

ECON B225: ECONOMIC DEVELOPMENT

Sebastian Anti,
Assistant Prof. of Economics, Bryn Mawr College

Agricultural Research and Extension

Agriculture is central to the economies of the Global South

2

- **Growth in agriculture increases expenditures of the poor 2.5 times as much as growth in any other sector**
 - ▣ Agricultural growth is “pro poor”

- **Around 80% of people living in extreme poverty live in rural areas and rely largely on agriculture as their main source of income**
 - ▣ This is *about* 900 million people

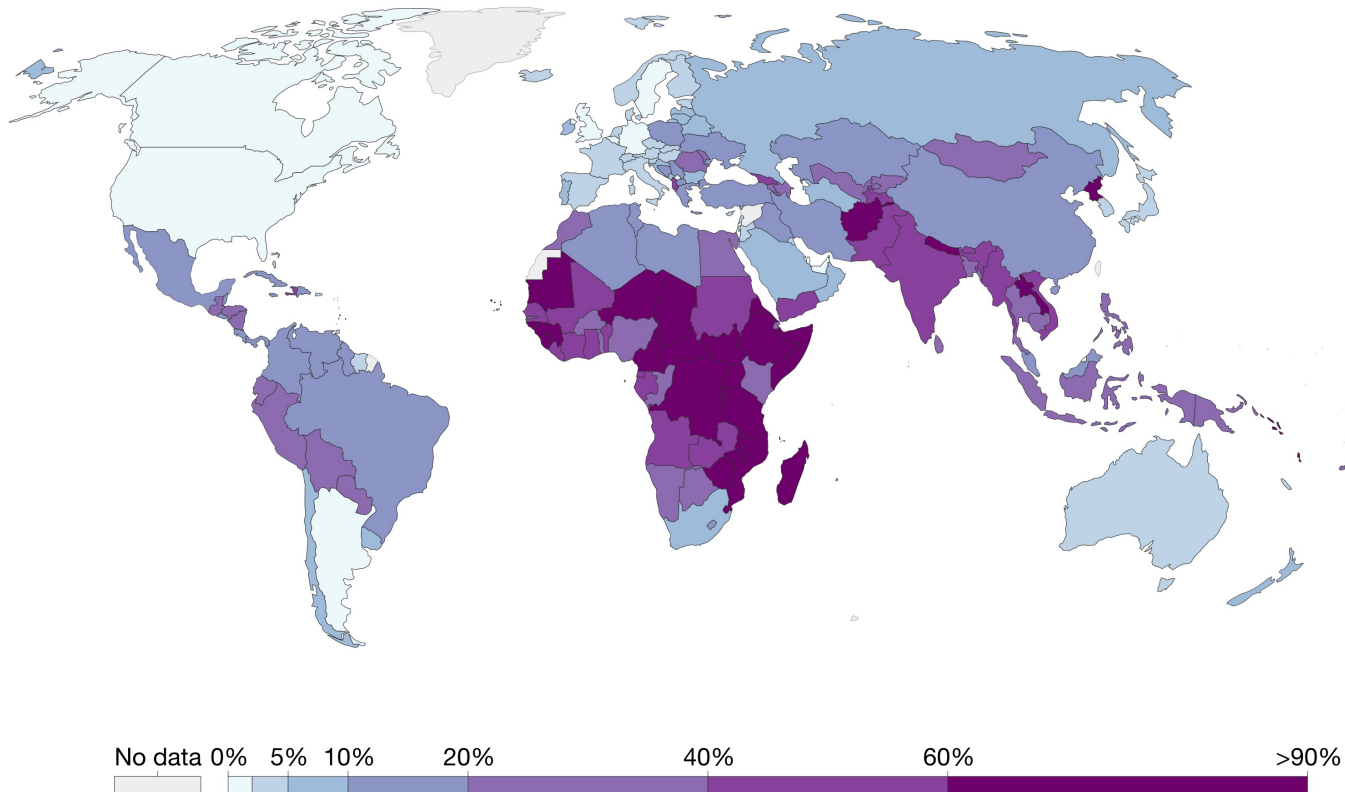
Ag. Sector: Many people participating, especially in Africa

3

Share of the labor force employed in agriculture, 2017

Share of persons of working age who were engaged in any activity to produce goods or provide services for pay or profit in the agriculture sector (agriculture, hunting, forestry and fishing).

