Does the presence of active marketing cooperatives improve the marketing performance of nonparticipating farmers? Evidence from Thai rice value chain

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PIER Seminar

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Agenda

- **Motivation: smallholder marketing problems**
- **Empirical strategy**
- **Sampling design and data**
- **Results and policy implications**
- **Conclusion**

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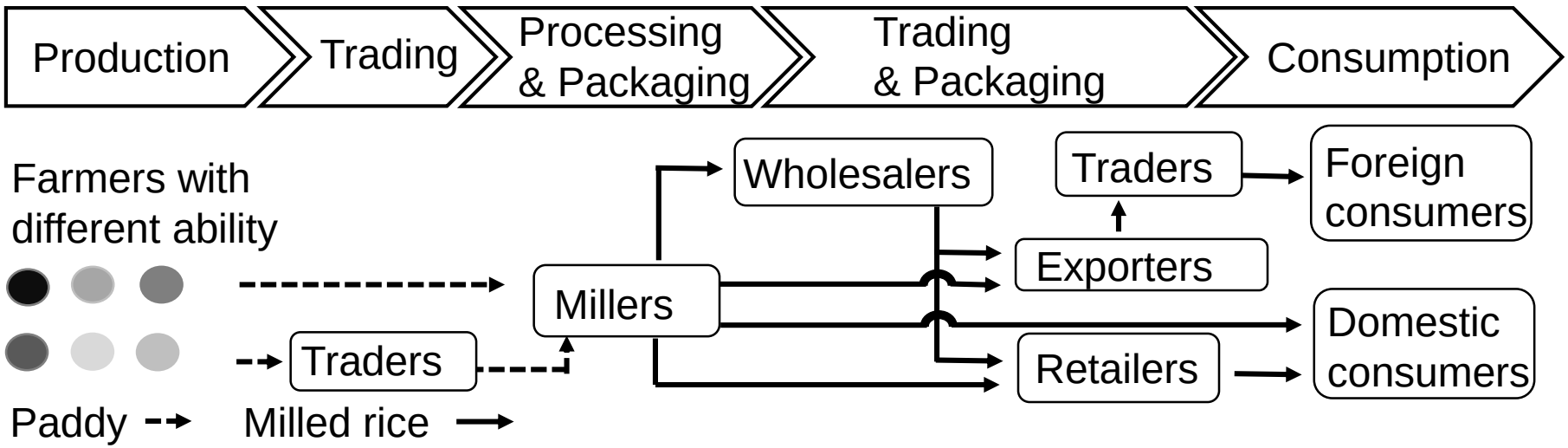
Smallholder farmers are facing many marketing problems in modern agri-food value chain.

Thai Jasmine rice value chain



Constraints

- **Poor negotiating positions**
- **Limited ability to meet the higher standards demanded**
- **High transaction cost due to small scale**
- **Low volume to offer**
- **Variable quality**
- **Bias toward large-scale farm**

Marketing cooperatives can be an efficient mechanism for overcoming smallholders' marketing problems.

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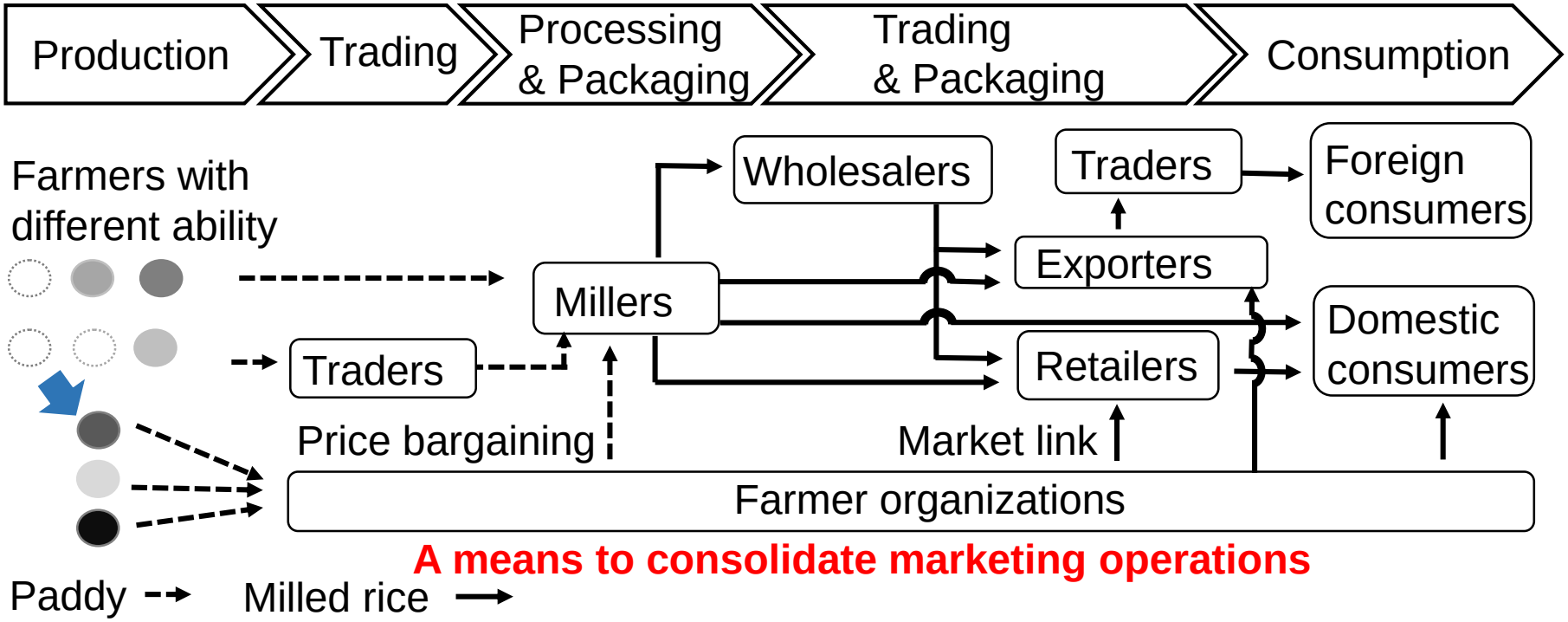


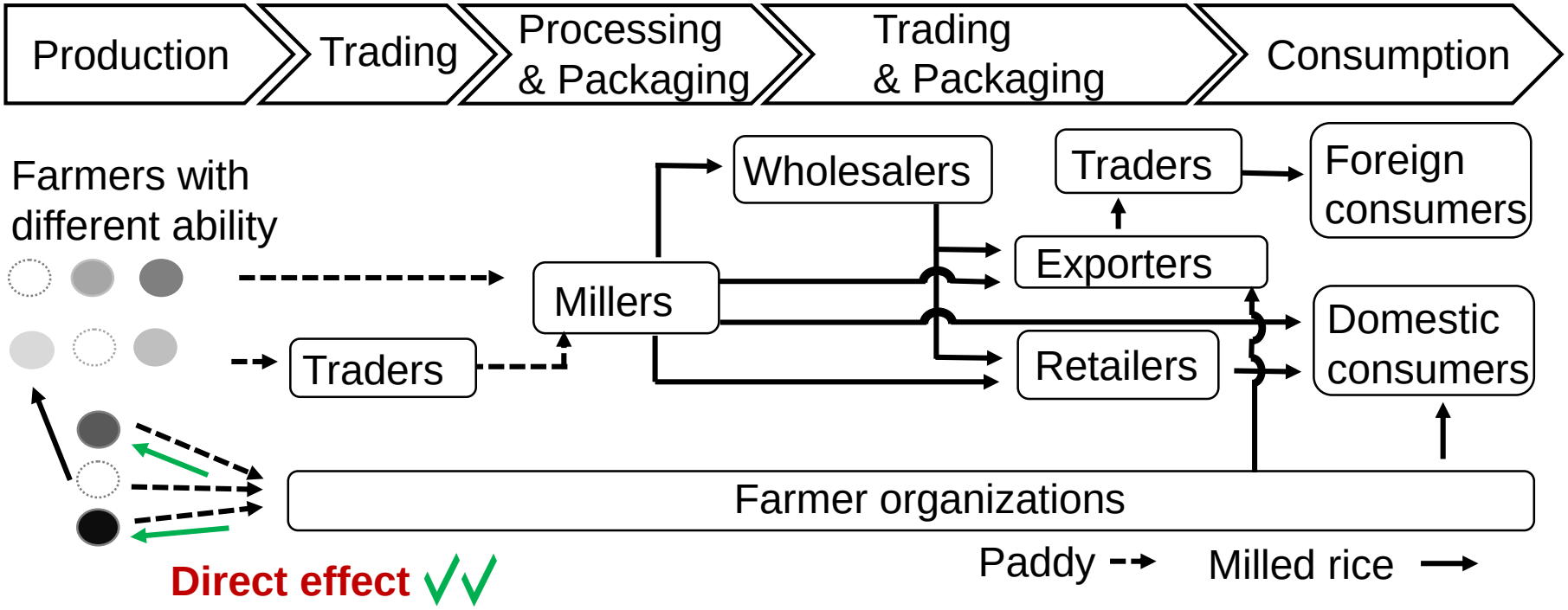
Producer-driven value chain development

Benefits

- **Lower transaction cost from economy of scale**
- **Capture more value-added from vertical integration**
- **Increase bargaining power from selling large volumes**

Significant progress has been made in estimating cooperative effects on participating farmers.

