

Impact of Livestock Production on Rural Poverty and Income Inequality: Evidence from Vietnam

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Introduction

- Livestock plays an important role in the livelihoods of rural households of developing countries in multiple ways:
 - An income source for 70% of households (Davis et al., 2007).
 - A “saving account” to robust hedge against income fluctuation (Kazianga and Udry, 2006)
 - Assets that can be sold in times of shocks (Mogues, 2011).

Situation of Vietnam:

- Poverty fell dramatically from 58% (1993) (Nguyen, 2012) to 14.5% (2008) (World Bank, 2012).
- Income inequality rises (World Bank, 2012; VASS, 2011).
- Livestock contributes 27% to the total agricultural production in 2011 (Stanton et al., 2011)

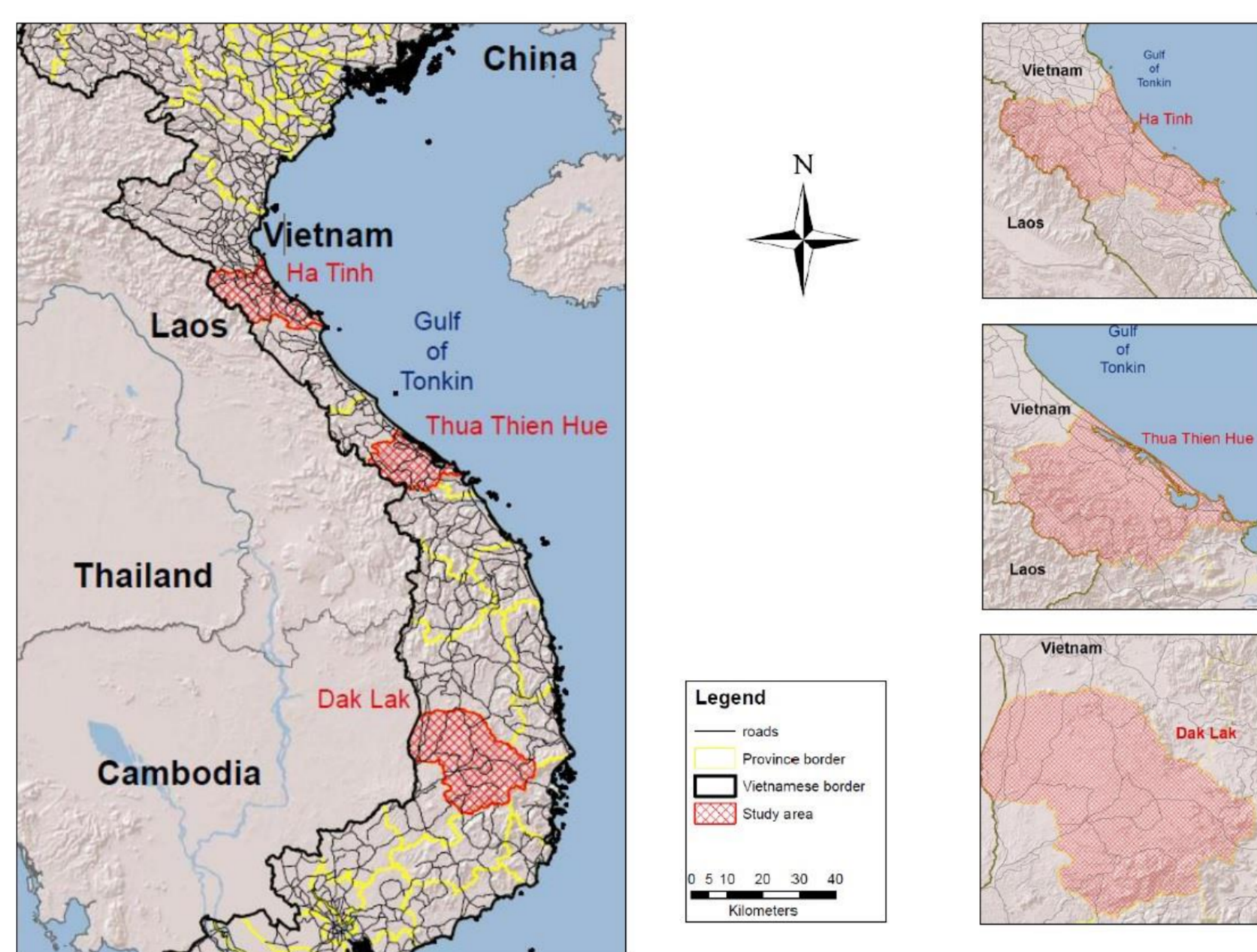
Research questions:

What are the roles of livestock production in reducing rural poverty and income inequality, especially when households face shocks?

