR process in Benin

- Main steps in each village:
  - Information campaign
  - Parcel surveying & identification of rights-holders
  - Preparation of village land use plans
  - Public review of village land use plan (60 days)
  - Review & approval of land use plan
  - **Certificate (CFR) delivery**

# **IMPACT EVALUATION APPROACH**

# Measuring program impact

- Exogenous treatment: Randomized selection of villages that submit a proposal & meet eligibility criteria (via *commune*-level lotteries) allows for rigorous analysis of impact
- Pre-program balance on observables
- Single-difference intent-to-treat estimates of program impact

# Model specification for impact estimates

- **OLS with village-level intent-to-treat variable:**

$$y_{ijk} = \beta_0 + \beta_1 \cdot t_{jk} + \beta_2 \cdot x_{ijk} + \gamma_k \cdot c_k + \lambda \cdot \text{emicov}_j + \varepsilon_{ijk}$$

- **OLS with added gender-treatment interaction term:**

$$y_{ijk} = \beta_0 + \beta_1 \cdot t_{jk} + \beta_2 \cdot \text{fem}_{ijk} \cdot t_{jk} + \beta_3 \cdot \text{fem}_{ijk} + \beta_4 \cdot x_{ijk} + \gamma_k \cdot c_k + \lambda \cdot \text{emicov}_j + \varepsilon_{ijk}$$

- For parcel (or plot)  $i$ , village  $j$ , and commune/municipality  $k$ :

$t_{jk}$  = Village was randomly assigned to PFR treatment (intent-to-treat)

$\text{fem}_{ijk}$  = Indicator variable for female manager (parcel or plot)

$\text{fem}_{ijk} \cdot t_{jk}$  = Gender interaction term

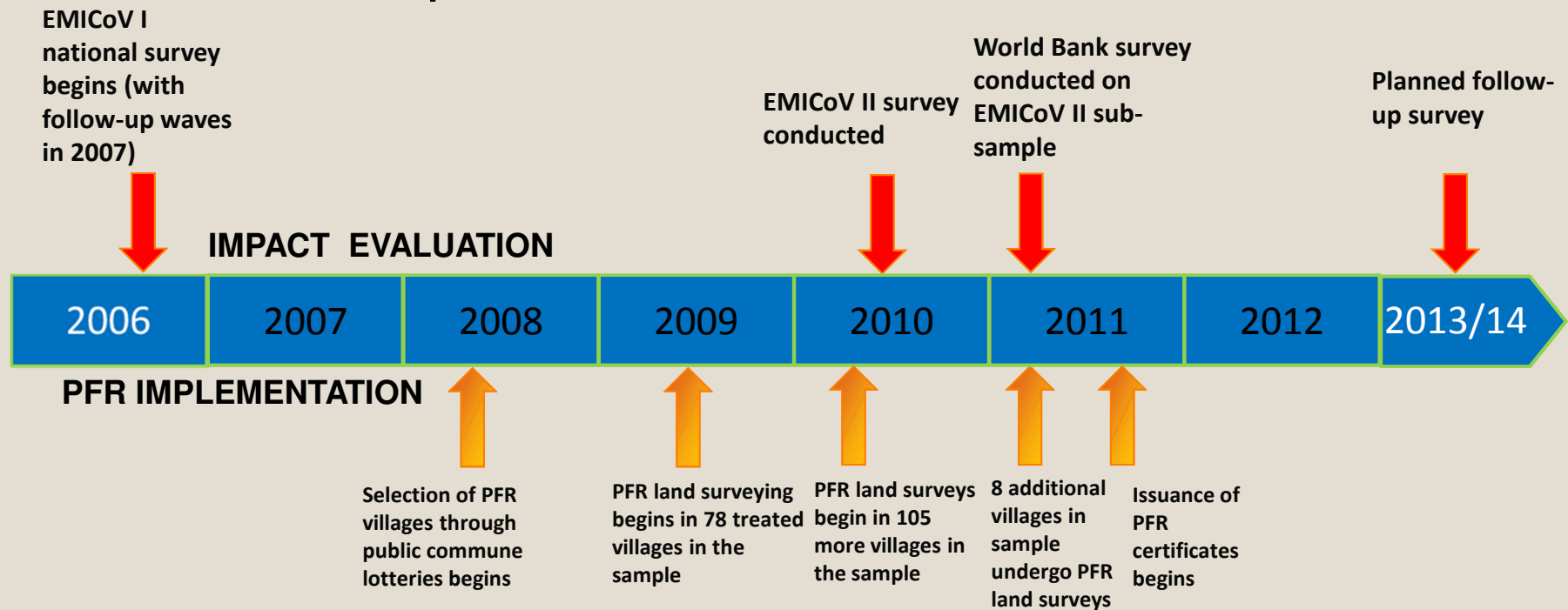
$x_{ijk}$  = Vector of household & parcel (or plot) controls

$c_k$  = commune dummy

$\text{emicov}_j$  = lottery dummy (villages covered by EMICoV 2006 vs. other villages)