Our World
in Data



Source: World Bank

OurWorldInData.org/employment-in-agriculture • CC BY

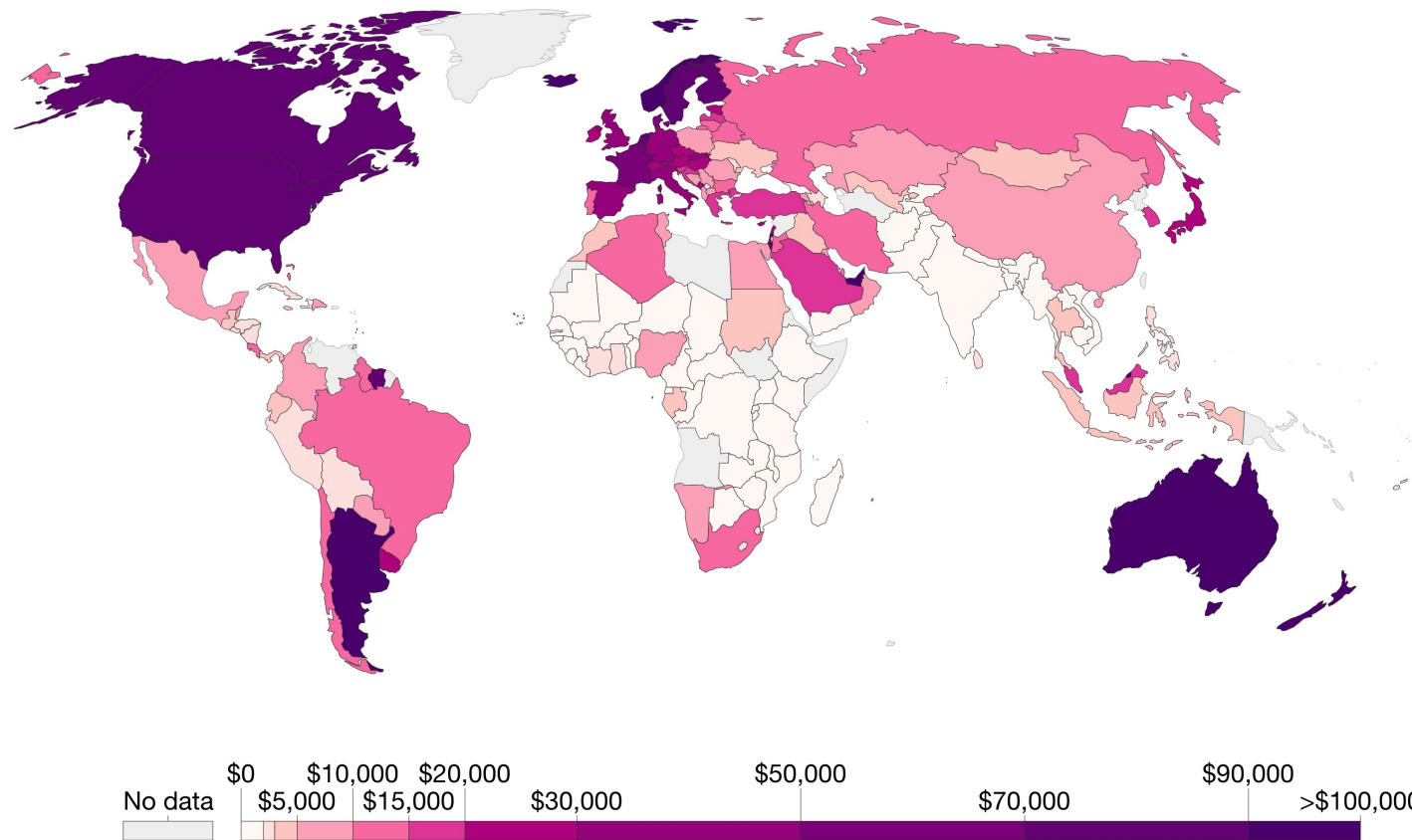
Ag. Sector: Low level of Capital and Very Unproductive Labor

4

Agriculture value added per worker, 2017

Agriculture value added per worker is a measure of labor productivity. It corresponds to the ratio between value added in agriculture (constant 2010 US\$) and number of people employed in agriculture.