Thai Jasmine rice value chain



- Marketing through marketing cooperatives has had mixed success.
- For example, Bernard, et al., (2008) find that MCs members received between 7.2% and 8.9% higher prices for their cereal products than their nonmember counterparts. In contrast, Chagwiza, et al., (2016) show that MCs fail to offer better milk price.

Marketing cooperative benefits may extend beyond participant farmers due to its pricing practices.

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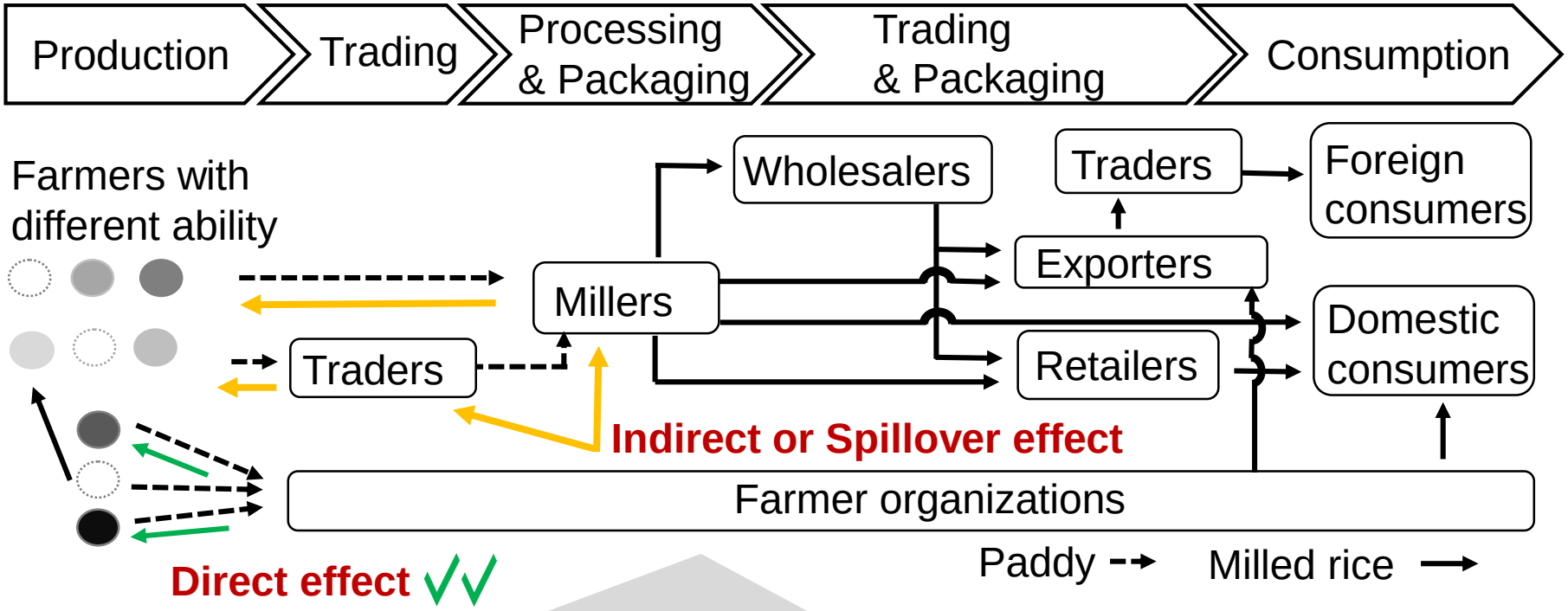

Offer farmers more favorable prices compared to profit-maximizing firms because of its practice of zero-profit pricing

The presence of active MCs may force the private intermediaries to raise prices paid to nonparticipating farmers.

No progress has been made in estimating this spillover effect due to the difficulty in finding a comparison group

Some empirical studies on the impact of value chain development

Authors	Year	Journal *	Area	Crops	Method ***	Type of effects	Driver for value chain development**
Bernard et al.	2008	AE	Ethiopia	Cereal	PSM	Direct	Producer (FO)
Chagwiza et al.	2016	Food P.	Ethiopia	Diary	PSM	Direct	Producer(FO)
Fischer and Qaim	2012	World D.	Kenya	Banana	PSM	Direct	Producer(FO)
Mishra et al.	2018	Food P.	India	Rice	ESR	Direct	Buyer (CF)
Soullier and Moustier	2018	Food P.	Sengal	Rice	PSM,IV	Direct	Buyer (CF)
Abdul-Rahaman and Abdulai	2019	JADEE	Ghana	Rice	ESR	Direct	Producer(FO)

Note: *AE = Agricultural Economics, Food P. = Food Policy, World D. = World Development, Journal of Agribusiness in Developing and Emerging Economies ** FO = farmers' organizations, CF = Contract farming *** PSM = Propensity Score Matching, ERS = Endogenous switching regime, IV = Instrumental variables

- Little is known about the spillover effect of MCs.
- **Yet, this knowledge is critical for food policy debates regarding the roles of MCs in agri-food value chain.**

This study fills important knowledge gap in the literature.

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This study	**2020**	**-**	**Thailand**	**Rice**	**IV**	**Spillover**	**Producer(FO)**

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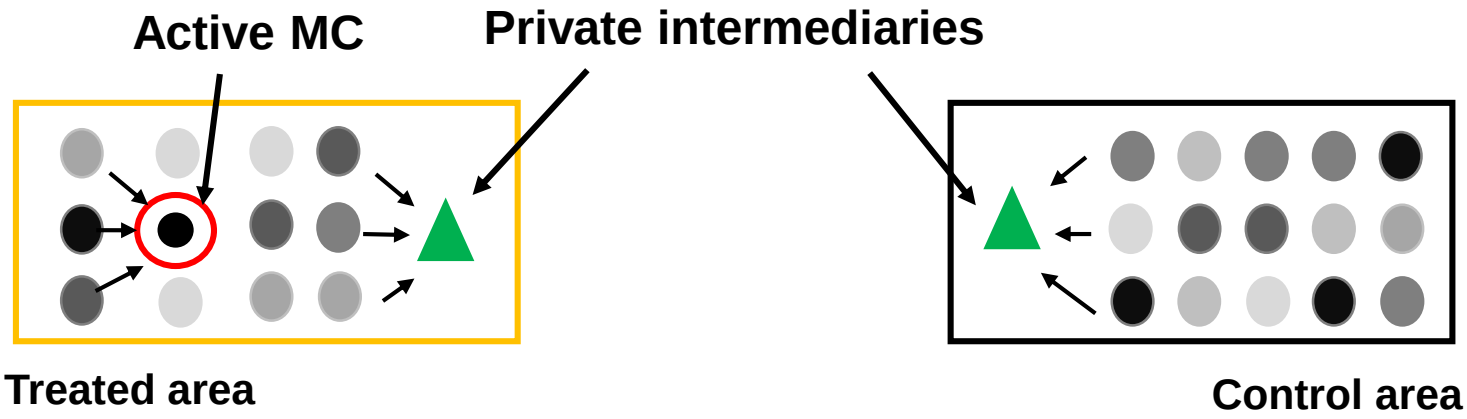
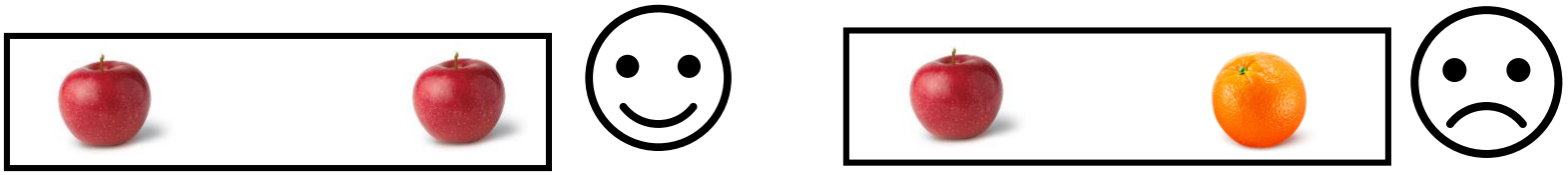
Hypothesis