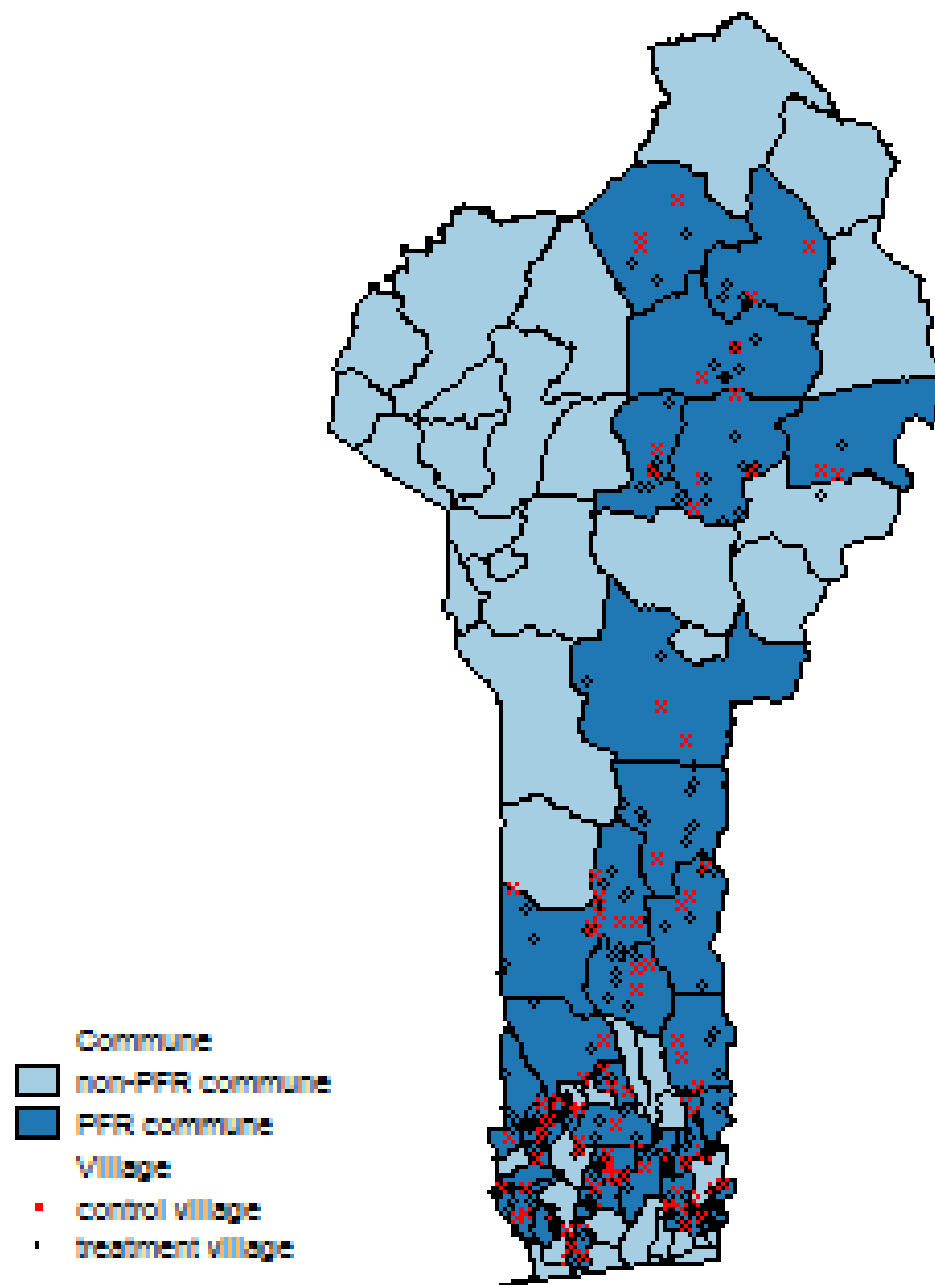
$\varepsilon_{ijk}$  = error term

# Benin PFR impact evaluation & implementation timeline



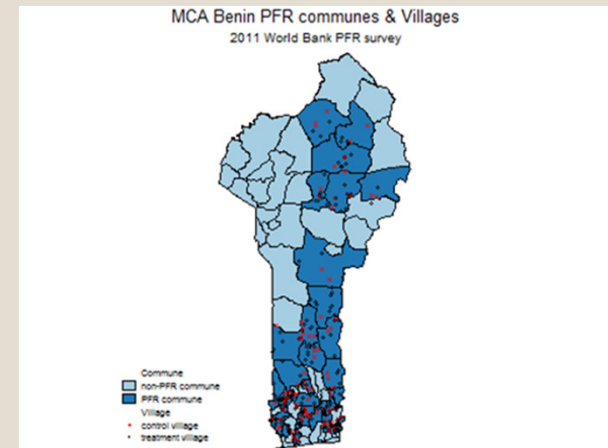
# MCA Benin PFR communes & Villages

2011 World Bank PFR survey



# Data

- 3,500 HH + community survey (2011)
- Rich set of data:
  - Communities
  - Households
  - Parcels/landholdings
  - Farm plots
  - Individual spouses
- 291 villages (193 treatment & 98 comparison)



# OVERALL RESULTS

**Table 6:** Effects of land demarcation activities

	Obs.	Control		ITT	
		Mean	Std. dev.	Coeff.	s.e.
Parcel has clear borders <sup>†</sup>	6,094	0.061		0.270***	(0.02)
<b>Panel A: Tenure security</b>					
Fear of land loss during fallow <sup>†</sup>	6,094	0.116		0.007	(0.01)
Land conflict <sup>a†</sup>	6,094	0.052		-0.009	(0.01)
Perceived land rights					
- A HH member will inherit land	3,582	0.829		-0.007	(0.02)
- The HH head can lend/rent-out/give the parcel	3,582	0.731		0.017	(0.02)
- The HH head can pledge land	3,582	0.719		0.000	(0.02)
- The HH head can sell land	3,582	0.554		0.040*	(0.02)
<b>Panel B: Investment and land transfers</b>					
Investment in tree planting <sup>a†</sup>	6,094	0.040		0.017**	(0.01)
Started fallowing parcel <sup>a†</sup>	6,094	0.010		0.004	(0.00)
Parcel is rented in/out <sup>†</sup>	6,094	0.147		-0.014	(0.01)
- rented in	6,094	0.082		0.002	(0.01)
- rented out	6,094	0.065		-0.016*	(0.01)
<b>Panel C: Agricultural activities<sup>b</sup></b>					
Total land size (ha)	2,972	6.236	13.827	0.320	(0.54)
Participation in agriculture <sup>†</sup>	2,972	0.902		0.006	(0.01)
Share of land size cultivated	2,675	0.538	0.323	-0.001	(0.01)
<b>Panel D: Agricultural production<sup>c</sup></b>					
Type of crop cultivated					
Cereals <sup>†</sup>	6,094	0.505		0.001	(0.02)
Pulses <sup>†</sup>	6,094	0.150		0.003	(0.01)
Roots and tubers <sup>†</sup>	6,094	0.245		-0.005	(0.02)
Vegetables <sup>†</sup>	6,094	0.052		-0.004	(0.01)
Cash crops <sup>d†</sup>					
- annual	6,094	0.037		0.001	(0.01)
- perennial	6,094	0.067		0.026**	(0.01)
Inputs					
- farm labor supply (person-days/ha)	3,994	202.854	261.071	1.690	(9.88)
- fertilizer/high-yield seeds <sup>†</sup>	3,994	0.272		0.018	(0.02)
Output					
- total output (Log USD)	3,677	6.135	1.358	-0.043	(0.06)
- yield (Log USD of total output/ha)	3,677	6.379	1.064	0.023	(0.05)