Our World
in Data



Source: World Bank

OurWorldInData.org/employment-in-agriculture • CC BY

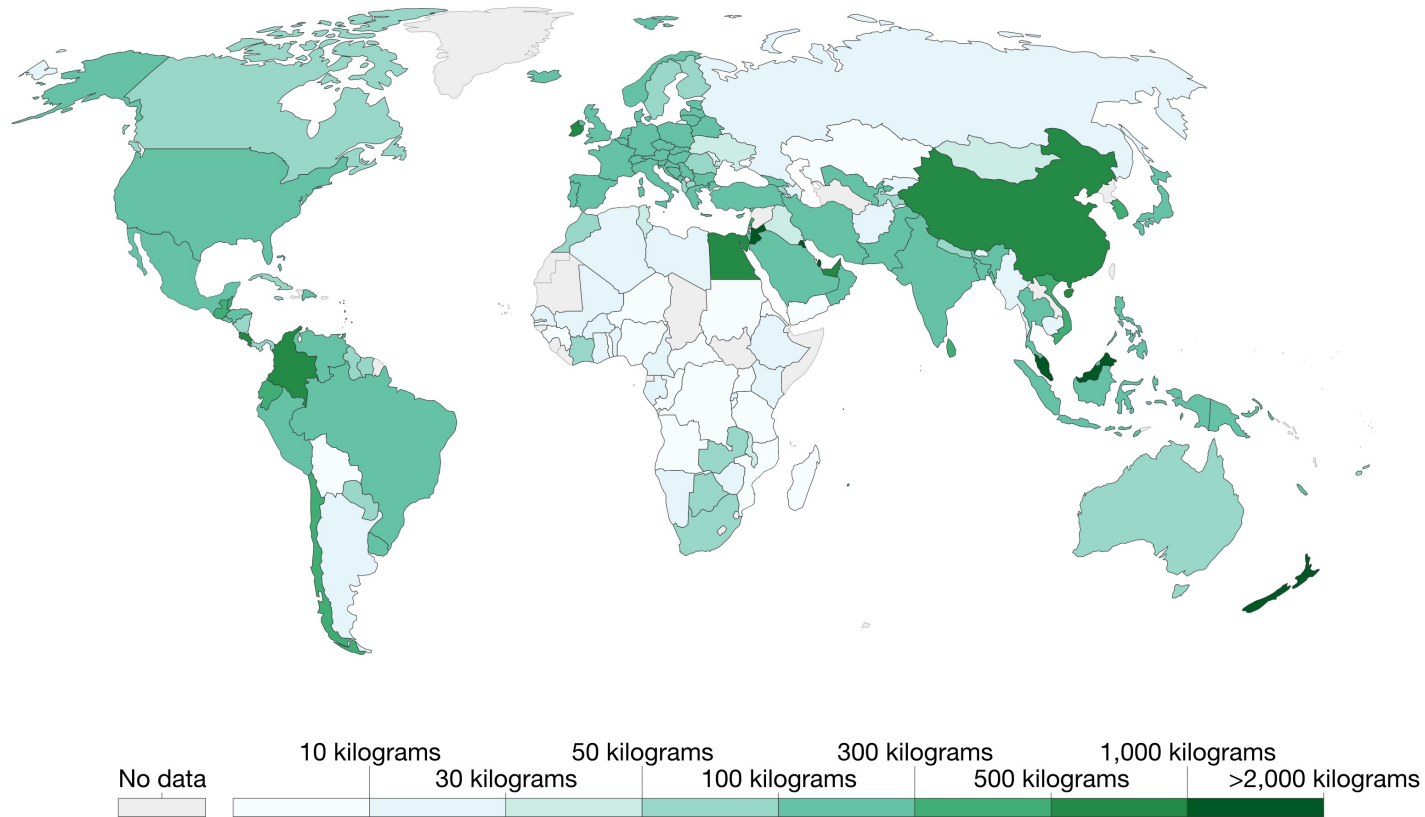
Why?: Input use very low – extremely inefficient use of resources

5

Fertilizer use per hectare of cropland, 2015

Fertilizer products cover nitrogenous, potash, and phosphate fertilizers (including ground rock phosphate). Animal and plant manures are not included. Application rates are measured in kilograms per hectare.