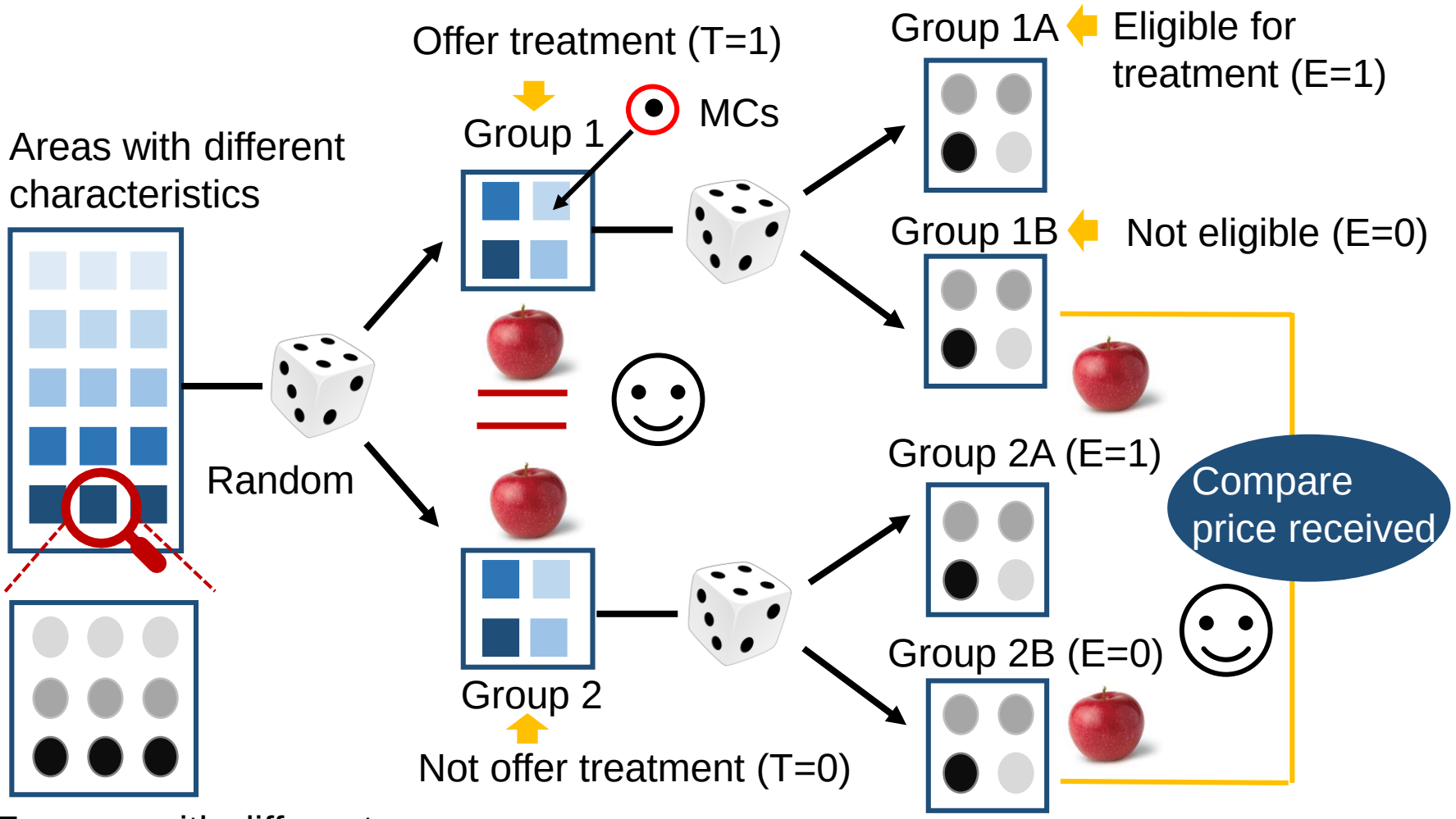
Nonparticipating farmers who live in the area where there is active MC (treated areas) are likely to receive a higher price from private intermediaries compared to farmers who live in area where there is no active MC (control areas).

To be successful in testing this hypothesis, treatment and control group should be similar in every way, including in ways that we cannot easily measure or observe.



Ideal experiment to test the hypothesis

A double randomization

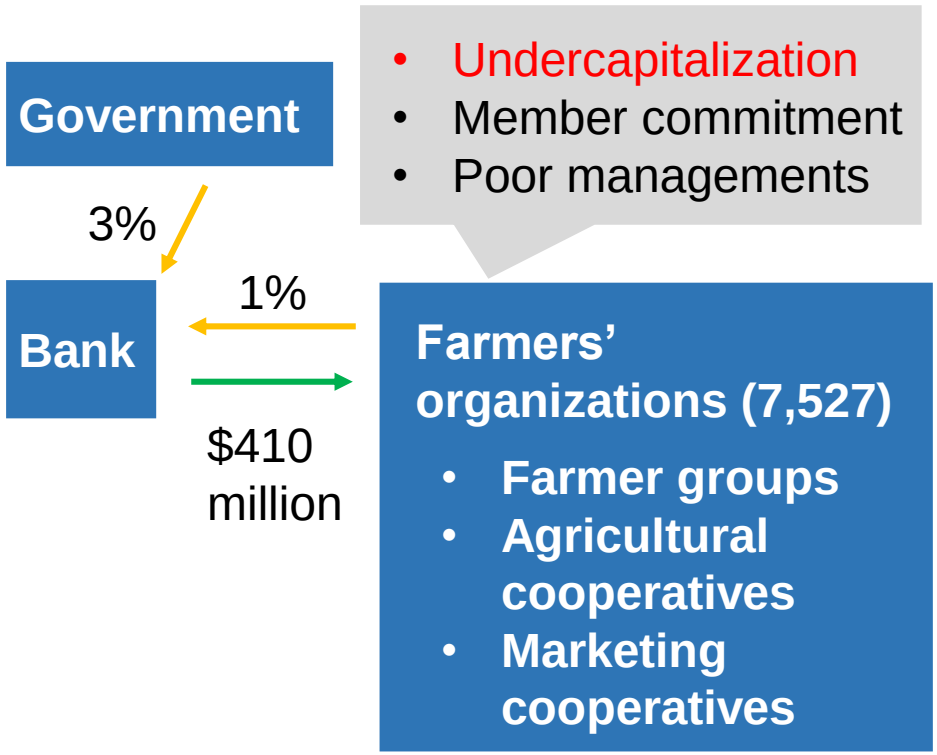


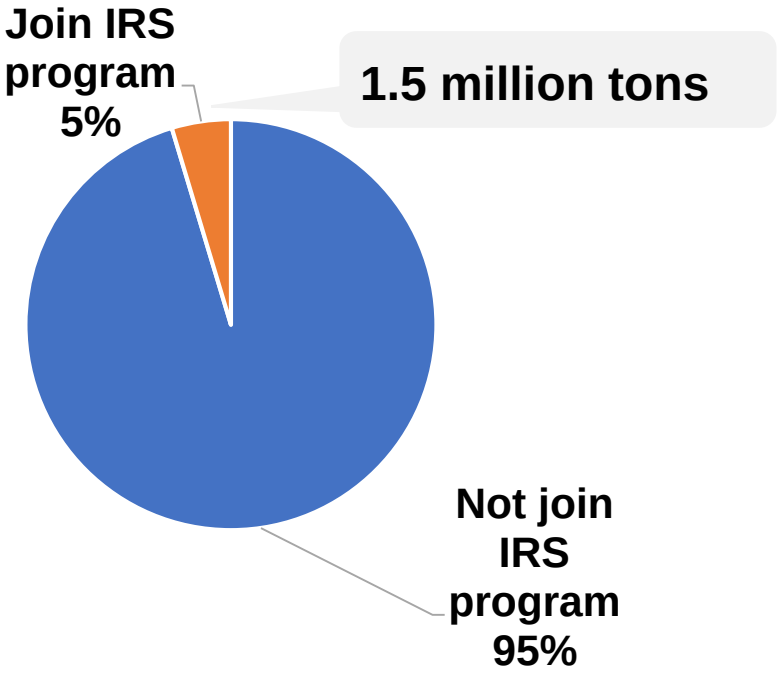
This experiment would be costly
→ Non-experimental setting

The interest-rate subsidy program for Thai farmers' organizations provides an interesting setting.

Interest-rat subsidy (IRS) program implementation and result in 2018/19

IRS program is designed to enhance the role of farmers' organization in rice value chain.

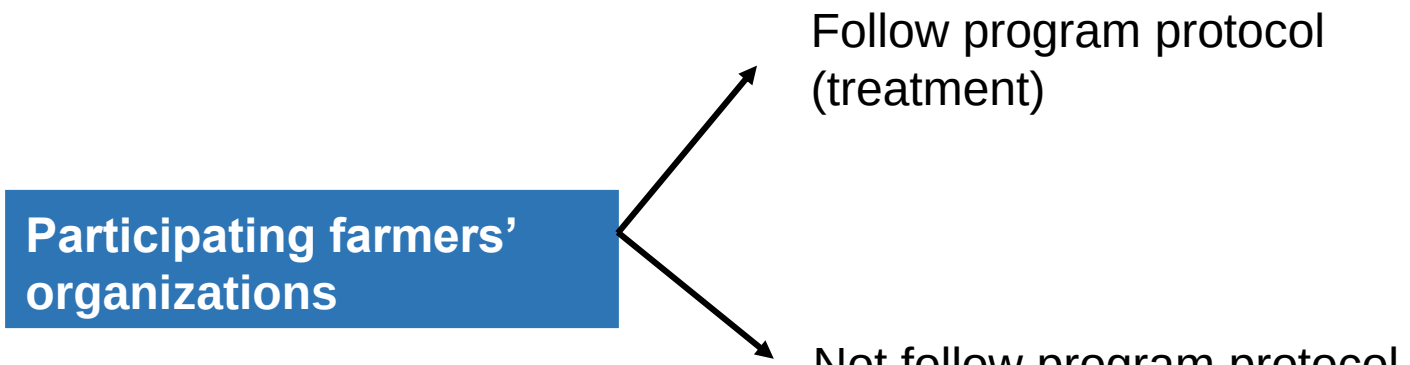




Noncompliant behaviors of participating farmers' organizations provide a setting to test spillover effect.