**Note:** The table shows estimates of village-wide land demarcation activities on several variables. Each row corresponds to an estimation where the dependent variable (reported in the first column) is regressed on a dummy variable equal to 1 when the household lives in a village that carried out a village wide land demarcation activities (see Equation 3). The column "Obs." reports the number of households and the column "Control mean" shows the average level of the dependent variable in the control villages. Column "Coeff. ITT" shows the effect of being in a PFR village.

The standard errors are clustered at the village level and are reported in parentheses. Each estimation includes the lottery pool fixed effects. Significance levels are denoted as follows: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

<sup>a</sup> The reference period is the previous twelve months.

<sup>b</sup> These estimations are performed at the household level; all others are performed at the parcel level.

<sup>c</sup> Yield and inputs are reported for the agricultural season that starts with the main rainy season.

<sup>d</sup> Annual cash crops are cotton, pineapple, and sesame. Perennial cash crops include cashew, oil palm, teak, and acacia trees.

<sup>†</sup> Indicates dummy variables.

# Tenure security

- Initial spike in perceived insecurity, which drops back for earlier PFR waves
- Increase in perennial & tree planting
- No overall effect on land conflicts
  - But increase in reported farmer/pastoralist conflicts among early-wave villages

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## OLS regressions with household / parcel / geographical / lottery controls

VARIABLE	Fear of parcel re-allocation	Fear of parcel being occupied	No fear of losing parcel	Conflict occurred	Planted trees
				on parcel (last 3 years)	on parcel (last 12 months)
Treatment - PFR village	-0.01	0.04**	-0.02	-0.01	0.01*
	(-0.67)	(2.42)	(-0.91)	(-0.99)	(1.75)
Observations	5,473	5,473	5,473	5,473	5,473
Outcome mean	0.206	0.145	0.267	0.0683	0.0583

Robust t-statistics in parentheses. Standard errors clustered at village level. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

# Land markets

- Initial freeze in PFR land markets before CFR issuance: drop in out transactions (sales, renting & sharecropping out) for recently-treated villages

OLS regressions with household / parcel / geographical / lottery controls

<b>VARIABLE</b>	Parcel currently on loan/rented out	HH sold land in last 5 years	Currently easy to rent out plots in this village?	Currently easy to find a buyer for plots in this village?
Treatment - PFR village	<b>-0.01**</b>	<b>-0.01**</b>	<b>-0.04</b>	<b>-0.04</b>
	(-2.33)	(-2.02)	(-1.30)	(-1.32)
Observations	5,473	2,753	2,600	2,516
Outcome mean	0.0115	0.0269	0.500	0.456

Robust t-statistics in parentheses. Standard errors clustered at village level. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

# Investments

- No observed increase in land investment (aside from tree planting)
- But a shift away from rain-fed to riverside land

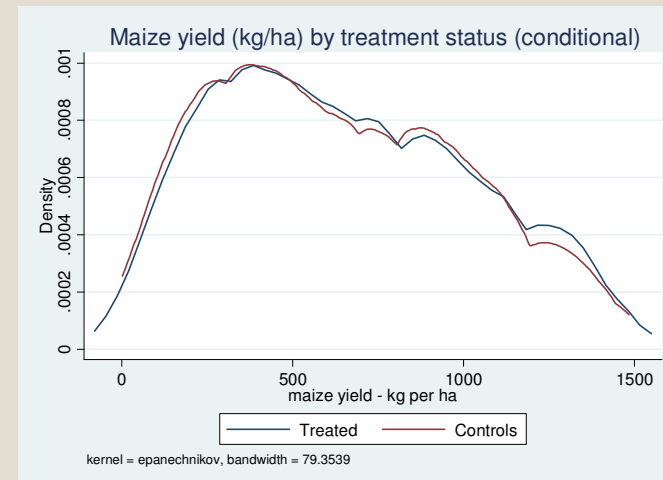
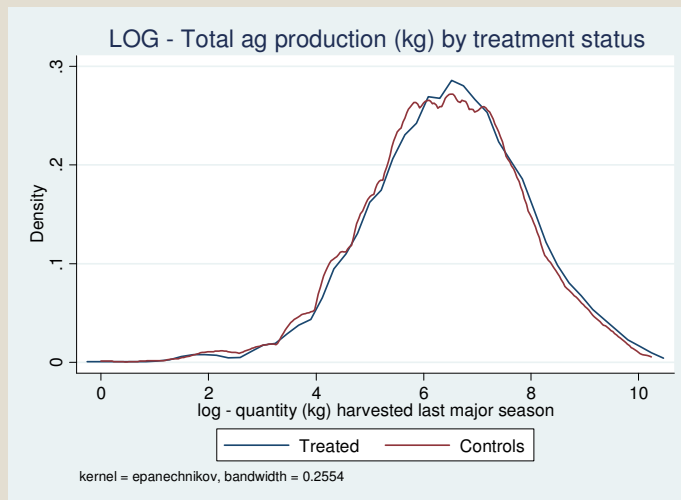
OLS regressions with household / parcel / geographical / lottery controls