Our World
in Data



Source: World Bank

OurWorldInData.org/fertilizers • CC BY

What is Agricultural “Extension”?

6



Figure 1: Farmer in Western Kenya with extension worker. Source: One Acre Fund

Arouna et al.: Introduction

28

□ **Research Questions:**

- ▣ Does contract farming affect farm yields and input use?
If so, how much?
- ▣ Does the structure of the contract affect farm yields and input use? If so, how much?

□ **What is “contract farming”?**

- ▣ Contract between small farmer and large commercial farm
- ▣ Farmer promises to grow a certain amount of product, deliver it at a certain time, attaining certain quality, for a certain price

Arouna et al.: Introduction

29

- **Why would contract farming affect yields and input use?**
 - ▣ Market prices are uncertain for small farmers
 - ▣ More uncertainty means higher risk they will not be able to recoup their investment if they use more fertilizer/land/etc.
 - ▣ Contracts lock in a certain price for farmers. If they know it, they won't be exposed to this risk

Arouna et al.: Introduction

30

- **Why would contract structure matter?**
 - ▣ Maybe the risk is not just b/c prices are uncertain
 - ▣ Maybe there are knowledge gaps or weather uncertainty for farmers and support from the company can alleviate this
 - ▣ So maybe contracts that promise farmers technical support and crop insurance will further reduce risk