The protocol for IRS program

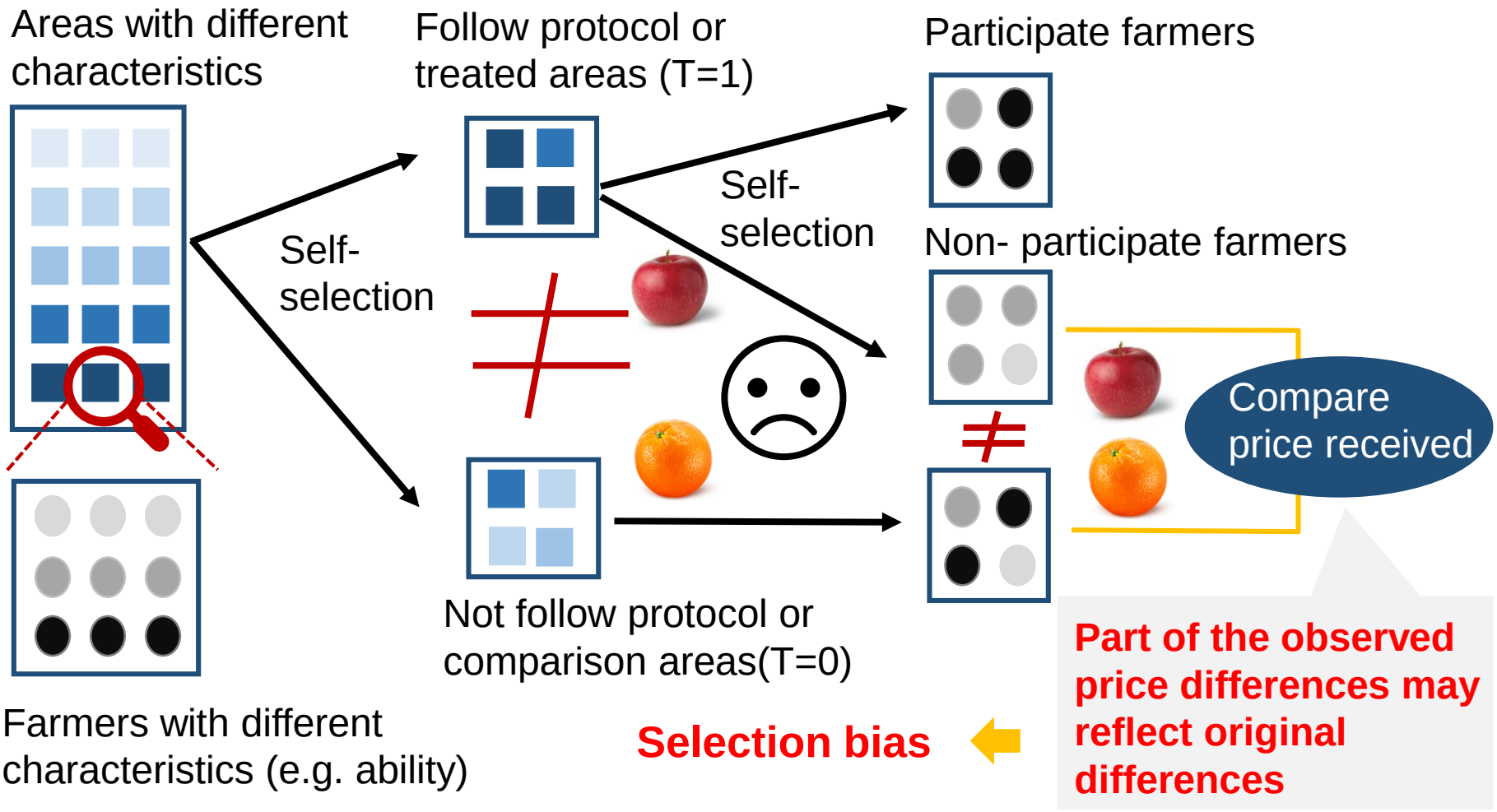
Farmers' organizations buy paddy from farmers and then resell it to processors or process paddy and sell milled rice to customers.



- To avoid risk from volatile rice price
- Invite processors or middlemen from other areas to use their facility to buy rice from farmers

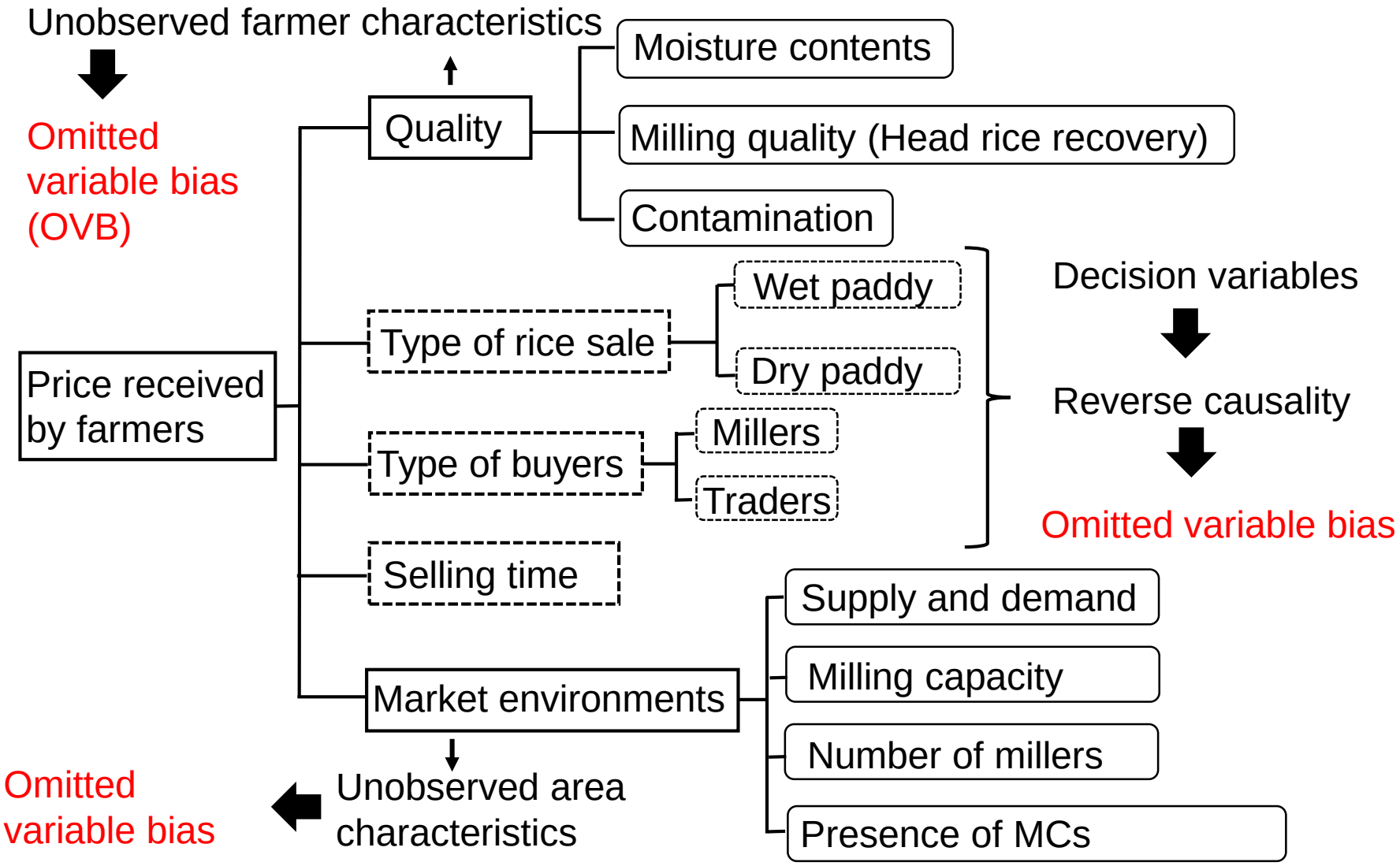
A comparison of outcome is unlikely to provide a causal estimate of spillover effect.

Non-experimental setting



Apart from selection bias, we also face with omitted variable bias.

