Effects of training duration and the role of gender on farm participation in water user associations in Southern Tajikistan: implications for irrigation management

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Annual Scientific Gender Conference and Capacity Development Workshop, September 25-28, 2018

Venue: ILRI Campus, Addis Ababa
Date: September 26, 2018

Summary

- Participatory irrigation in Tajikistan trained managers (male)
- Longer training increases farms' likelihood of participating in WUAs
- With rapid male migration, untrained individuals (male and female) operate ~50% of farms
- Farms operated by untrained males don't participate any less than farms operated by directly trained males
- Farms operated by females are less likely to pay dues, enter into water contracts, be represented at irrigation planning meetings (~30% of all farms)
- Sustaining participatory irrigation management in Tajikistan depends on directly investing in female human capital

Transformation in production systems

- From state collectives to dehkan (private) farms

- Cotton/wheat systems
- ~3 households associated with one farm
- ~14% rural households have access to a farm

Transformation in institutions

- WUAs introduced for delivering irrigation water to dehkan farms
  - WUA Law (2006): membership only to dehkan farms
  - GoT requested international support to create WUAs
  - WUAs in gravity schemes (USAID + GoT)
  - WUAs in lift schemes (World Bank/GoT)

- Participatory institutions of collective action
- Member cooperation needed for successful functioning

WUAs in gravity schemes (Southern TJ)

- Some established by USAID; others by district irrigation departments
- Same training materials used (developed by USAID)
- But length of training is different
  - USAID WUAs: 20-24 months training during 2012-2013
  - Government WUAs: 3-6 months during 2013

Dehkan farm managers were trained

- Legal position; listed on title
- 98% managers male (FAO 2018)
- Male migration (~48% rural households; Buisson *et al.*, 2016)
- Farms operated by non-trained members (Balasubramanya *et al.*, 2018)
  - Non trained males: 30% of farms (in 2016)
  - Non-trained females: 25% of farms (in 2016)

Research questions

- Does length of training effect participation?
  - Yes; a positive effect
- Is participation affected when farm operated by non-trained member?
  - Not when male
  - Participation significantly lower when female
- Implications for WUA functioning
  - Potentially serious

Draws from (and contributes to)…

- Social Sciences:
  - Boundaries between consumer and service provider is blurred; 'co-produce' services (Beresford, 2010)
  - Longer training improves participation (Nagrah *et al.*, 2016)
- Agricultural economics:
  - Lead/male farmers have stronger networks to diffuse information (Anderson and Feder, 2007)
  - Improve cost-effectiveness of trainings (Feder *et al.*, 2004)
- Development economics: diffusion depends on
  - Complexity of information (e.g. Rola et al., 2002); density of trained farmers (e.g. Tripp et al., 2005)
  - Gender composition of trained and untrained (e.g Kumar and Quisumbing 2011; Beaman and Dillon, 2018)
  - Farmer and farm characteristics (e.g.Fuglie and Kascak, 2001)

Confounders

- Assignment to length of training not random
- Gender of the operator when farm is managed by non-trained individual is also a choice (likely endogenous)
- This study controls for:
  - Observable and unobservable confounders at cluster level that determine assignment to training length (study design)
  - Observable and unobservable confounders at farm level that also affect participation (data and methods)

Identification strategy in summary

- Study design (matched clusters)
  - controls for selection on subdistrict observables
- The Modified DID with RHS covariates:
  - Eliminates time-invariant unobservable confounders
  - Controls time-varying unobservable confounders
  - Introduces a bias (underestimate) of treatment effects,
- In addition
  - All results also clustered at subdistrict level

Balasubramanya, S., Price., J., Horbulyk, T. 2017. Impact assessments without true baselines: assessing the relative effects of training on the performance of water user associations in Southern Tajikistan. *Water Economics and Policy.* *https://doi.org/10.1142/S2382624X18500078*.