Research Method

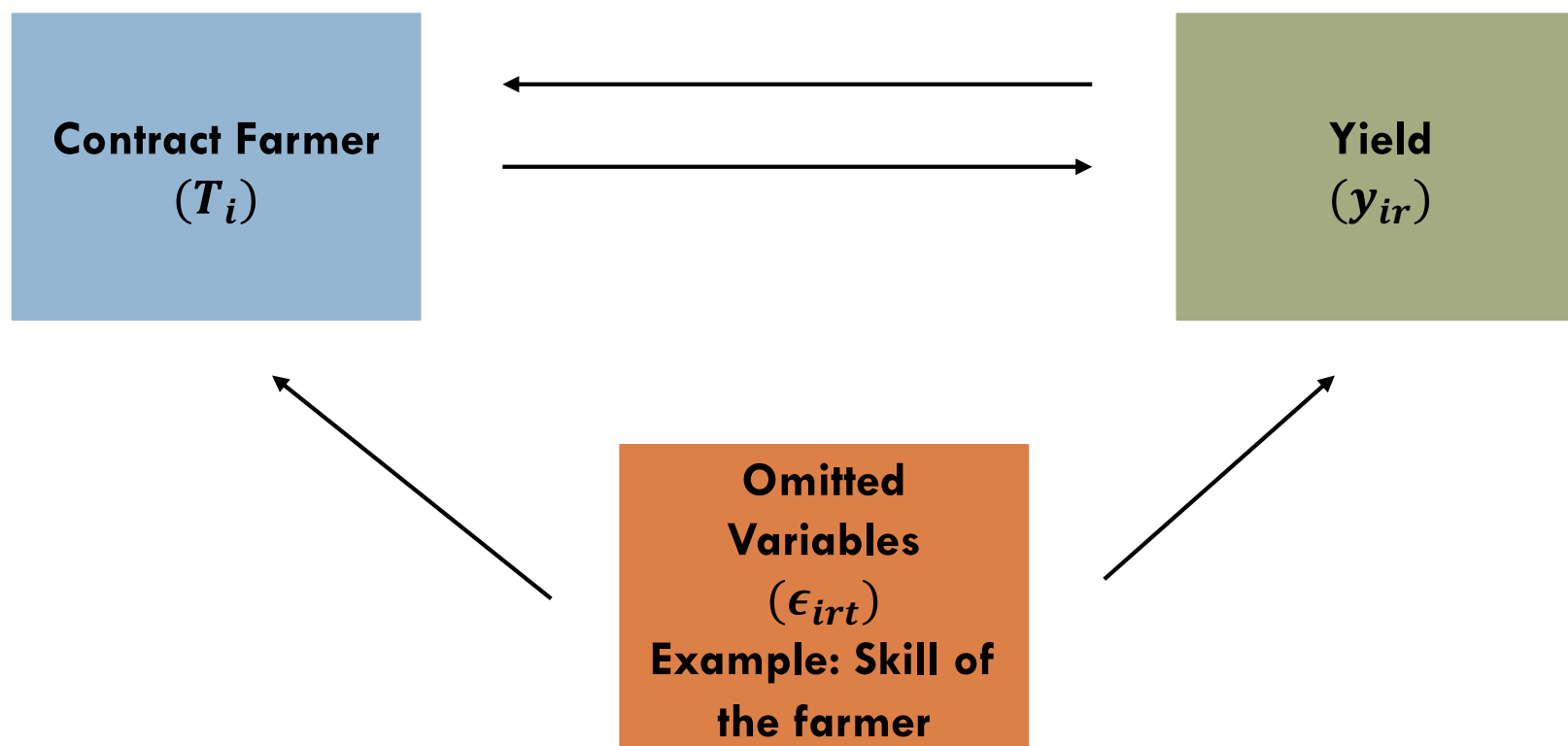
31

- **In previous literature, multivariate econometric models show a strong positive relationship between contract farming and income, yields, and input use**
 - ▣ Why is inferring a positive causal effect of CF on these outcomes problematic from these studies?
- **Reverse causality!**
- **Omitted variables!**
 - ▣ Example: Skill of the farmer