Factors affecting price received by farmers



Empirically, we estimate the following equation:

Indicator of marketing performance

$$log(P_{ij}) = \beta_0 + \beta_1 T_i + \beta F_i^o + \varepsilon_{ij}$$

Where

P_{ij} is price received by farmer *i* in location *j*

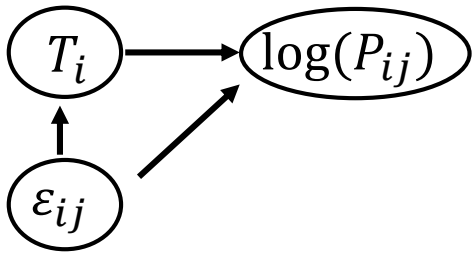
T_i is a treatment dummy variable equal 1 if the farmer lives in areas with active MCs and 0 if he/she lives in areas without active MCs.

F_i^o are observed farmers' characteristics

ε_{ij} is an error term

- Observed farmers' marketing decisions
- Observed and unobserved local area characteristics
- Unobserved farmers' characteristics

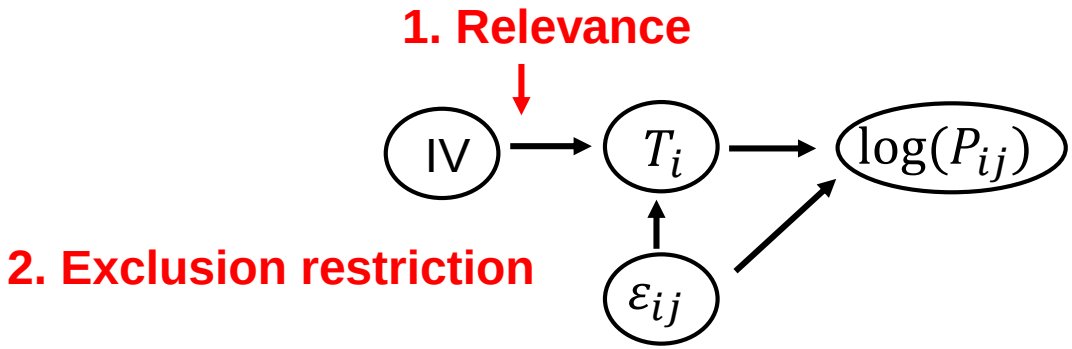
Violate zero conditional mean



A biased and inconsistent estimates

We address selection bias and omitted variable bias by using the instrumental variables (IV) approach.

- The “Next Best Alternative” to Randomized Experiments



A consistent estimates

- Finding strong and valid instrumental variable is difficult.
- In our case, we need to find instrumental variable that affects farmers’ locations or treatment status **(testable)** but does not have a direct effect on price received by farmers or uncorrelated with the error term **(untestable).**

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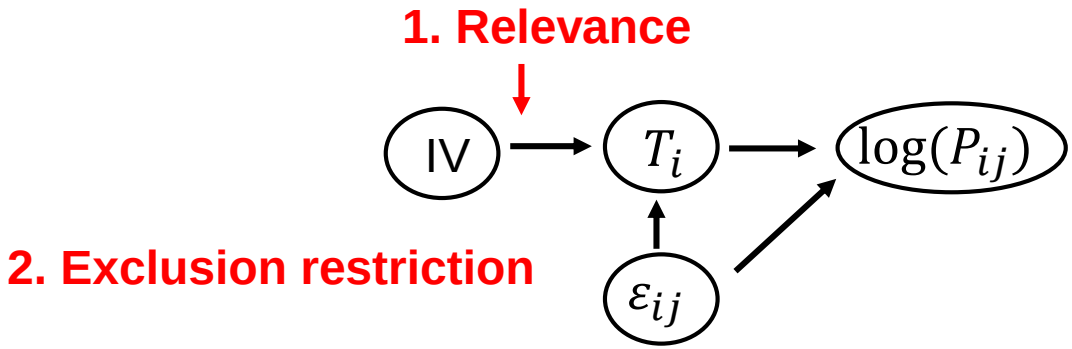

A consistent estimates

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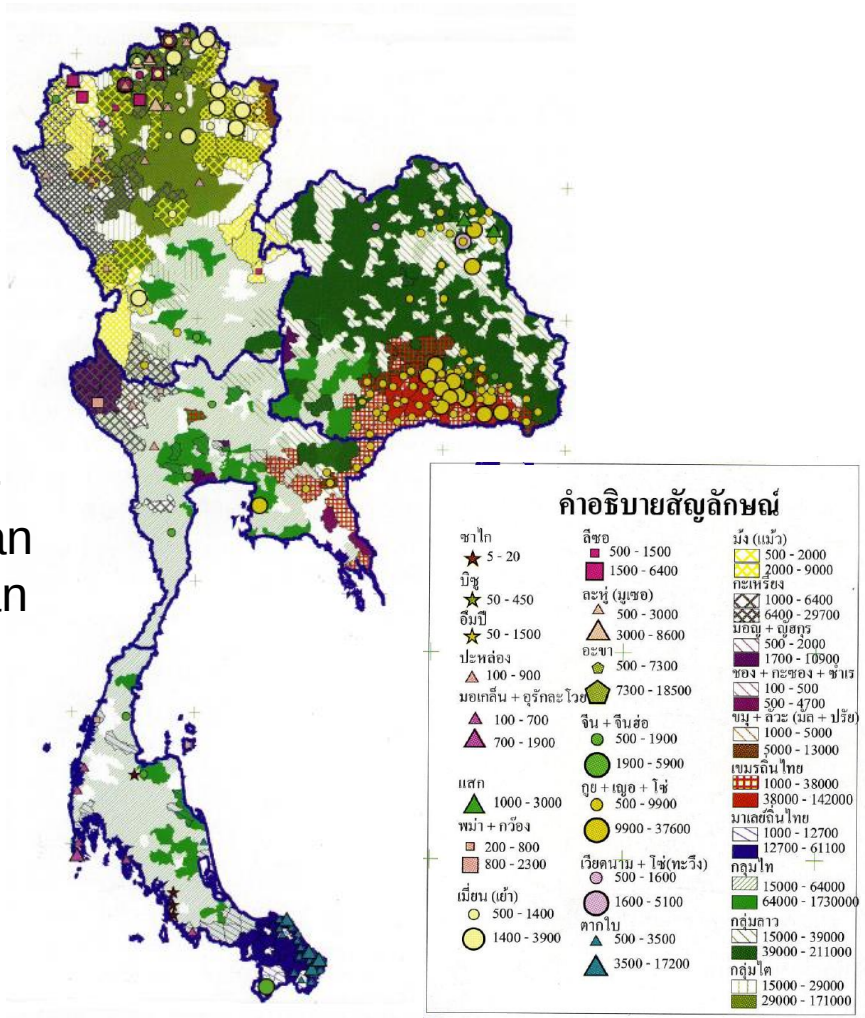
Language spoken at home as an instrumental variable for treatment status.

Instrumental variable strategy relies on language diversity in Thailand.

- Ethnically diverse country, 62 ethnic groups with 62 different languages
- Central Thai is the most spoken language in the country comprising around 39% of the population.
- Farmers in our study areas are the native-born Thai who speak a language other than Central Thai at home even though they can speak Central Thai fluently.
- We ensure that our IV satisfies relevance assumption through our sampling design.