Methods: reduced form

$$Y_{jt} = \mu + \gamma S_j + \theta t + \omega(S_j \times t) + \beta X_{jt} + \vartheta_{jt}$$

Performance indicator

Length of Training (dummy)

Time trend

Interaction term (causal effect of training)

Vector of farm-level co-variated (includes gender of person who runs the farm; dummy)

Source: Balasubramanya et al., 2018. *Water Economics and Policy*

Participation Indicators (LHS)

Irrigation Fees

Fees were paid for both irrigation seasons in the year

WUA membership fees

Membership fees were paid for the calendar year

Participation in pre-irrigation cleaning of canals

# of person-days supplied by farm towards cleaning

Legal relations

Farm signed a contract with the WUA

Farm member(s) attended WUA meetings

On the RHS

Time-varying farm characteristics
Farm operated by non-trained male
Farm operated by female
Number of members
Share of members that were female
Share of members that spent majority of time on farm
Number of households
Area with official title (ha)
Cultivated area (ha)
Irrigated area (ha)
Farm cultivated cotton
Area under cotton cultivation (ha)

Also on the RHS

Time-invariant farm characteristics
Age of the farm
Age of farm manager
Education of farm manager
Distance of farm from road

Time-invariant subdistrict characteristics
Dummy for subdistrict

Results

	Irrigation fees paid	Membership fees paid	# man-days labor	Farm signed a water contract	Farm attended WUA meetings
Longer training	-0.06 (0.05)	0.08 (0.05)*	7.10 (2.40)***	0.20 (0.05)***	0.09 (0.04)**
Farm operated by non-trained male	-0.02 (0.04)	-0.02 (0.02)	-2.43 (1.85)*	-0.02 (0.03)	-0.01 (0.02)
Farm operated by female	0.03 (0.05)	-0.09 (0.03)***	3.21 (1.94)	-0.11 (0.04)**	-0.03 (0.01)*
Number observations	1753	1753	1561	1753	1753
Prob > F	0.28	0.57	0.01	0.00	0.09
R-squared	0.02	0.04	0.02	0.09	0.03

Implications for WUA functioning

- Non-payment of membership fees compromises financial health of WUA; affects operations
- Not signing contract: district irrigation department budgets less water for particular WUA than what is actually needed
- Not attending meetings: affects planning of irrigation schedule

Reasons for lower participation

- FGDs to understand female perspective (6 FGDs with female irrigators; 5 females per group)
  - Women believe only managers can attend meetings: non-managers are not allowed to attend
  - Irrigation scheduling at inconvenient times (midnight): less inclined to pay membership fees
  - Not clear about the purpose and frequency of contract

Role of policy and programming

- WUA Law: specify that any member can be nominated to represent a farm

- FTF Phase II:
  - Target female irrigators and train them on participation
  - Train WUAs to cope with changing demographics (hiring wage labor at WUA level to assist with irrigation)
  - Train district irrigation authorities (follow-ups with WUAs; capacity building activities)

Materials

- Balasubramanya, S., Price., J., Horbulyk, T. 2018. Impact assessments without true baselines: assessing the relative effects of training on the performance of water user associations in Southern Tajikistan. *Water Economics and Policy.* *https://doi.org/10.1142/S2382624X18500078*.

- Balasubramanya, S. 2018. Effects of training duration and the role of gender on farm participation in water user associations in Southern Tajikistan: implications for irrigation management(in review).

- Balasubramanya, S., Buisson, M.C., Saikia, P., MacDonald, K., Aslamy, S., Horbulyk, T., Hannah, C., Yakubov, M., Platonov, A. (2016). Impact of water-user associations on water and land productivity, equity, and food security in Tajikistan. Baseline Technical Report. Colombo, Sri Lanka: International Water Management Institute. Prepared for the United States Agency for International Development, USAID Grant Number AID-BFS-G-11-00002. https://tinyurl.com/ybrbjqqf

- Buisson, M.C., MacDonald, K., Saikia, P., Balasubramanya, S., Aslamy, S., Horbulyk, T. (2016). Impact of Water Users Associations on Water and Land Productivity, Equity and Food Security in Tajikistan. Mid-term Technical Report. Colombo, Sri Lanka: International Water Management Institute. Prepared for the United States Agency for International Development, USAID Grant Number AID-BFS-G-11-00002. https://tinyurl.com/yafoe53x