Data

The data is taken from a series of rural surveys under the research project “Impact of shocks on the vulnerability to poverty: Consequences for development of emerging Southeast Asian Economies”(DFG FOR 756):

- Panel Data on 2200 rural households and 220 villages in 2007, 2008, 2010, and 2013 in three provinces of Vietnam, namely Ha Tinh, Thua Thien Hue, and Dak Lak.
- The household questionnaire contains sections on the demographic, economic and social situation of households.
- The village questionnaire captures village-level data on population, infrastructure, and the socio-economic structure of the village.



Map of Vietnam and of three provinces Ha Tinh, Thua Thien Hue, and Dak Lak.

- Information about livestock at the beginning and at the end of the period, stock change in the period, and expenditure is collected.
- Regarding shocks, perceived shock events that the households have experienced during the last three years are reported.

Method

(1) Methods to evaluate the impact of livestock on poverty reduction

- The propensity score (Rosenbaum and Rubin, 1983) is defined as:

$$P(X) = \Pr(D_{ij,2013} = 1 | X_{ij,2010}, Sh_{ij,2010}, V_{j,2010}, FE_{prov}, L_{2007}) \quad (1)$$

Where $D_{ij,2013}$ (dummy variable) equals to one if household i in village j has livestock in 2013 and zero otherwise; $X_{ij,2010}$ refers to household assets, $Sh_{ij,2010}$ are the number of shocks household i faced in the last three years, $V_{j,2010}$ represents village characteristics and FE_{prov} are province fixed effects in 2010; L_{2007} is a dummy variable to indicate if the household has livestock in 2007.

- The impact of livestock production on poverty reduction is modeled as follows:

$$ATT = E(Y_{2013}^T - Y_{2007}^T | D = 1, P(X)) - E(Y_{2013}^C - Y_{2007}^C | D = 0, P(X)) \quad (2)$$

- The outcome variables are poverty indices identified and modified from Foster et al. (1984) as follows:

$$P_\alpha = \frac{1}{N} \sum_{i=1}^q n_i \left[\frac{Z - Y_i}{Z} \right]^\alpha \quad (3)$$

where Y_i is income per capital in poor household i , Z is the poverty line, N is the number of people in the sample population, n_i is the number of members in household i , q is the number of poor household. The poverty lines are 1.25 PPP\$ and 2 PPP\$ in 2005. When $\alpha=0$, P_0 is the headcount index; when $\alpha=1$, P_1 is the poverty gap index; and when $\alpha=2$, P_2 is the poverty severity.

(2) Methods to evaluate the impact of livestock on income inequality

- Gini decomposition method developed by Shorrocks (1982) as follows:

$$G = \sum_{k=1}^K S_k G_k R_k \quad (4)$$

where S_k refers to the share of the income component k in total household income, G_k represents the Gini coefficients of the income component k , R_k is the Gini correlation of income component k with the distribution of total income.

Results

Table 1: Difference-in-difference estimates of the impact of livestock production on income poverty reduction

(1) is ATT of poverty line = 1.25 \$PPP, (2) is ATT of poverty line = 2 \$PPP, * Significant at 10%, ** significant at 5%, *** significant at 1%. Standard errors bootstrapped 200 replications only for Kernel matching and Radius matching, ^a NNM = five nearest neighbor matching with common support and replacement, ^b KBM = Kernel matching with common support and band width 0.06, ^c Radius matching with common support and band width 0.06.