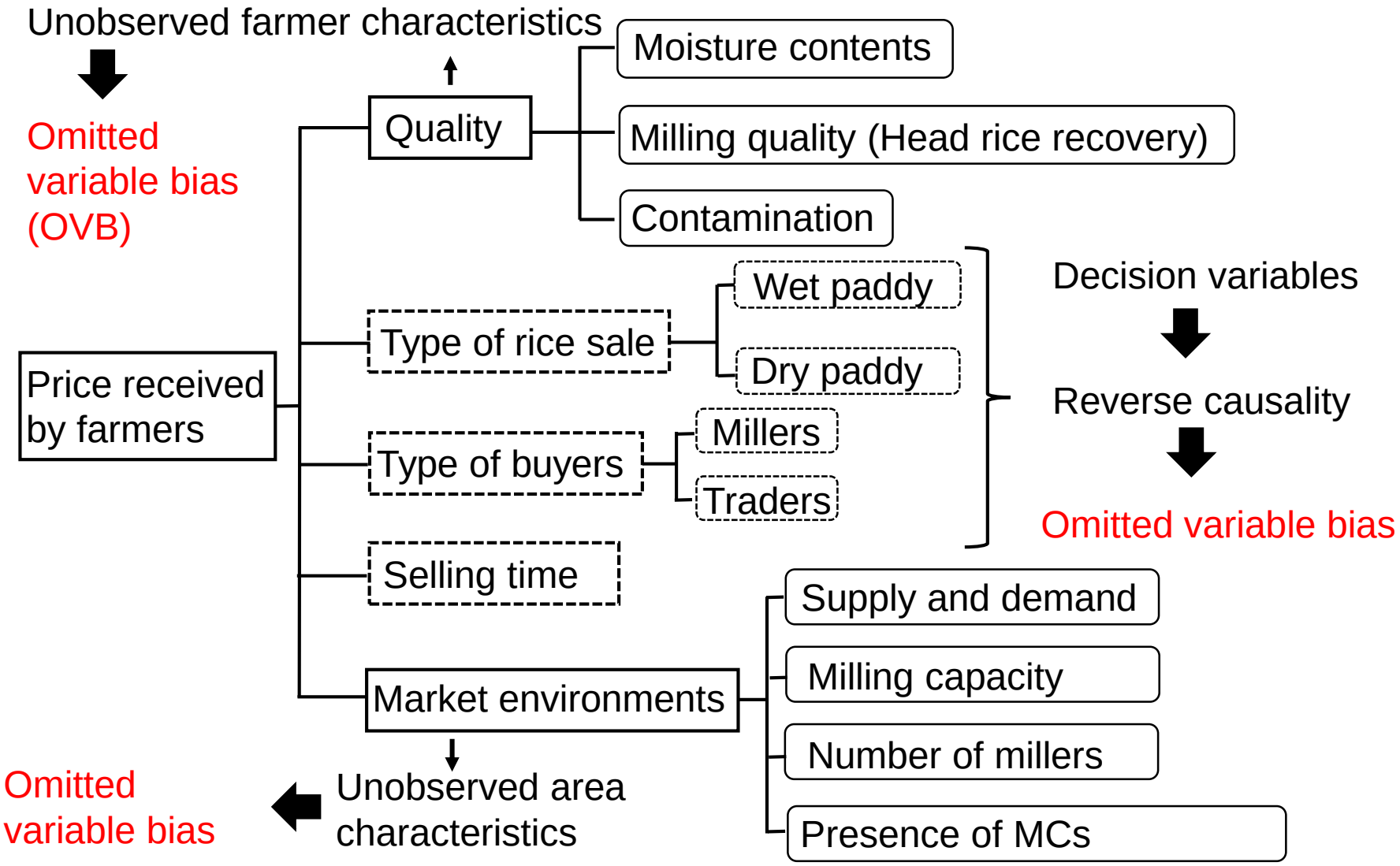
Linguistic Map of Thailand



Source:Premsrirat, 2005

Exclusion restriction: the language spoken at home is unlikely to correlate with the error term

Factors affecting price received by farmers



Ways in which our exclusion restriction could be violated (1/3)

- Language spoken at home has been used by development economists to identify the effect of social networks on welfare decisions (Bertrand et al., 2000).

Norms

Information

Behaviors

Social factors can influence crop productivity by affecting crop management practices vis-à-vis input intensity.

- Language spoken at home will affect price received by farmers if norms associated with language groups affect crop quality and language groups to be compared have the different norms.

Not an issue in our application for two important reasons

- 1) high degree of cultural similarity (Vail, 2007)

- A result of cultural assimilation in our study areas (Keyes, 1967)
- A common culture allows the traders to have common expectations and customs, which enhances trust (Lazear, 1999).

Source: Pictures from http://variety.teenee.com/saladharm/63905.html, https://www.agrifarming.in/rice-cultivation-information-guide

Not an issue in our application for two important reasons

- 2) None of rituals is related to crop management practices.

Rocket Festival

Honour Phaya Taen, the god of rain

Bun Khun Lan Ceremony

Honour Mae Phosop, the goddess of rice

- Modern agricultural practices since 1960s

It is unlikely that norms will affect crop quality in our setting.

Source: Pictures from https://workpointnews.com/2019/02/07/__trashed-8/, https://www.travelbeginsat40.com/event/rocket-festival-thailand-bun-bang-fai/

Ways in which our exclusion restriction could be violated (2/3)

- Labor economists also use language spoken at home to identify the effect of second language skills on earning (Chiswick & Miller, 2016).

- Knowledge of a second language may increase earning if that language is valuable in the labor market.

Knowledge of Lao Isan language has no value in selling paddy to buyers in our study areas.

Source: Picture from https://www.learnsmart.com.ng/course-detail/Njkw

Ways in which our exclusion restriction could be violated (3/3)

- Education economists have investigated the impact of language used in education on the human capital formation (Ramachandran, 2017).

- Increase the cost and reduce the efficiency of learning

If using Central Thai in class has an impact on educational outcomes, this impact will likely cancel each other out in our setting.

Source: Picture from https://news.thaipbs.or.th/content/270353

Given that language spoken at home is valid IV, we estimate

- Second-stage

An approximate effect of treatment on the subset of farmers who would not live in the areas affected by the presence of active MCs if they were not born into Lao-Isan speaking family

$$\log(P_{ij}) = \beta_0 + \beta_1 \hat{T}_i + \beta F_i^o + \varepsilon_{4ij}$$

- First-stage

$$T_i = \alpha_0 + \alpha_1 L_i + \alpha F_i^o + \varepsilon_{5ij}$$

- The coefficient β_1 is local average treatment effects (LATE).

Monotonicity assumption: L should push T in the same direction (or no direction) for all observations or no defiers.

Note: groups of population with a binary treatment and a binary instrument are Always Takers, Never Takers, Compliers, Defiers

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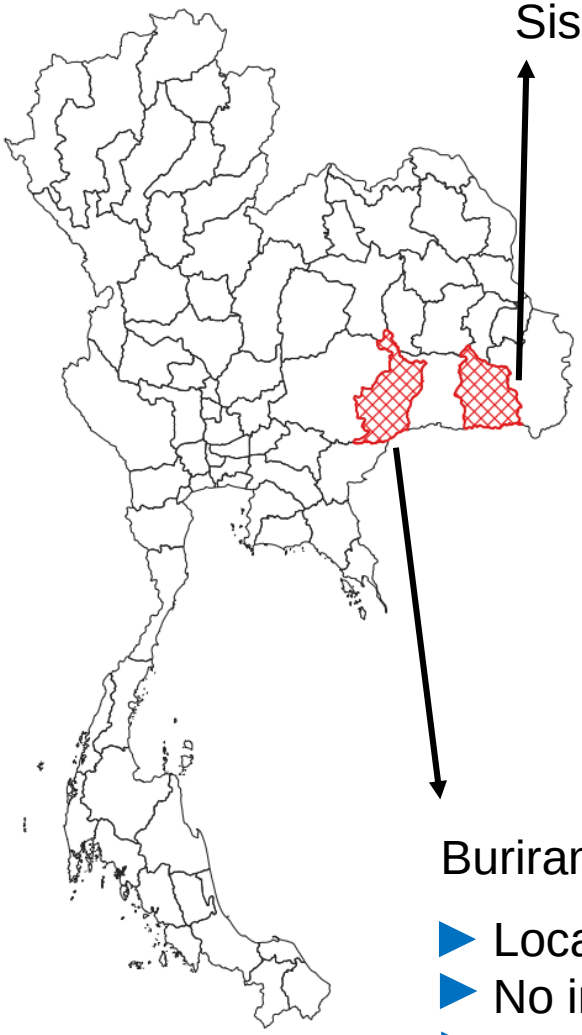
Treated province and control province



Sisaket (treated province)

- Sisaket agricultural marketing cooperative of BAAC clients (136,088 members)
- Milling factory (80 tons per day)
- Drying factory (300 tons per day)
- Set the paddy buying price at zero-profit

