Shock Experience, Risk Aversion, and Farm Production: Evidence from Rice Farmers in Thailand

Manh Hung Do [a], Trung Thanh Nguyen [a], Ulrike Grote [a]

Motivation

- Rice plays a crucial role in generating income and ensuring food security for millions of rice farmers in Southeast Asian countries;
- The current rice farming practices heavily rely on synthetic fertilizers and pesticides to achieve a higher rice productivity;
- Rural households in developing countries are living under a vulnerable context and more frequently facing with different types of shocks (Klasen and Waibel, 2015);
- Uncertainties caused by adverse shocks affect rural households' risk attitude that may lead to improper applications of inputs and reduce farm efficiency;
- The objectives are to:
  - examine the impacts of risk preferences on fertilizer and pesticide use in the context of shocks in rural regions; and
  - investigate the effect of adverse shocks and risk preferences on technical efficiency in crop production in developing countries.

Data

- **Data**: Thailand – Vietnam Socio Economic Panel (TVSEP) funded by the German Research Foundation (DFG - FOR 756) [b];
- In Thailand, the survey was carried out in three provinces, namely Buriram, Nakhon Phanom, and Ubon Ratchathani;
- **Final sample**: A balanced panel data consisting of 1200 identical rice farmers in 2013 and 2017 (with 2400 observations).

Estimation strategy

- Examining impacts of shocks and risk preferences on input use by employing fixed-effects (FE) estimations with instrumental variables (IV);
- Investigating effects of shocks and risk preferences on farming efficiency:
  - Farming efficiency is estimated from the translog true random-effects stochastic production frontier function with Mundlak's adjustments;
  - Effects of shocks and risk preferences on farming efficiency are evaluated from IV fixed-effects and pooled sample estimations.

Descriptive summary

Table 1 Descriptive summary of some key variables

Variables	*Whole sample* (n = 2440)	*By years* 2013 (n=1220)	2017 (n=1220)	*Statistic test*
Risk preferences	5.59	4.80	6.38	-13.11***, a
Rice production				
Fertilizer volume (Kg/hectare)	83.66	87.90	82.48	1.38 a
Fertilizer cost (PPP$[c]/hectare)	214.25	271.68	156.83	9.92***, a
Pesticide cost (PPP$/hectare)	11.41	13.65	9.16	4.08***, a
Shocks				
Weather shocks†	0.34	0.48	0.20	14.54***, b
Pest/disease shocks†	0.09	0.08	0.09	-0.502 b

Notes: Farmers' risk preferences vary from 0 = unwilling to take risks to 10 = fully prepared to take risks;
[a]: Two-sample t-test; [b]: non-parametric two-sample test: rank-sum test; [c] PPP$: Purchasing Power Parity $ adjusted to 2005 prices; †: Dummy variable; *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Key results

Table 2 Impacts of shocks and risk preferences on input use from IV FE models

	Pesticide expenditure (ln)		Fertilizer volume (ln)	
	Coef.	Robust SE [a]	Coef.	Robust SE [a]
Risk preferences (Instrumented)	**-0.123***	0.073	**-0.086***	0.051
Weather shocks†	**0.327*****	0.091	0.008	0.069
Pest/disease shocks†	**0.279***	0.147	**0.294*****	0.091
Demographic characteristics	*Yes*		*Yes*	
Farming characteristics	*Yes*		*Yes*	
Physical and social capital	*Yes*		*Yes*	
_cons	1.216**	0.544	3.009***	0.432
Number of observations	2440		2440	
Wald chi2(21)	118.700		238.020	
Prob > chi2	0.000		0.000	
Under identification	0.000		0.000	
Over identification	0.484		0.889	
Weak identification	23.961		23.961	

Note: [a]: Robust standard errors clustered at village levels; †: Dummy variable; *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Figure 1 Farming technical efficiency of rice production in Thailand