Poverty indexes	Matching algorithm	The shock household group		The non-shock household group		Whole sample	
		(1)	(2)	(1)	(2)	(1)	(2)
Treatment is households with livestock							
Head count index (P_0)	NNM ^a	-0.196***	-0.248***	-0.034	-0.015	-0.112**	-0.159***
	KBM ^b	-0.173***	-0.248***	-0.034	-0.017	-0.117**	-0.171***
	Radius ^c	-0.177***	-0.252***	-0.037	-0.018	-0.123**	-0.173***
Poverty gap index (P_1)	NNM ^a	-0.123***	-0.169***	-0.071	-0.041	-0.085**	-0.105***
	KBM ^b	-0.117**	-0.157***	-0.061	-0.039	-0.082**	-0.107***
	Radius ^c	-0.119**	-0.160***	-0.057	-0.039	-0.083**	-0.110***
Poverty severity (P_2)	NNM ^a	0.107	-0.048	0.072	-0.004	0.119	-0.010
	KBM ^b	0.122	-0.036	0.087	0.005	0.129	-0.007
	Radius ^c	0.122	-0.037	0.095	0.009	0.130	-0.008
Treatment is households with positive livestock income							
Head count index (P_0)	NNM ^a	-0.186**	-0.321***	-0.070	-0.115	-0.168***	-0.238***
	KBM ^b	-0.195***	-0.325***	-0.076	-0.146*	-0.155***	-0.257***
	Radius ^c	-0.199**	-0.318***	-0.076	-0.139*	-0.156***	-0.259***
Poverty gap index (P_1)	NNM ^a	-0.157***	-0.198***	-0.082	-0.087	-0.133***	-0.159***
	KBM ^b	-0.144***	-0.188***	-0.125	-0.116*	-0.132***	-0.159***
	Radius ^c	-0.145***	-0.188***	-0.122	-0.114*	-0.130***	-0.158***
Poverty severity (P_2)	NNM ^a	-0.106**	-0.148***	-0.091	-0.085	-0.102***	-0.128***
	KBM ^b	-0.096***	-0.138***	-0.149	-0.128	-0.104***	-0.128***
	Radius ^c	-0.097***	-0.139***	-0.145	-0.125	-0.101***	-0.126***

Table 2: Gini decomposition by income source

* Significant at 10%, ** significant at 5%, *** significant at 1%.

(a) for no-livestock households and livestock households in 4 years 2007, 2008, 2010, and 2013, (b) for no-livestock households and positive livestock income households in 4 years 2007, 2008, 2010, and 2013.

Group and income source	Share in total household income		Gini coefficient for income source		Gini correlation with total income rankings		Share in Gini of total income		Percentage change in Gini coefficient	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
The shock household group										
Livestock income	0.116	0.171	1.242	0.734	0.583	0.565	0.160	0.145	0.043***	-0.025***
Other income	0.884	0.829	0.530	0.527	0.948	0.954	0.840	0.855	-0.043***	0.025***
Total income	1.000	1.000	0.528	0.487	1.000	1.000	1.000	1.000		
The non-shock household group										
Livestock income	0.114	0.142	1.070	0.789	0.570	0.562	0.129	0.123	0.015***	-0.019***
Other income	0.886	0.858	0.549	0.543	0.962	0.965	0.871	0.878	-0.015***	0.019***
Total income	1.000	1.000	0.537	0.513	1.000	1.000	1.000	1.000		
Whole sample										
Livestock income	0.115	0.157	1.166	0.758	0.577	0.562	0.144	0.132	0.029***	-0.025***
Other income	0.885	0.843	0.545	0.542	0.955	0.961	0.856	0.868	-0.029***	0.025***
Total income	1.000	1.000	0.538	0.506	1.000	1.000	1.000	1.000		

- For the whole sample, the contribution of livestock income to total household income is significant (as in columns 1a and 1b).
- The Gini coefficient of livestock income is very high, 1.17 due to negative livestock income (Column 2a). It is approximately 0.76 (Column 2a) when we only account for no-livestock households and positive livestock income households.
- The correlations do not vary considerably between “the shock household” and “the non-shock household groups”. The high correlations (0.56-0.58) imply the important role of livestock income share in the overall Gini coefficient. (Column 3).
- An increase of 1%-point in the livestock income, *ceteris paribus*, increases the overall Gini coefficient by 0.029% for the whole sample (Column 5a), but decreases the overall Gini coefficient by 0.025% if our sample does not contain negative livestock income households (Column 5b). The impacts are higher when households have shocks.

Conclusions

- Livestock production significantly contributes to household income. It is more important when households face shocks.
- Livestock production has a significant and positive effect on poverty reduction at the household level, especially for the households who face shocks.
- The effects of livestock production on income inequality depend on whether the livestock income is positive or negative. If there are households with negative livestock income, the effect is negative. If all households have positive livestock income, the effect is significant and positive on equal distribution of rural income.

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