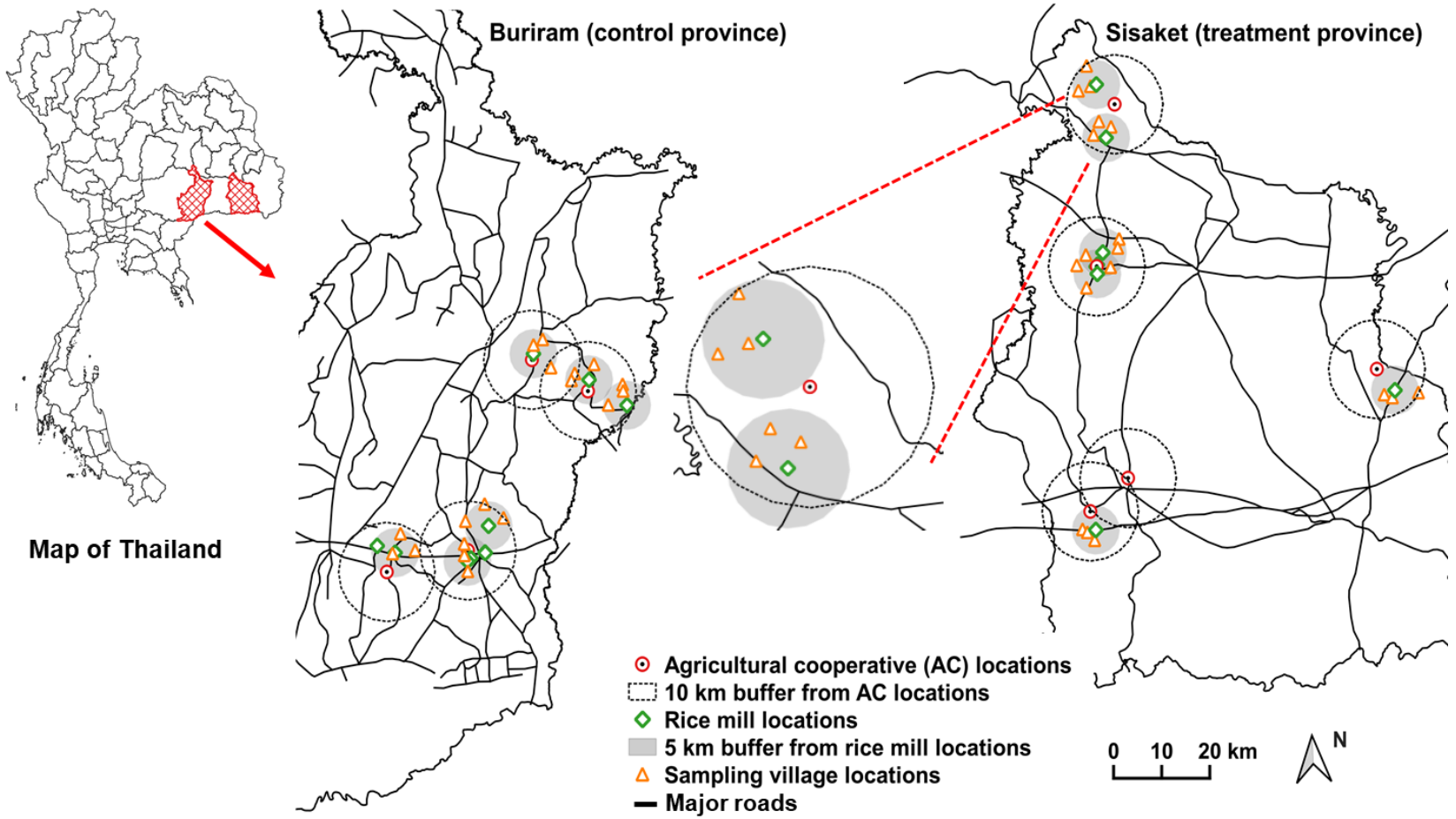
- Bought paddy approximately 11,000 tons from both its members and non-members in 2018/19

Buriram (control province)

- Located within the same agro-ecological zone
- No impact of the presence of MCs , No coop drying factory
- No contamination from the intervention
- Major Jasmine rice producing areas

We use a multistage sampling procedure to randomly select 360 households from 36 villages.

Study areas



I conducted face-to-face interview between June and July 2019.

Summary statistics

Variables	Unit	Locations			
		Treated areas		Control areas	
		Mean	Std. dev.	Mean	Std. dev.
Characteristic of rice sale					
Price received	Baht/kilogram	**13.78**	1.683	**12.53**	1.957
Quantity sold	Kilogram	2,574	2,635	3,241	3,882
Type of paddy sold	1 = wet paddy	0.583	0.494	0.622	0.486
Type of buyers	1 = miller	0.522	0.501	0.606	0.490
Paddy quality_a	1 = the best quality	0.411	0.493	0.583	0.494
Paddy quality_b	1 = no mixing verities	0.789	0.409	0.844	0.363
Selling in October	1 = October	0.161	0.369	0.150	0.358
Selling in November	1 = November	0.478	0.501	0.572	0.496
Selling in December	1 = December	0.0722	0.260	0.0111	0.105
Characteristic of farmers					
Age	Year	57.73	11.26	56.24	10.19
Gender	1 = male	0.461	0.500	0.517	0.501
Year of education	Year	5.972	3.172	5.939	3.425
Household size	Number	3.961	2.053	3.967	1.704
Farm size	Hectare	2.599	2.301	4.244	3.432
Language spoken at home	1 = Laos	**0.928**	0.260	**0**	0
Characteristic of areas				Monotonicity ✓	
Number of millers	Number	2	1.418	1.667	1.109
Milling capacity	Tonne/day	478.3	186.2	453.3	460.1
Production	1 = decrease	0.361	0.482	0.583	0.494
Observations		180		180	

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language spoken at home is virtually randomly assigned.

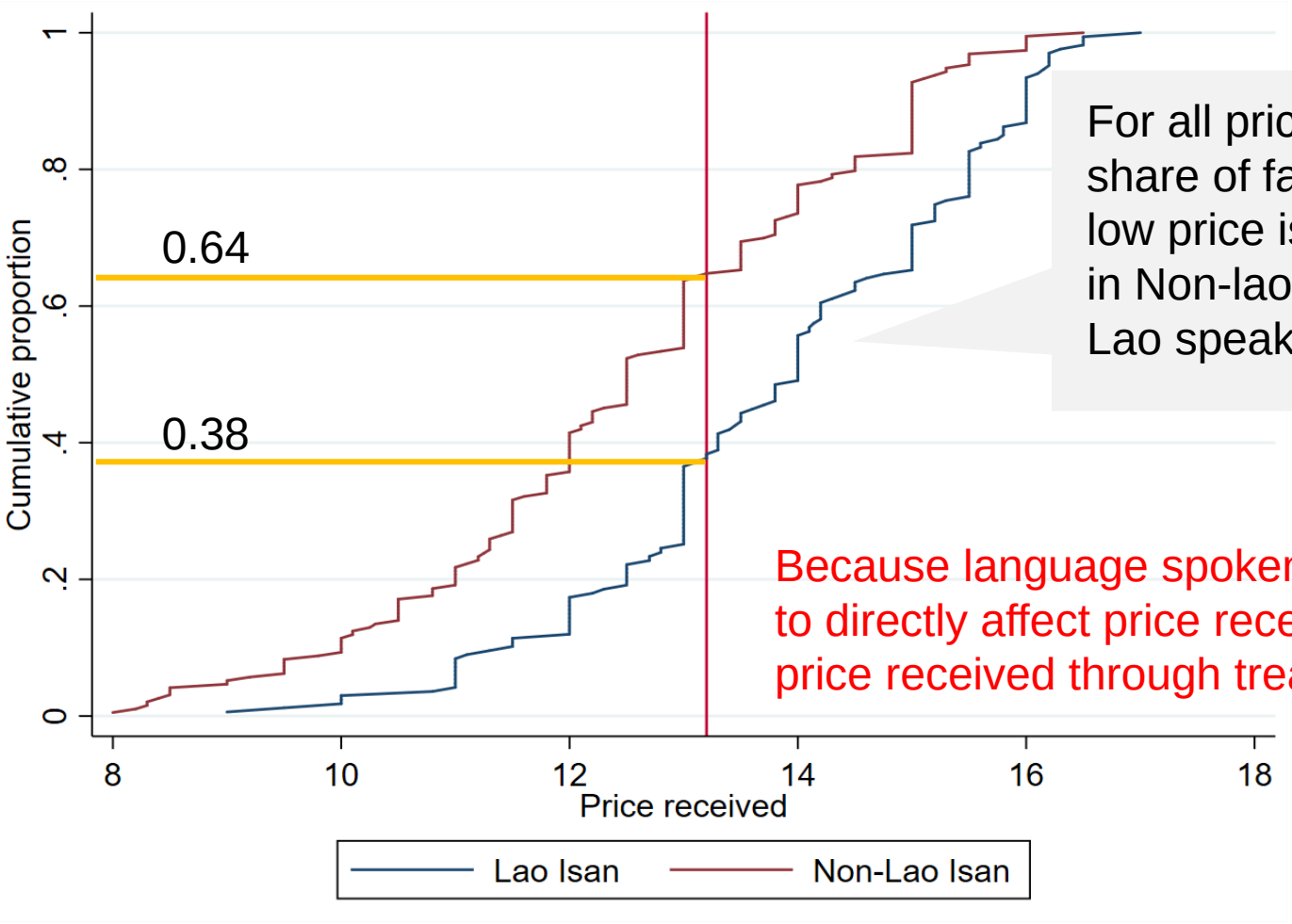
Demographic characteristics of farmers by language spoken at home

	Language spoken at home		
	Lao	Non-lao	Difference
	(1)	(2)	(3)
Age	57.76	56.32	1.444
	[0.88]	[0.73]	[1.135]
Year of education	5.96	5.95	0.005
	[0.24]	[0.25]	[0.349]
Gender (1 = male)	0.44	0.53	-0.085
	[0.04]	[0.04]	[0.053]
Born (1 = inside village)	0.69	0.69	0.005
	[0.04]	[0.03]	[0.049]
Household size	3.97	3.96	0.012
	[0.16]	[0.13]	[0.199]
Off-farm work (1 = yes)	0.42	0.46	-0.042
	[0.04]	[0.04]	[0.053]
Farm size (hectare)	2.61	4.12	-1.511***
	[0.18]	[0.24]	[0.311]
Sample size	167	193	360

Note: The quantities in blankets below the estimates are the standard errors. *, **, *** indicate significance at the 0.1, 0.05, 0.01 levels, respectively.

A clear relationship between language spoken at home and price received.

Cumulative distribution functions (CDF) of price received by farmers



For all price received, the share of farmers that receive low price is relatively larger in Non-lao speaking than in Lao speaking farmers.