Identification Strategy: RCT

32

- Usual worry is that CF is correlated with unobservable variables



Research Method

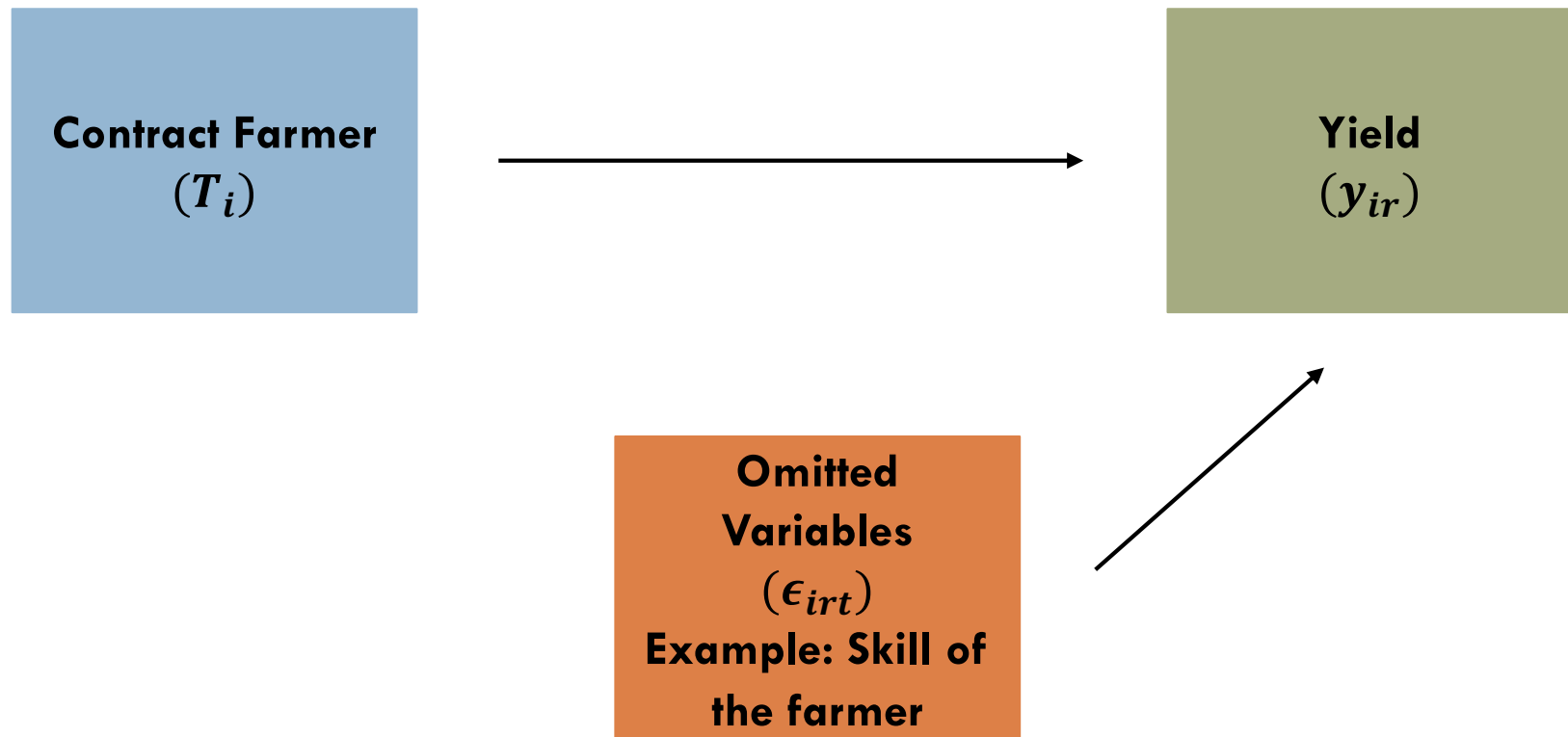
33

- **They're going to use an RCT to correct for these**

Identification Strategy: RCT

34

- RCT breaks these relationships



Research Method

35

- **They're going to use an RCT to correct for these**
- **3 Groups**
 - ▣ **Control:** No contract
 - ▣ **Treatment 1 (T1):** Contract w/ guaranteed price
 - ▣ **Treatment 2 (T2):** T1 w/ added extension training
 - ▣ **Treatment 3 (T3):** T2 w/ added input loan
- **855 willing participants in rural Benin**

Econometric Model

36

- **Two models that are highly related**

$$y_{ir} = \alpha + \delta_{SMD} T_i + X_{ir} \beta + \rho_r + \epsilon_{ir} \quad (\text{paper equation 12})$$

And,

$$y_{ir} = \alpha + \delta_{ANCOVA} T_i + \mu y_{ir,PRE} + X_{ir} \beta + \rho_r + \epsilon_{ir} \quad (\text{paper equation 13})$$

- **These are measuring the same thing. The second has some desirable statistical properties, but the parameters of interest should be very similar**
- **Measures the Intent to Treat (ITT)**
 - ▣ Ignores non-compliance with the contract

Table 5: Treatment effects of farming contract [T-C]

	SMD (1)	SMD (2)	ANCOVA (3)	ANCOVA (4)	
<i>Panel A: rice area (ha)</i>					
Treatment effect	0.199*** (0.055)	0.179*** (0.057)	0.199*** (0.055)	0.178*** (0.057)	← 25 percent increase
Mean dependent variable in control	0.772				
Observations	855	855	855	855	
R-squared	0.06	0.07	0.06	0.07	
Arrondissement FE	Yes	Yes	Yes	Yes	
Household covariates	No	Yes	No	Yes	
<i>Panel B: productivity (kg/ha)</i>					
Treatment effect	466.9*** (98.08)	480.2*** (106.2)	459.0*** (98.03)	472.5*** (105.8)	← Increase of 473 kg/ha (around 29 percent of sample mean)
Mean dependent variable in control	1,652				
Observations	855	855	855	855	
R-squared	0.09	0.09	0.09	0.10	
Arrondissement FE	Yes	Yes	Yes	Yes	
Household covariates	No	Yes	No	Yes	
<i>Panel C: market participation (%)</i>					
Treatment effect	32.95*** (2.634)	34.79*** (2.433)	32.97*** (2.664)	34.83*** (2.440)	← Increase of 35 percentage points more of rice harvest
Mean dependent variable in control	24.96				
Observations	855	855	855	855	
R-squared	0.49	0.50	0.49	0.50	
Arrondissement FE	Yes	Yes	Yes	Yes	
Household covariates	No	Yes	No	Yes	
<i>Panel D: rice income per capita (US\$)</i>					
Treatment effect	128.7*** (32.44)	139.6*** (32.05)	132.8*** (32.64)	139.3*** (32.64)	← Increase of 139.3 USD (229 percent increase of sample mean)
Mean dependent variable in control	60.70				
Observations	855	855	855	855	
R-squared	0.13	0.25	0.13	0.25	
Arrondissement FE	Yes	Yes	Yes	Yes	
Household covariates	No	Yes	No	Yes	

Table 11: Treatment effects of extension training [T2-T1]