- Project details and resources: https://agrilinks.org/library/impact-water-users-associations-water-and-land-productivity-equity-and-food-security

Media Coverage

- BBC Persian: زنان و آبیاری مشارکتی در تاجیکستان(Sep 6, 2018)
- BBP Persian: زنان و آبیاری مشارکتی در تاجیکستان(Sep 6, 2018)
- Farming First: Why Women are Key for Water Management in Tajikistan (July 5, 2018)
- Asia Times: Women will be key to tackling water worries in Central Asia (July 2, 2018)
- Agrilinks: Local Water Sharing in Tajikistan Requires Improved Coordination (June 28, 2018)
- World Bank Water Blog: Secrets to successful irrigation management from Central Asia (Jun 20, 2018)
- The Diplomat: The Impact of Migration on Water Scarcity in Central Asia (Jun 19, 2018)
- Agrilinks: Training Female Farmers is Essential to Sustain Participatory Irrigation in Tajikistan. (May 25, 2018)
- Agrilinks: Traditional Farming or High-Value Crops? An Integrated Approach to Help Farmers Choose (May 21, 2018).
- Agrilinks (USAID): New Community Organizations Need Longer Training to Perform Effectively (May 11, 2018)

Thank you!

Determining sample size and design

- WUAs provide water to 1-2 sub-districts
  - Classify sub-districts on training length (treatment = longer training)
- Clustered sampling: first sub-districts, then farms
- Power calculations:
  - Indicators/measures of central tendency from T-LSMS 2003/2009
  - 2,000 farms from 40 treatment/40 control sub-districts; 25 farms per cluster

Selecting treatment and control subdistricts

- Implemented a census of all subdistricts (164) in all gravity schemes (10).

- Collected information on subdistrict covariates in 2014 (and historically)

- Calculated propensity scores; then matched treated and control subdistricts (1:1 without replacement)
  - Selected 40 treatment and 40 control subdistricts

	Logit **USAID treated jamoat**
Population of the jamoat in 2014	0.000
	(0.000)
Number of villages	0.033
	(0.052)
Total area of the jamoat	**0.000*** **
	(0.000)
Majority of population Tajik (dummy)	-0.694
	(0.541)
Number of secondary schools in jamoat	0.069
	(0.080)
Number of rural health centers in the jamoat	-0.542***
	(0.196)
Number of agricultural markets in the jamoat	0.400
	(0.291)
Chairman born in the jamoat (Dummy)	0.162
	(0.642)
Number of years of election of the chairman	-0.073
	(0.070)
Elevation of the jamoat	0.000
	(0.001)
Sandy soil (Dummy)	0.003
	(0.554)
Low groundwater level (Dummy)	-0.809
	(0.521)
Land reform completed (Dummy)	2.538***
	(0.694)
Cotton main crop of the jamoat (Dummy)	2.838***
	(0.658)
Gravity system (Dummy)	0.605
	(0.670)
Constant	-3.892***
	(1.498)
Pseudo R2	0.402
Sample	164.000

PSM controls for selection on observable confounders at subdistrict

	Treatment-Control Unmatched		Treatment -Control Matched	
	Mean	Std Dev	Mean	Std Dev
Population of the jamoat in 2014	797.18	1446.5	-845.48	2000.07
Number of villages	-1.34	1.08	-0.775	1.45
Total area of the jamoat	2770.21	2888.16	1537.04	3992.63
Majority of population Tajik (dummy)	-0.13	0.07*	-0.1	0.09
Number of secondary schools in jamoat	0.51	0.69	-0.125	0.98
Number of rural health centers in the jamoat	-1.03	0.33***	-0.125	0.28
Number of agricultural markets in the jamoat	0.09	0.15	-0.125	0.22
Chairman born in the jamoat (Dummy)	0.05	0.07	-0.1	0.09
Number of years of election of the chairman	0.12	0.62	0.4	0.81
Elevation of the jamoat	-178.22	56.08***	-56.48	70.73
Sandy soil (Dummy)	0.04	0.07	-0.025	0.1
Low groundwater level (Dummy)	-0.23	0.08***	-0.11	0.11
Land reform completed (Dummy)	0.34	0.08***	0.125	0.09
Cotton main crop of the jamoat (Dummy)	0.48	0.08***	0.17	0.11
Gravity system (Dummy)	0.06	0.07	-0.025	0.09

