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# The impact of livestock asset transfers on the livelihoods of the ultra-poor

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## ABSTRACT

This paper estimates the impacts of Livestock Asset Transfers on the livelihoods of the ultra-poor in West Bengal, India. The programme provides the female members of ultra-poor households with livestock assets as grants. We find that the intervention increases per capita monthly income by Rs 1061 (122% increase). It also increases the food expenditures of households and enables them to secure enough food to eat at least two meals a day. Furthermore, the programme also increases the number/amount of owned livestock assets, poultry, and cultivable lands amid the treatment households.

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## KEYWORDS

Asset transfer; ultra-poor; income; food security; West Bengal

## 1. Introduction

Livestock rearing has largely contributed to earnings, consumption, and food security (Murphy and Allen 2003; and Randolph et al. 2007). Besides, generating income from livestock has predominantly been a female-centric activity in rural households (McPeak and Doss 2006). Female members in a household who manage and generate income through animal farming/rearing have enhanced bargaining power within households, consequently leading to positive effects on their children's health, nutrition, and educational outcomes (Quisumbing and Maluccio 2003). It is, thus understandable that livestock transfer is a popular intervention for addressing ultra-poverty in rural areas of developing countries. Several studies evaluate the effects of livestock transfers on the livelihoods of ultra-poor households. For example, Bandiera et al. (2017) assess BRAC's Ultra-poor Graduation (UPG) Program in Bangladesh, which provides interventions in the form of asset transfer (mainly livestock and poultry) and training. Bandiera et al. found a significant increase in the labour supply and earnings for programme participants. Evaluating a similar programme implemented in Ethiopia, Ghana, Honduras, India, Pakistan, and Peru, Banerjee et al. (2015) also document positive effects on these outcomes. Similar positive effects on the livelihoods of the ultra-poor are also observed from programmes implemented in West Bengal and Rwanda (Banerjee et al. 2011; Argent, Augsburg, and Rasul 2014).

In this paper, we examine the effects of a livestock-based anti-poverty programme on the livelihoods of the ultra-poor<sup>1</sup> in West Bengal, India. The programme titled Targeting Hardcore Poor (THP) has been implemented by a local NGO called Belghoria Janakalyan Samity (BJS). The THP programme targets ultra-poor households who are marginalised, severely food insecure, and have no entrepreneurial skills and productive assets. West Bengal is the sixth-largest economy among Indian states, with a per capita GDP of USD 1634 in 2019 against USD 2100 for all of India (MSPI 2021). As of 2011, 22.5% of India's population lived below \$1.90 per person per day at the PPP exchange rate (World Bank 2021), and in West Bengal, the rate is 20% (World Bank 2017). About two-thirds of West Bengal's population live in rural areas,<sup>2</sup> with the rural population of this state heavily relying on farming activities for their livelihoods (Datta and Ghosal 2014).

The intervention provided by the THP programme includes the provision of productive assets (mainly livestock) and other supports such as training, weekly consumption allowances, and health support to ultra-poor women. Using propensity score matching (PSM), we estimate the effects of the intervention on employment, income, food security, productive and durable assets, social inclusion, housing, sanitation, and women's empowerment.

Our paper expands on the existing evaluation literature of anti-poverty programmes (including the transference of livestock assets) (Bandiera et al. 2017; Banerjee et al. 2015; Banerjee et al. 2011; Argent, Augsburg, and Rasul 2014). However, we deviate from the existing literature by showing that livestock-based anti-poverty programmes can improve the welfare of more vulnerable households in the community compared to households studied by the current papers on similar interventions. Comparing some basic household demographics between the studies, we find that our sample (from the 2017 cohort) consists of more vulnerable households at baseline in comparison to those previously covered in the evaluation literature (Banerjee et al. 2015; Banerjee et al. 2011; Bandiera et al. 2017; Argent, Augsburg, and Rasul 2014). For instance, a majority of the treatment households in our study sample (57%) come with female household heads, which is proportionately higher than the proportion of female-headed households (41%) used in the sample by Bandiera et al. (2017).<sup>3</sup> In addition, households in our sample own considerably fewer assets (cows: 3% vs. 5.5% and goats: 6% vs. 9.2%) than those studied by Bandiera et al. (2017) and have fewer household members of working age (1.61 vs. 2.36) than the sample used by Banerjee et al. (2011), further confirming their vulnerable status.

The rest of the paper proceeds as follows. A description of the THP programme is provided in Section 2 to set the context, and the conceptual framework is examined in Section 3. Then Sections 4 and 5 elaborate on the research design, data collection methods, and analytical methodology, respectively. Finally, Section 6 presents the findings, and Section 7 concludes the paper.