	SMD (1)	SMD (2)	ANCOVA (3)	ANCOVA (4)
<i>Panel A: rice area (ha)</i>				
Treatment effect	-0.116** (0.052)	-0.115** (0.056)	-0.116** (0.053)	-0.117** (0.056)
Mean dependent variable in control	1.008			
Observations	366	366	366	366
R-squared	0.04	0.05	0.04	0.05
Arrondissement FE	Yes	Yes	Yes	Yes
Household Covariates	No	Yes	No	Yes
<i>Panel B: productivity (kg/ha)</i>				
Treatment effect	-164.9 (99.98)	-110.6 (110.64)	-151.1 (101.4)	-99.34 (110.2)
Mean dependent variable in control	2,133			
Observations	366	366	366	366
R-squared	0.04	0.05	0.04	0.05
Arrondissement FE	Yes	Yes	Yes	Yes
Household Covariates	No	Yes	No	Yes
<i>Panel C: market participation (%)</i>				
Treatment effect	10.41*** (2.161)	8.949*** (2.122)	10.31*** (2.137)	8.729*** (2.117)
Mean dependent variable in control	51.13			
Observations	366	366	366	366
R-squared	0.09	0.12	0.09	0.12
Arrondissement FE	Yes	Yes	Yes	Yes
Household Covariates	No	Yes	No	Yes
<i>Panel D: rice income per capita (USD\$)</i>				
Treatment effect	-35.67 (24.69)	-22.21 (22.32)	-33.46 (23.96)	-20.10 (21.39)
Mean dependent variable in control	190.3			
Observations	366	366	366	366
R-squared	0.11	0.21	0.11	0.22
Arrondissement FE	Yes	Yes	Yes	Yes
Household Covariates	No	Yes	No	Yes

← T2 does worse here

← T2 does worse here (but statistically insignificant)

← T2 does better here

← T2 does worse here (but statistically insignificant)

Table 13: Treatment effects of input loans and extension training [T3-T1]

	SMD (1)	SMD (2)	ANCOVA (3)	ANCOVA (4)	
<i>Panel A: rice area (ha)</i>					
Treatment effect	0.024 (0.047)	0.023 (0.048)	0.024 (0.048)	0.023 (0.049)	← T3 Statistically Insignificant
Mean dependent variable in control	1.007				
Observations	383	383	383	383	
R-squared	0.03	0.04	0.03	0.04	
Arrondissement FE	Yes	Yes	Yes	Yes	
Household Covariates	No	Yes	No	Yes	
<i>Panel B: productivity (kg/ha)</i>					
Treatment effect	121.0 (101.3)	112.7 (108.9)	118.0 (99.84)	109.4 (106.8)	← T3 Statistically Insignificant
Mean dependent variable in control	2,133				
Observations	383	383	383	383	
R-squared	0.04	0.06	0.04	0.07	
Arrondissement FE	Yes	Yes	Yes	Yes	
Household Covariates	No	Yes	No	Yes	
<i>Panel C: market participation (%)</i>					
Treatment effect	17.05*** (2.030)	16.75*** (2.072)	16.76*** (1.975)	16.40*** (1.994)	← T3 does better here
Mean dependent variable in control	51.13				
Observations	383	383	383	383	
R-squared	0.21	0.23	0.22	0.24	
Arrondissement FE	Yes	Yes	Yes	Yes	
Household Covariates	No	Yes	No	Yes	
<i>Panel D: rice income per capita (USD\$)</i>					
Treatment effect	69.34** (29.97)	90.78*** (24.85)	73.25** (30.45)	92.22*** (25.34)	← T3 does better
Mean dependent variable in control	190.3				
Observations	383	383	383	383	
R-squared	0.07	0.25	0.08	0.25	
Arrondissement FE	Yes	Yes	Yes	Yes	
Household Covariates	No	Yes	No	Yes	

Some Conclusions and Thoughts

40

- **Contract farming really benefitted these farmers**
- **Most gains seem to come from addressing the price risk (productivity differences were not statistically significant between the contract types)**
 - ▣ More complex contract types did not seem to make a huge difference
- **Are there external validity issues?**
 - ▣ **Study Design:** Only willing participants are in the sample
 - ▣ What about socio-economic situations where farmers are less resource poor? Maybe extension training would be more effective?