VARIABLE	Parcel has at least 1 irrigation/ soil/ tree investment	Parcel water source: rain-fed	Parcel water source: dug well	Parcel water source: river	Plans to leave parcel fallow in next 12 months
Treatment - PFR village	<b>0.02</b> (1.32)	<b>-0.03*</b> (-1.70)	<b>0.01</b> (1.37)	<b>0.02*</b> (1.72)	<b>0.01</b> (0.99)
Observations	5,473	5,473	5,473	5,473	5,473
Outcome mean	0.121	0.854	0.0382	0.0437	0.0559

Robust t-statistics in parentheses. Standard errors clustered at village level. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

# Agricultural production

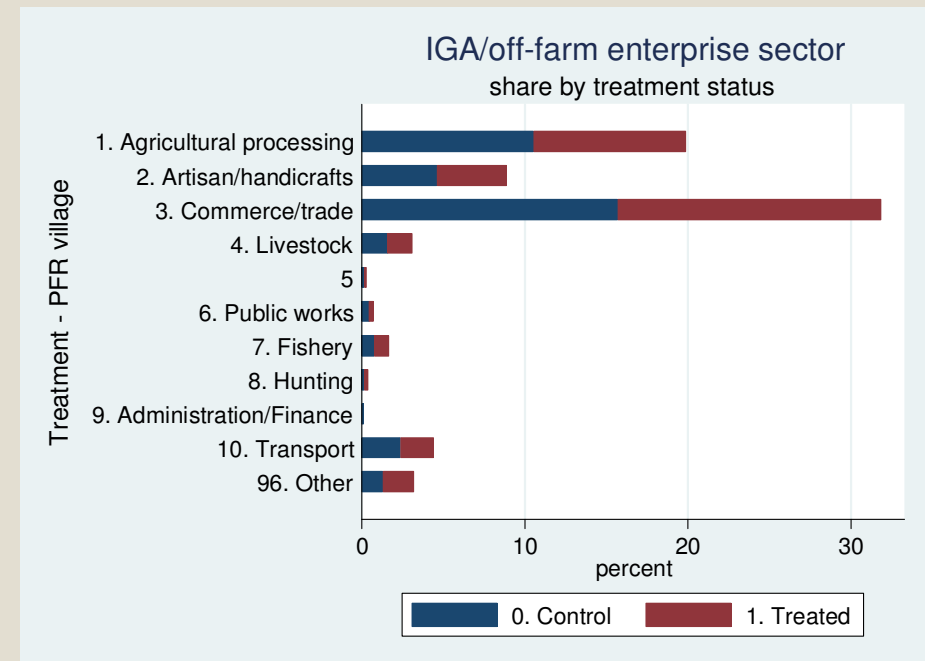
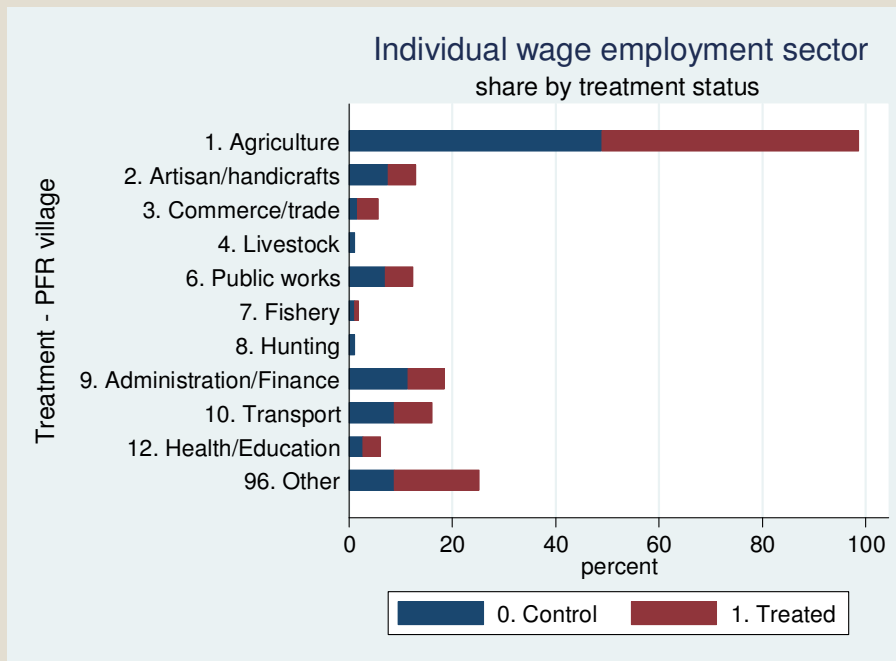
- No increase in average productivity



- Shift towards perennial cash crop (33% increase in oil palm production)

# Off-farm activities

- Drop in paid wage employment for men (return to the farms?)
- No impact on off-farm enterprises



# Institutions

- Initial increase in trust in institutions
- More engaged in village land mgmt

OLS regressions with household / parcel / geographical / lottery controls

VARIABLE	HH head has responsibilities for land management in village	Other HH members have responsibility for land management in village	For problems with your land do you trust: <i>Chef de terre</i>	For problems with your land do you trust: Traditional/religious leader	For problems with your land do you trust: Village Land Cmte	For problems with your land do you trust: Mayor's office	For problems with your land do you trust: Association/ NGO
Treatment - PFR village	<b>0.03***</b> (3.90)	<b>0.01**</b> (2.43)	<b>0.02</b> (0.83)	<b>0.06**</b> (2.01)	<b>0.29***</b> (7.12)	0.04 (1.28)	<b>0.06*</b> (1.70)
Observations	2,909	2,909	2,570	2,591	1,921	2,706	1,940
Outcome mean	0.0382	0.0103	0.814	0.721	0.531	0.822	0.446

Robust t-statistics in parentheses. Standard errors clustered at village level. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