Study design and sampling

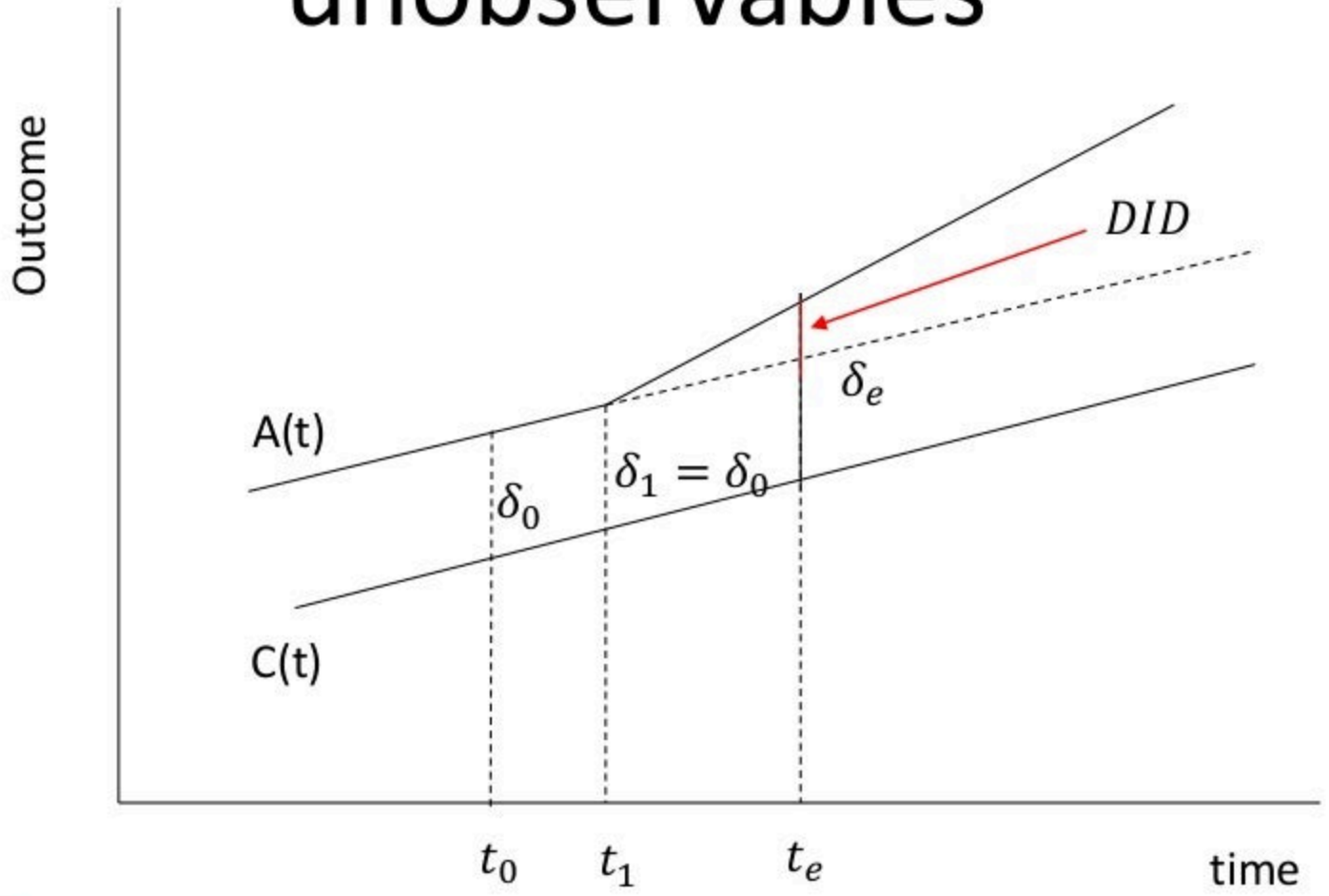
- Power calculations (40 subdistricts each of longer/shorter training; 25 farms per subdistrict)
- Propensity scores constructed for census of gravity subdistricts; matched pairs sampled (1:1)
- In selected subdistricts: census of farms to stratify on canal type; farm location
- Stratified random sample of farms in each subdistrict