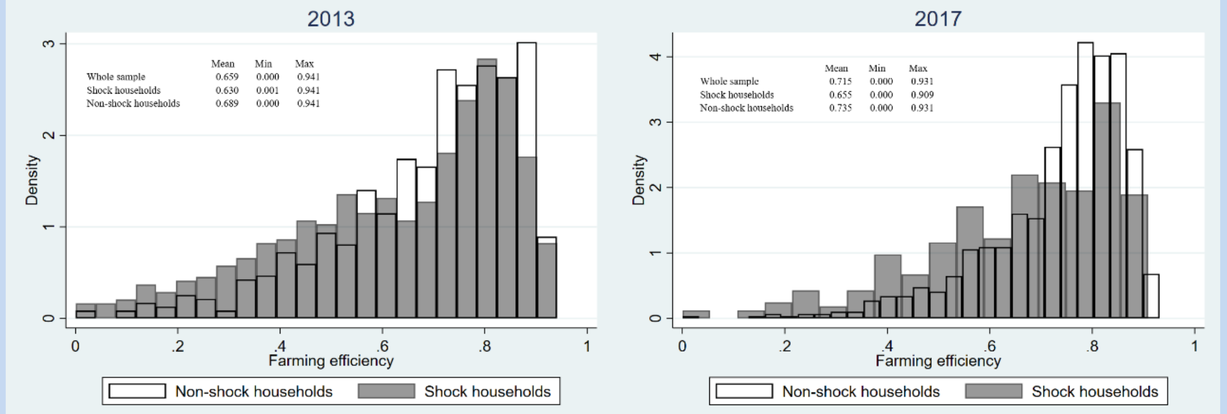

Table 3 Effects of shocks and risk preferences on farm efficiency

	Fixed-effects		Pooled sample	
	Coef.	Robust SE [a]	Coef.	Robust SE [a]
Risk preferences (Instrumented)	**0.015***	0.008	**0.027*****	0.009
Weather shocks†	**-0.080*****	0.013	**-0.074*****	0.009
Pest and disease shocks†	0.014	0.019	0.002	0.014
Demographic characteristics	*Yes*		*Yes*	
Farming characteristics	*Yes*		*Yes*	
Physical and social capital	*Yes*		*Yes*	
_cons	0.697***	0.084	0.515***	0.063
Number of observations	2440		2440	
Wald chi2(15)	260.56		152.08	
Prob > chi2	0.000		0.000	
Under identification	0.000		0.000	
Over identification	0.088		0.2235	
Weak identification	32.737		23.817	

Note: [a]: Robust standard errors clustered at village levels; †: Dummy variable; *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Findings and implications

- Fertilizers and pesticides can be considered as risk-reducing inputs in rice production in Thailand. In other words, the more the farmers avoid risks, the more they apply fertilizers and pesticides;
- In the context of weather and pest/disease shocks, they also tend to use more fertilizers and pesticides. This urges governments in developing countries on supporting rural households to cope with these shocks, especially in the context of climate change that causes extreme natural events more frequently;
- Uncertainties caused by adverse shocks affect rural households' risk attitude that might lead to improper applications of inputs and, therefore, reduce farming efficiency;
- The stimulation of policies on providing production insurance mechanisms and enhancing farmers' awareness of proper application is critical to mitigate adverse impacts of shocks and reduce overuse of chemical inputs.

Tropentag 2021

We highly acknowledge the financial support of the German Research Foundation (DFG - FOR 756) for the TVSEP project and the University of Hohenheim for organizing the Tropentag 2021. MH Do would like to thank the German Academic Exchange Service (DAAD) for financial assistance.

[a] Institute for Environmental Economics and World Trade (IUW), Leibniz University of Hannover (LUH)
[b] Thailand – Vietnam Socio Economic Panel (TVSEP) www.tvsep.de

Klasen, S., and Waibel, H. (2015). Vulnerability to poverty in South-East Asia: Drivers, measurement, responses, and policy issues. *World Development*, (71), 1-3.