# **GENDER-DISAGGREGGATED RESULTS**

# Reduction in conflicts, despite drop in tenure security

OLS regressions with household / parcel / geographical / lottery controls

VARIABLE	Parcel conflict in last 3 years	# of conflicts on parcel	Fear of parcel re- allocation	Fear of parcel being occupied	Started fallowing parcel in last 3 years	Plans to leave parcel fallow in next 12 months	Planted trees on parcel (last 12 months)
Treatment - PFR village	-0.01	0.19	-0.03	0.04**	-0.00	0.02*	0.01
<b>Female-headed household * treatment</b>	-0.02	<b>-0.67*</b>	<b>0.13**</b>	-0.03	0.00	<b>-0.07***</b>	0.00
Female-headed household	0.01	0.31	-0.10**	0.05	0.01	0.05**	-0.02
Observations	5,473	5,460	5,473	5,473	5,473	5,473	5,473
Outcome mean	0.0683	0.541	0.206	0.145	0.0329	0.0559	0.0583

Standard errors clustered at village level.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

# Women taking part in land market

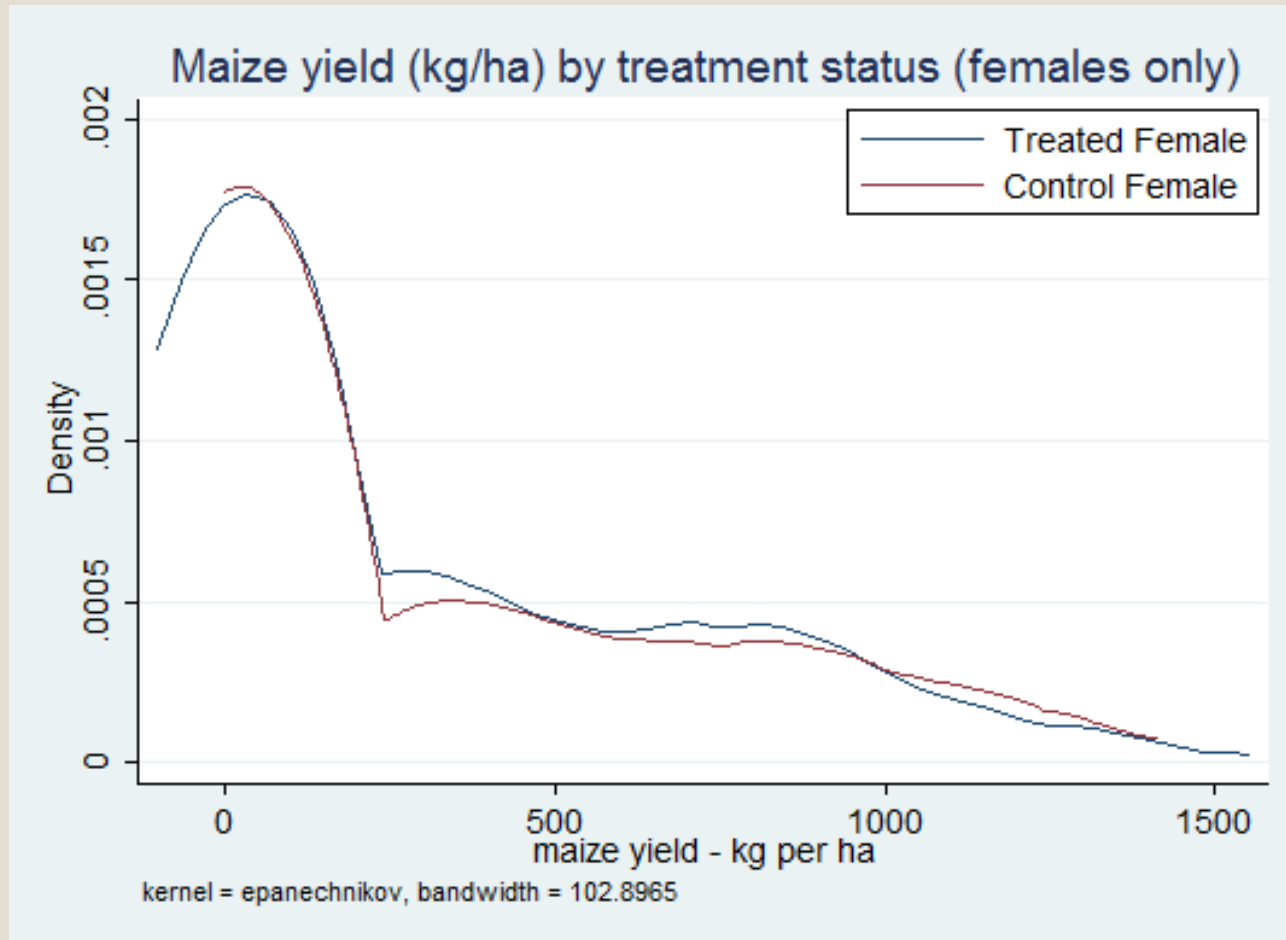
OLS regressions with household / parcel / geographical / lottery controls

VARIABLE	Parcel obtained via inheritance - last 3 years	Parcel obtained via gift/donation - last 3 years	Parcel obtained via loan/ borrowed - last 3 years	Parcel obtained via métayage/ share- cropping (in) - last 3 years	Parcel obtained via purchase - last 3 years
Treatment - PFR village	0.01**	-0.00	-0.01*	0.00	-0.01*
<b>Female-headed household * treatment</b>	-0.01	<b>0.02***</b>	0.02	<b>0.01*</b>	<b>0.03**</b>
Female-headed household	0.01	-0.01	-0.00	-0.01	-0.01
Observations	5,473	5,473	5,473	5,473	5,473
Outcome mean	0.0239	0.00804	0.0280	0.00621	0.0298

Standard errors clustered at village level.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

# No evidence of increase in female PFR farmer yields



# Initial conclusions

- It gets worse before it gets better: initial spike in tenure insecurity drops for early-wave PFR villages
- Evidence of some long-term investments (perennials, trees)
- Dynamic institutional story: increased trust in the modern state apparatus
- Despite increased insecurity, women face less conflict & have greater say within the household

## **Tenancy and Productivity**

- Key questions
  - What drives choice of agricultural organization/contracts?
  - Does it affect productivity?
  - If it does, why doesn't everyone choose the most efficient organization?

