

Abstract

We study whether BRAC as a microcredit lender uses household performance in a livestock transfer program as a signal of creditworthiness to improve targeting in its subsequent microcredit program. We find that risk-adjusted income and efficiency in the livestock activity explain demand and supply of microcredit from BRAC. It indicates that BRAC uses both observable and unobservable characteristics from the livestock transfer program to reduce adverse selection in the microcredit program.

Introduction

In absence of collateral or credit score, microcredit lenders rely on observable characteristics of potential borrower and judgment of loan officer as screening mechanisms. If the judgment of loan officer is not a crucial factor in loan approval, we would expect that borrowers' observable characteristics are enough to explain loan approval decision. In this study, we estimate whether, and to what extent, judgment of loan officer matters on microcredit approval decision.

We use a unique data set from a Randomized Control Trial (RCT) based livestock transfer program administered by BRAC in Bangladesh where beneficiary households were also encouraged to take loan from the same institution at the end of the intervention. During the intervention period, BRAC officers visit beneficiary households periodically to monitor transferred assets, provide training, or discuss potential investment plans.

Our hypothesis is that if efficiency in the livestock activity is a significant predictor of loan rejection after controlling other observable characteristics, it will imply that BRAC uses information from the transfer program as a screening mechanism to judge borrowers' credibility and hence, to reduce adverse selection.

Loan rejection and efficiency in livestock production

We use information from the first follow-up (2009) and second follow-up (2009) surveys of 3,677 treatment households in the livestock transfer experiment by Bandiera et al. (2017). 27% households received at least one loan and 8% households were rejected to take loan from BRAC after four years of the intervention.

We use the bivariate probit model with sample selection to study household microcredit market participation and loan approval outcomes as follows,

$$y_i = \beta x_i + u_{1i} \text{ if } az_i + u_{2i} > 0, \quad 0 \text{ Otherwise}$$

Where y_i is a binary indicator of microcredit approval or rejection, which is observed only if a household decides to participate into microcredit market. We estimate household **efficiency** in livestock production using stochastic production frontier model and use it in both selection and outcome equations. In addition, z_i includes a binary indicator on whether **household risk-adjusted income** is positive or not following Samphantharak and Townsend (2017).

	Rejected (yes=1)	Applied (yes=1)
Efficiency Score	-0.5821** (0.2416)	-0.1346 (0.2053)
Livestock Asset Index	-0.1500*** (0.0379)	0.0863*** (0.0188)
Male working Aged member	0.1431*** (0.0429)	0.1094*** (0.0291)
Positive risk-adjusted Income		0.0855** (0.0432)
Constant	-0.4290** (0.2001)	-0.1945 (0.1495)

Note: N=7,354. Other variables included in the model are age of household head, land holding, household income, and number of female working aged members in households. Robust standard errors in parentheses. *** p<0.01, ** p<0.05.

Does the livestock program generate additional information?

Do information from the follow-up rounds have better predictive power over baseline information to predict the loan rejection decision? Is baseline information is enough to predict credit market outcomes?

We apply the **Random Forest Classifier** to predict credit outcomes and important variables using respondents' information from different phases: baseline, first follow-up, and second follow-up rounds.

	Correct Prediction (%)			Important variable	
	Accuracy	Sensitivity	Specificity	First	Second
Baseline(Objective)	76	94	10	Income	Age of Head
Baseline (Objective + Subjective)	75	93	14	Income	Age of Head
First follow-up	74	92	8	Income	Asset Index
First follow-up and efficiency	76	95	18	Efficiency	Income
Second follow-up	78	91	30	Income	Asset Index
Second follow-up and efficiency	79	93	27	Income	Efficiency

Note: Baseline objective, first follow-up, and second follow-up include age and education of household head, land holding, livestock asset index, household income, and number of male and female working aged members in households. Subjective indicators consist of women ability to initiate or influence new economic activity (ability), mobility index (mobility) , and communication with outside business people (communication),.

Does return to capital differ by selection?

Do households with low-return are more likely to get loan rejection from BRAC compared to low return households?

We estimate return to capital by loan approval group controlling observable characteristics and efficiency indicator.

$$profit_{it} = \alpha_0 + \alpha_1 capital_{it} + \alpha_2 rejected_i + \alpha_3 capital_{it} \times rejected_i + \epsilon_{it}$$

	Livestock Profit	Other Profit
Capital (USD/PPP)	0.03 (0.02)	1.11*** (0.16)
Rejected (Yes=1)	-15.75 (62.53)	-203.47*** (54.61)
Rejected* Capital	0.05 (0.06)	-0.64* (0.34)
Efficiency	2,546.85*** (174.55)	400.84** (174.10)
Constant	-1,139.76*** (179.06)	24.03 (178.68)

Note: N=2,031. Other variables included in the model are age of household head, working aged member, women ability to initiate or influence new economic activity (ability), mobility index , and communication with outside business people. Standard errors in parentheses. *** p<0.01, ** p<0.05.

Discussion

BRAC utilizes efficiency in livestock production as a signal about borrowers' credibility.

Income, asset holding, and age of the household head are most important variables to explain microcredit market outcomes.

Additional information from follow-up rounds have better prediction power than baseline information

We show that BRAC reduces adverse selection through monitoring. It also indicates that pure machine-based credit scoring model may not be the best alternative option in the context of microcredit market.

References

- Bandiera, O., Burgess, R., Das, N., Gulesci, S., Rasul, I., & Sulaiman, M. (2017). Labor markets and poverty in village economies. *The Quarterly Journal of Economics*, 132(2), 811-870.
- Samphantharak, K., & Townsend, R. M. (2017). Risk and Return in Village Economies..

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