Because language spoken at home is unlikely to directly affect price received, it must affect price received through treatment status.

The IV exclusion restriction is fulfilled.

Testing the exclusion restriction assumption (partly)

Dependent variable: language spoken at home	
Farmers' marketing decisions	
Type of paddy sold (1 = wet paddy)	-0.015
	[0.078]
Type of buyer (1 = miller)	0.012
	[0.119]
Selling months (number of months)	-0.025
	[0.014]
Local area characteristics	
Number of millers	0.109
	[0.127]
Milling capacity	-0.000
	[0.000]
Farmers' characteristics	
Farm size	-0.007**
	[0.002]
Household size	0.009
	[0.020]
Age	0.002
	[0.003]
Gender (1 = male)	-0.064
	[0.053]
Year of education	0.010
	[0.014]
R-squared	0.144
Observations	360

Note: The quantities in blankets below the estimates are the standard errors, clustered by sample treatment and sample control areas. *, **, *** indicate significance at the 0.1, 0.05, 0.01 levels, respectively.

The presence of MCs has a positive correlation with price received by farmers.

Ordinary least squares (OLS) estimation results

Dependent variable: Log (price received)	
Estimation method	OLS
Independent variables	
locations (1 = treated areas)	0.118***
	[0.009]
Quantity sold	0.000**
	[0.000]
Type of paddy sold (1 = wet paddy)	-0.140***
	[0.018]
Type of buyer (1 = miller)	0.007
	[0.012]
Paddy quality_a (1 = the best quality)	0.078***
	[0.013]
Quality_b (1 = no mixing varieties)	0.065**
	[0.025]
Selling in October	-0.126***
	[0.024]
Selling in November	-0.102**
	[0.030]

Dependent variable: Log (price received)	
Estimation method	OLS
Independent variables	
Age	-0.000
	[0.001]
Gender (1 = male)	0.000
	[0.008]
Year of education	0.000
	[0.002]
Farm size	-0.000
	[0.000]
Number of millers	-0.013**
	[0.004]
Milling capacity	0.000***
	[0.000]
Observations (N)	360
R-squared	0.625

Note: The quantities in blankets below the estimates are the standard errors, clustered by sample treatment and sample control areas. *, **, *** indicate significance at the 0.1, 0.05, 0.01 levels, respectively.

The instrument appears sufficiently strong to avoid bias caused by weak instruments.

Ordinary least squares (OLS) and IV estimation results

	Dependent variable: Log (price received)			
Estimation method	OLS	OLS	IV 2SLS	IV 2SLS
	(1)	(2)	(3)	(4)
Independent variables				
locations (1 = treated areas)	0.118***	0.098**	0.110***	0.113***
	[0.009]	[0.027]	[0.021]	[0.022]
Gender (1 = male)	0.000	0.003	0.004*	
	[0.008]	[0.006]	[0.002]	
Year of education	0.000	0.004	0.000	
	[0.002]	[0.002]	[0.000]	
Observations (N)	360	360	360	360
R-squared	0.625	0.118	0.117	0.105
First stage F-statistic	**-**	**-**	**133.81**	**135.47**

Note: The quantities in blankets below the estimates are the standard errors, clustered by sample treatment and sample control areas. *, **, *** indicate significance at the 0.1, 0.05, 0.01 levels, respectively. In (1), controls for selling time in January, February, March, April, May, June, October, November December, controlling for household size, the number of millers, quantity sold, type of paddy sold, type of buyer, paddy quality, number of millers, and milling capacity are not shown.

The presence of active MCs significantly affects the pricing behaviors of private intermediaries.

Ordinary least squares (OLS) and IV estimation results

	Dependent variable: Log (price received)			
Estimation method	OLS	OLS	IV 2SLS	IV 2SLS
	(1)	(2)	(3)	(4)
Independent variables				
locations (1 = treated areas)	0.118***	0.098**	0.110***	0.113***
	[0.009]	[0.027]	[0.021]	[0.022]
Gender (1 = male)	0.000	0.003	0.004*	
	[0.008]	[0.006]	[0.002]	
Year of education	0.000	0.004	0.000	
	[0.002]	[0.002]	[0.000]	
Observations (N)	360	360	360	360
R-squared	0.625	0.118	0.117	0.105
First stage F-statistic	**-**	**-**	**133.81**	**135.47**

Note: The quantities in blankets below the estimates are the standard errors, clustered by sample treatment and sample control areas. *, **, *** indicate significance at the 0.1, 0.05, 0.01 levels, respectively. In (1), controls for selling time in January, February, March, April, May, June, October, November December, controlling for household size, the number of millers, quantity sold, type of paddy sold, type of buyer, paddy quality, number of millers, and milling capacity are not shown.

The presence of active MCs significantly affects the pricing behaviors of private intermediaries.

Ordinary least squares (OLS) and IV estimation results

	Dependent variable: Log (price received)			
Estimation method	OLS	OLS	IV 2SLS	IV 2SLS
	(1)	(2)	(3)	(4)
Independent variables				
locations (1 = treated areas)	0.118***	0.098**	0.110***	0.113***
	[0.009]	[0.027]	[0.031]	[0.022]
Gender				
Year of education	0.000	0.004	0.000	
	[0.002]	[0.002]	[0.000]	
Observations (N)	360	360	360	360
R-squared	0.625	0.118	0.117	0.105
First stage F-statistic	**-**	**-**	**133.81**	**135.47**

Farmers in treated areas receive 11.0% higher price from private intermediaries than those who live in control areas.

Note: The quantities in blankets below the estimates are the standard errors, clustered by sample treatment and sample control areas. *, **, *** indicate significance at the 0.1, 0.05, 0.01 levels, respectively. In (1), controls for selling time in January, February, March, April, May, June, October, November December, controlling for household size, the number of millers, quantity sold, type of paddy sold, type of buyer, paddy quality, number of millers, and milling capacity are not shown.

Treatment effect results are robust.

		Dependent variable: Log (price received)			
		Coefficient on location variable (1 = treated areas)			
	Observations	OLS (1)	OLS (2)	2SLS (3)	First stage F-statistic
Full sample	360	0.118***	0.098**	0.110***	133.81
		[0.009]	[0.027]	[0.021]	
Restricted sample					
Selling the best quality sample	179	0.146***	0.111***	0.116***	103.21
		[0.010]	[0.011]	[0.012]	
Selling to miller sample	203	0.110***	0.075	0.077**	228.17
		[0.016]	[0.039]	[0.034]	
Selling to trader sample	116	0.145***	0.114***	0.142***	47.94
		[0.014]	[0.022]	[0.018]	
Selling wet paddy sample	217	0.119***	0.117**	0.121***	65.58
		[0.015]	[0.029]	[0.025]	
One miller in the area sample	240	0.159**	0.095**	0.108***	52.36
		[0.046]	[0.032]	[0.023]	

Note: The quantities in blankets below the estimates are the standard errors. *, **, *** indicate significance at the 0.1, 0.05, 0.01 levels, respectively.

The spillover effect varies with gender.

The heterogeneity of spillover effect

	Dependent variable: Log (price received)				
	(1)	(2)	(3)	(4)	(5)
Independent variables					
Location (1 = treated areas)	0.096***	0.139***	0.121***	-0.057	0.122***
	[0.022]	[0.032]	[0.032]	[0.068]	[0.044]
Location*Gender	0.031**				
	[0.014]				
Location*Year of education		-0.005			
		[0.003]			
Location*Farm size			-0.001		
			[0.001]		
Location*Age				0.003**	
				[0.001]	
Location*Household size					-0.003
					[0.008]
Gender (1 = male)	-0.012**	0.004	0.003	0.004	0.003
	[0.006]	[0.006]	[0.006]	[0.007]	[0.006]
Age	0.001	0.001	0.001	-0.000	0.001
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Household size	0.004	0.004	0.004	0.004	0.006
	[0.003]	[0.003]	[0.003]	[0.003]	[0.007]
Observations	360	360	360	360	360
R-squared	0.118	0.120	0.118	0.127	0.117

Note: The quantities in blankets below the estimates are the standard errors. *, **, *** indicate significance at the 0.1, 0.05, 0.01 levels, respectively. Controls for Year of education, farm size and household size are not shown.

Our result carries three crucial implications for policy makers and evaluators

1. **Evaluating the inclusiveness of MCs toward poor farmers should not be limited to characteristics of participating farmers.**

2. **Prior studies that do not control for the spillover effect of MCs may underestimate the effects of MCs on participating farmers. So, the results from these studies should be interpreted with caution.**

3. **Spillover effect needs to be incorporated in the future evaluation of MCs performance.**

Agenda

- Motivation: smallholder marketing problems
- Empirical strategy
- Sampling design and data
- Results and policy implications
- **Conclusion**

Conclusion and Key takeaways

- **This is the first study that provides empirical evidence of the existence and magnitude of the spillover effect of active MCs.**
- **The presence of MCs does improve the marketing performance of nonparticipating farmers.**
- **Failure to consider this spillover effect could lead to substantial misestimates of the benefits of MCs.**

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Thank you for your attention!

Q&A