## Evidence

- Key Empirical Question: How much does contractual structure affect productivity?
  - E.g. if we see sharecropping instead of owner cultivation, how much of output is potentially lost due to the agency problems?

Tenancy Reform in West Bengal, India (Banerjee, Gertler & Ghatak, JPE 2002)

- Quasi Natural Experiment

- A Left-Wing administration came to power in the Indian state of West Bengal in 1977
  - Decided to implement existing tenancy laws rigorously - Operation Barga (OB)
  - Offers opportunity to directly measure productivity effect of tenancy reform
- Not land redistribution.
    - Instead, increased tenant bargaining power (improves outside option) & limited eviction rights of landlord.
    - So long as tenant pays 25% rent to landlord, cannot be evicted (earlier share was mostly 50%)

- Bargaining power effect - should raise share & effort
- Security of tenure effect
  - To the extent landlord uses eviction to enforce higher output, this could decrease effort
  - But investment incentives better (also because share & effort is higher)
- Survey done by authors indicates crop shares went up significantly
- Eviction threats were not widely used (only 12% of all tenants said yes)
- Two main empirical approaches based on district-wise data

1. Difference in difference approach using districts from neighboring country Bangladesh

- Experienced similar agroclimatic/technological/market shocks but not this institutional reform
- Controlling for year dummies & district fixed effects, did WB districts experience higher growth in the post OB period? See figure.
- Estimate:

$$\ln y_{dt} = \alpha_d + \psi_t + \beta * treatment_d * post_t + \sum_j \phi_j X_{jdt} + \varepsilon_{dt}.$$

- Adjusted difference in difference: control for as many observables as possible (irrigation, rainfall)

- Estimated productivity effect of OB is 52%

## 2. Exploiting inter-district variation in programme intensity within West Bengal

- Registration rate
- Assumption: these were driven bureaucratic factors uncorrelated with productivity
- However, could be partly driven by demand: areas that experiences positive productivity shock also experienced large demand for registration
- Also, the variation in registration rate could be correlated with other programmes (e.g., decentralization)

- Do not have good instruments (anything you can think of that drives registration, is also likely to be correlated with productivity shocks)
- Control for as many time-varying factors as possible (other than year dummies & district fixed effects) - public irrigation, roads, rainfall etc
- Estimate

$$\ln y_{dt} = \alpha_d + \psi_t + \gamma * r_{dt-1} + \sum_k \beta_k X_{kdt} + \varepsilon_{dt}.$$

- Estimated productivity effect of OB is 62%
- Productivity effects obtained were thought to be high
  - Indirect effects of tenancy reform: land sales from landlords to tenants went up (landlordism became unprofitable)

Burchardi, Gulesci, Lerva, and Sulaiman (2018)

- Provide evidence from a field experiment designed to estimate and understand the effects of sharecropping contracts on agricultural input choices, risk-taking, and output.
- The experiment induced variation in the terms of sharecropping contracts.
- After agreeing to pay 50% of their output to the landlord, tenants were randomized into three groups:
  - (i) some kept 50% of their output;
  - (ii) others kept 75%;

- (iii) others kept 50% of output and received a lump sum payment at the end of their contract, either fixed or stochastic.
- Find that tenants with higher output shares utilized more inputs, cultivated riskier crops, and produced 60% more output relative to control.
- Income or risk exposure have at most a small effect on farm output; the increase in output should be interpreted as an incentive effect of the output sharing rule.

# The Experiment

## Experimental Design

**Baseline season** with  $s=50\%$ .

**Experimental seasons**, advertise plots with  $s=50\%$  contracts.

Randomize farmers into three groups:

- C:** Keeps the agreed-upon contract,  $s = 50\%$ .
- T1:** Is offered a higher share of output,  $s = 75\%$ .
- T2:** A third group is provided with an unconditional cash transfer of approximately same value as  $s=25\%$ , to be paid out at time of harvest.
  - Sub-groups with safe (**T2A**) vs. stochastic transfers (**T2B**).

**Measure** expected output pre-harvest and inputs post-harvest.

Slide credit - Konrad Burchardi

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## Key Design Features

1. Random assignment to treatment groups.

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  - Condition on selection.  
(Karlán and Zinman (2009), Akerberg and Botticini 2002)
  - Avoid design-induced attrition.

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  - T2B vs. T2A allows to estimate risk exposure effect.

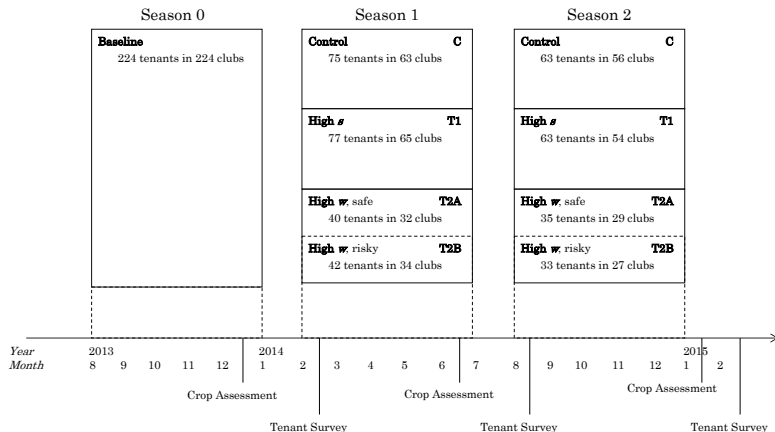
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5. Risky  $w$  treatment exposes tenant to additional risk.
  - T2B vs. T2A allows to estimate risk exposure effect.
6. Pre-harvest plot survey.
  - Provides objective measure of expected yield.