Data: Panel

- Panel data by calendar-year
  - Survey 1: Data on 2014 (collected early 2015)
  - Survey 2: Data on 2016 (collected early 2017)

- Survey 1 answered by 1,956 farms; Survey 2 answered by 1,885 farms
  - 1,885 farms in 80 subdistricts

Methods: Standard DID estimator not sufficient to eliminate time-invariant unobservables



Methods: modified DID estimator

S. Balasubramanya, J. P. G. Price & T. M. Horbulyk

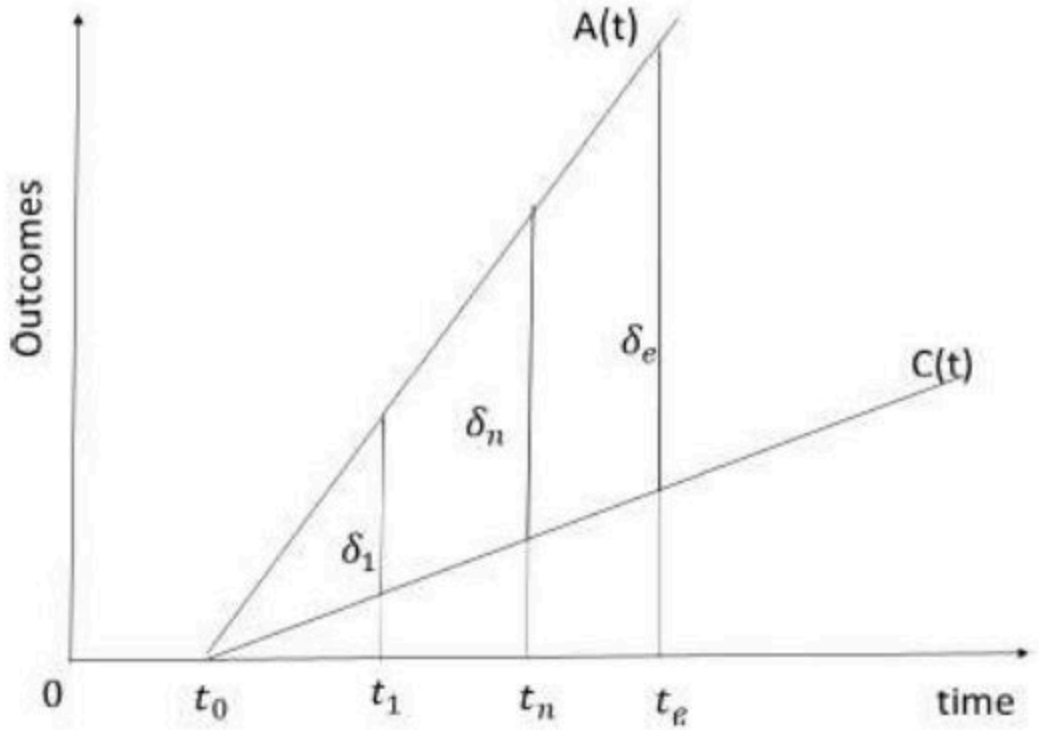


Figure 1. The Standard and Modified DID Technique When the Treatment Unit Performs Better than the Control Unit

Source: Balasubramanya et al., 2018. *Water Economics and Policy*