# The Experiment

## Experiment Details



[Partner]

[Context]

[Locations]

[Timeline Details]

[Surveys]

[Randomization]

[Balance]

[Attrition]

# Outline

1. Theory
2. The Experiment
3. **Reduced Form Results**
4. Discussion: Effect Size, Welfare
5. Conclusion

# Estimation

Regress outcome of interest for farmer  $i$  in club  $c$  in season  $t$  ( $y_{ict}$ ) on treatment assignment ( $T_{ik}$ ) dummies

$$y_{ict} = \sum_{k=1}^2 \delta_k T_{ik} + \delta_s + \varepsilon_{ict}$$

- Control for strata fixed effects ( $\delta_s$ );
- Standard errors clustered at club level (in round brackets);
- Randomization inference  $p$ -values [in square brackets].

## Result 1: Effect on Input Levels

To measure input levels, we rely on self-reported data from the tenant surveys conducted post-harvest

**K:** fertilizer, insecticide, irrigation, tools;

**L:** tenant's own labor, any hired labor (paid vs unpaid);

Table: EFFECTS ON CAPITAL INPUTS

	Fertiliser	Insecticide	Tools	Index
	(1)	(2)	(3)	(4)
<i>Panel A: Extensive Margin</i>				
High $s$ (T1)	0.095 (0.061) [0.174]	-0.010 (0.052) [0.866]	0.086 (0.055) [0.123]	0.202 (0.133) [0.157]
High $y$ (T2)	0.021 (0.059) [0.767]	-0.071 (0.054) [0.216]	0.007 (0.053) [0.901]	-0.066 (0.138) [0.661]
<i>Within-Equation Test</i>				
$H_0: T1 = T2$	0.265	0.255	0.142	0.059
<i>Cross-Equations Test</i>				
$H_0: T1 = 0$		0.286		-
$H_0: T2 = 0$		0.550		-
$H_0: T1 = T2$		0.323		-
Mean Outcome (C)	0.277	0.276	0.500	0.000
Observations	432	423	432	423

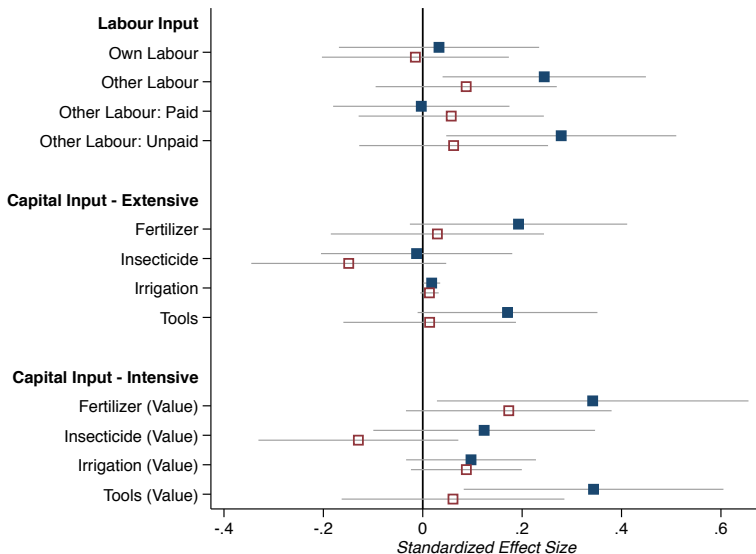
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	Fertiliser	Insecticide	Tools	Index
	(1)	(2)	(3)	(4)
<i>Panel B: Intensive Margin (USD)</i>				
High $s$ (T1)	1.13* (0.55) [0.065]	0.43 (0.51) [0.418]	11.36** (5.04) [0.039]	0.434*** (0.152) [0.007]
High $y$ (T2)	0.53 (0.42) [0.246]	-0.53 (0.47) [0.259]	1.59 (4.32) [0.727]	0.016 (0.124) [0.887]
<i>Within-Equation Test</i>				
$H_0: T1 = T2$	0.280	0.038	0.059	0.008
<i>Cross-Equations Test</i>				
$H_0: T1 = 0$		0.042		-
$H_0: T2 = 0$		0.308		-
$H_0: T1 = T2$		0.035		-
Mean Outcome (C)	0.96	1.81	37.81	0.000
Observations	419	413	427	402

Table: EFFECTS ON LABOR INPUTS

	Own labor (hours/week) (1)	Paid (days/season) (2)	Unpaid (days/season) (3)	Index (4)
High $s$ (T1)	0.34 ( 1.28) [0.781]	-0.05 ( 1.98) [0.982]	8.02* ( 4.03) [0.065]	0.20 ( 0.12) [0.157]
High $y$ (T2)	-0.03 ( 1.22) [0.984]	1.06 ( 2.08) [0.628]	1.79 ( 3.31) [0.626]	0.05 ( 0.12) [0.721]
<i>Within-Equation Test</i>				
$H_0: T1 = T2$	0.783	0.550	0.173	0.280
<i>Cross-Equations Test</i>				
$H_0: T1 = 0$		0.277		-
$H_0: T2 = 0$		0.909		-
$H_0: T1 = T2$		0.575		-
Mean Outcome (C)	17.13	4.28	12.54	-0.00
Observations	417	432	432	417

Figure: Contracts and Input Choice



## Result 2: Effects on Risk-Taking

To rank different crops in terms of their risk level:

1. Study the effect of rainfall on crop yields:
  - a. on the control plots in the experiment,
  - b. in panel data from *FAO-Stat* on SSA countries (1961-2006).
2. Calculate coefficients of variation of crop yields in the *FAO-Stat* panel data.

Table: CROP SENSITIVITY TO RAINFALL

	Maize (1)	Beans (2)	Peanuts (3)	Tomatoes (4)	Potatoes (5)
<i>Panel A:</i>	<i>Cross-Sectional Variation in Control Group</i>				
Rainfall	8.651* (4.580)	-1.505 (6.108)	23.993*** (8.948)	n/a	n/a
Observations	150	150	150	150	150
<i>Panel B:</i>	<i>Panel Variation in FAO-Stat Data</i>				
Rainfall	0.212*** (0.066)	0.023 (0.042)	0.084* (0.049)	0.093* (0.052)	0.005 (0.038)
Observations	2358	683	2245	1752	1697

**Table:** COEFFICIENTS OF VARIATION FOR CROP YIELDS

	Maize (1)	Beans (2)	Peanuts (3)	Tomatoes (4)	Potatoes (5)
cross-section	0.597	0.489	0.535	0.694	0.580
time-series	0.335	0.191	0.253	0.236	0.293
panel	0.655	0.543	0.546	0.752	0.623

**Table:** EFFECTS ON CROP CHOICE

	Maize (1)	Beans (2)	Peanuts (3)	Tomatoes (4)	Potatoes (5)	Others (6)
<i>Panel A:</i>	<i>Extensive Margin</i>					
High $s$ (T1)	0.112** (0.047) [0.025]	0.049 (0.042) [0.253]	0.055 (0.040) [0.212]	0.021*** (0.010) [0.008]	0.012 (0.008) [0.201]	0.000 (0.037) [0.997]
High $y$ (T2)	0.090* (0.048) [0.084]	0.032 (0.041) [0.447]	0.049 (0.038) [0.239]	-0.001 (0.004) [0.805]	0.002 (0.003) [0.686]	-0.016 (0.040) [0.712]
$H_0: T1 = T2$	0.652	0.720	0.899	0.013	0.217	0.728
Mean Outcome (C)	0.620	0.300	0.327	0.000	0.000	0.140
Observations	479	479	479	479	479	479

Table: EFFECTS ON CROP CHOICE

	Maize (1)	Beans (2)	Peanuts (3)	Tomatoes (4)	Potatoes (5)	Others (6)
<i>Panel B:</i>	<i>Intensive Margin</i>					
High $s$ (T1)	4.51 (4.85) [0.384]	5.40 (6.17) [0.389]	32.77*** (11.04) [0.003]	7.67* (4.23) [0.051]	0.27 (0.24) [0.447]	28.55 (34.42) [0.473]
High $y$ (T2)	-2.43 (4.40) [0.591]	1.78 (6.84) [0.820]	4.72 (9.38) [0.655]	-0.25 (1.89) [0.917]	0.05 (0.11) [0.814]	-11.47 (31.39) [0.754]
$H_0: T1 = T2$	0.152	0.613	0.065	0.074	0.318	0.403
Mean Outcome (C)	28.43	15.78	22.44	0.00	0.00	58.61
Observations	479	479	479	479	479	479

T2A/B

## Result 3: Output Effects

**Findings so far** reveal that:

- tenants in T1 use more inputs and grow riskier crops.
- tenants in T2 do not increase input use; T2A slightly increase risk-taking.

**Expected output effects:**

- for T1, we expect an increase in output.
- for T2, we may have an increase in output, driven by T2A.

Table: EFFECTS ON OUTPUT

	Output		Output/m <sup>2</sup>	
	(1)	(2)	(3)	(4)
High $s$ (T1)	56.11*** (18.33) [0.004]	55.92*** (18.40) [0.004]	0.073** (0.030) [0.024]	0.073** (0.031) [0.026]
High $y$ (T2)	5.42 (16.93) [0.762]		-0.000 (0.030) [0.993]	
High $y$ , safe (T2A)		17.99 (25.48) [0.541]		0.043 (0.048) [0.405]
High $y$ , risky (T2B)		-6.84 (15.64) [0.652]		-0.043 (0.031) [0.207]
$H_0$ : T1 = T2	0.024		0.046	
$H_0$ : T1 = T2A		0.214		0.592
$H_0$ : T1 = T2B		0.001		0.002
$H_0$ : T2A = T2B		0.347		0.123
Mean Outcome (C)	93.43	93.43	0.171	0.171
Observations	473	473	473	473

# Summary: Reduced Form Effects

## 1. Marshallian effect positive, and large:

Output increases by 60% for increase in the share of 25 percentage points. [QTE T1] [QTE T2] [QTE T2A/T2B] [Box Plots]

- No effects on self-reported yield. [Self-Reported Yields]
- Result robust to attrition bounds. [Bounds]
- No detrimental effect on soil quality. [Soil Quality]
- Positive effects on household level welfare measures. [Welfare]
- Magnitude of the effect is large compared to previous studies exploiting non-experimental variation. [Magnitude]

## 2. Higher $s$ increases input levels and risk-taking.

## 3. Effect of $s$ on output lower bound on incentive effect.

## Concluding Comments on Future Research

- Greater focus on heterogeneous treatment effects in evaluating impact of property rights interventions
  - Heterogeneity across producers in characteristics such as wealth, access to other inputs and/or markets will tend to affect the marginal effect of an improvement in property rights. Besley et al (2012) shows that for low and high wealth individuals, the effect of improved property rights on improving access to credit will be limited: for the former, since they have very little wealth anyway and the for the latter, since they will have other means of accessing credit.
  - Goldstein et al (2015) find that female-managed landholdings in treated villages are more likely to be left fallow which is an important investment in long-term fertility of the soil.

- Greater emphasis on complementary reforms
  - Like any other intervention, in the presence of multiple distortions, reforming just property rights may not be effective at best, and can be counter-productive at worst.
  - Besley et al, 2012 give an illustration of how very poor borrowers may become worse off due to greater threat of dispossession, without a sufficiently compensating increase in credit supply.
  - The study by Bandiera et al (2017) we saw earlier shows that asset transfer to the very poor is most effective when combined with training.

- Paying greater attention to property rights relating to natural and common property resources
  - Across the developing world, often conflicts over property rights take place over the attempt of businesses to use natural resources (e.g., forests, minerals) that clash with traditional livelihoods of communities.
  - In this setting, from the political point of view, “property rights” often seems like a technical term for dispossession of poor people.
  - While economic development does require a move away from low return to high return activities, one has to take into account traditional rights of communities over common property resources and think of designing appropriate compensation mechanisms

- Property rights and gender
  - Property rights for women is clearly one of the most important factors in economic empowerment of women.
  - Gender discrimination is not just ethically undesirable, it also prevents efficient allocation of resources by depriving half the population from developing and utilizing their productive potential.