## **2. The THP programme**

### **2.1. Selection of beneficiaries**

This paper examines the programme effects on the 2017 cohort of beneficiaries. The THP programme selects beneficiaries through several steps: Households of a community are first categorised by their poverty status (e.g. ultra-poor, poor, middle class, non-poor) through a Participatory Rural Appraisal (PRA). Households were then surveyed from the bottom two wealth ranks on their socio-economic characteristics and were checked to see if they fit the specific targeting criteria set out by BJS, which were as follows: (i) monthly household income cannot be more than Rs.1000, (ii) the family has no physically active male member who can work and earn, (iii) the family has a physically active woman as primary earner who can undertake economic activities and can grow enterprises, (iv) the household has not taken any loans from a formal or an informal institution, and (v) the household is not adequately supported by the Government or NGOs.<sup>4</sup> A household must meet all these selection criteria to be eligible for the programme support.

### **2.2. Community support mobilisation**

A village committee is formed comprising village elders, leaders (local government representatives), and scholars (such as teachers), where the committee is responsible for guiding and taking care of ultra-poor households. This supplements the programme at the local level, and the committee gradually becomes a support system for beneficiaries even after the programme is phased out.

### **2.3. Enterprise selection**

After completing the selection process, each beneficiary woman selects her enterprise based on the discussion with the programme staff. The enterprises include farm, non-farm, and mixed-farm/firm

assets. The beneficiaries of farm enterprises received five to six goats. In comparison, those of the mixed-farm/firm category got one/two goats and some other non-farm assets like garments, sewing machines, grocery materials, food items, supply materials, and so on. About 75% of the beneficiaries of the 2017 cohort received at least one goat, indicating that the programme provided mainly livestock assets to its recipients.

#### **2.4. Training**

Each participant received enterprise development and confidence-building training. The enterprise development training is at first provided through the classroom for eight to ten days based on the individual member's capability to manage enterprises which is meant to enhance their enterprise management skills. On-field training and refresher courses were also provided quarterly, depending on the types of enterprises selected. As part of the confidence-building training, attempts were also made to instil faith, self-motivation, and self-reliance among the beneficiaries. Confidence-building training was also provided in the classroom.

#### **2.5. Asset transfer**

The programme staff purchase the assets directly and then transfer them to the selected beneficiaries.

#### **2.6. Consumption support/allowance**

The primary purpose of this allowance is to smooth their consumption until they start generating earnings from the assets they received from the programme. Beneficiary households receive consumption support/allowances of Rs.140.00 per week. The support continues for about seven weeks for the non-farm category and 14 weeks for the farm and mixed-farm/firm categories.

#### **2.7. Follow up and monitoring**

Each field staff visits beneficiary households at least once a week to monitor household socio-economic status, followed by designated senior officials who visit beneficiary households once a month.

#### **2.8. Graduation**

The duration of the programme cycle is two years, where all support provided by the THP programme during this period is fully subsidised and borne by the THP programme. Finally, the graduation phase marks the programme's culmination with the beneficiaries emerging as confident and capable of sustaining their livelihoods. At this stage, beneficiary households are believed to achieve significant progress in their livelihoods.

### **3. Conceptual framework**

The two salient approaches related to poverty are the "capability approach" by A.K. Sen and "social exclusion" by Townsend. The capability approach is a framework that enables researchers to utilise various approaches to understand and analyse multidimensional poverty and well-being coherently (Alkire 2007), where Sen (1999) argues that poverty can be identified as capability deprivation, and income is only one instrument in generating capabilities. He stressed that the impact of income on capabilities is conditional and that the relation between income and capability is firmly contingent on the individual's age, gender, location, epidemiological atmospheres, and other variations on which a person may or may not have any control. On the other hand, social exclusion refers to

the situation where people are denied participation in the everyday activities of a citizen, which views poverty as declining participation and access to resources when a particular interest group keeps individuals away from the market economy, and these individuals lack social status (Townsend and David 2002). Providing the poor with livestock might open up opportunities to reduce poverty, as many people depend on livestock as their livelihoods (Thornton et al. 2002). The intervention that provides livestock is thus expected to enhance the capability and access to resources and improve the living standards of the disadvantaged population.

According to Halder and Mosley (2004), the ultra-poor is the poorest group with a limited or non-existent asset base. Hence, they rely on earnings from wage labour. They are also reluctant to borrow due to the fear of being overburdened (Halder and Mosley 2004). Hence, the intervention that builds a productive asset-base is assumed to reduce their vulnerabilities effectively. Since the THP programme provides the ultra-poor with productive assets (mainly livestock), participants would likely multiply those without selling immediately as they also receive consumption allowances that can be used to finance their immediate needs. Evidence shows that training on livestock rearing to ultra-poor households helps them to better utilise it (Argent, Augsburg, and Rasul 2014). Hence, the training and livestock asset of the THP programme may increase self-employment in livestock rearing of ultra-poor women which may consequently increase household income. As such, we expect that the programme would increase income and productive assets of ultra-poor households, which may ultimately translate into improved welfare (household expenditure). Overall, we expect the THP programme may impact the following outcomes:

- (1) Employment of working-age members
- (2) Income
- (3) Productive and durable assets
- (4) Welfare (food security)

In this study, we examine the effects of the THP programme on the outcomes mentioned above. In addition, we also examine the effects on secondary outcomes like housing, sanitation, women's empowerment, and social inclusion as they might be affected by the programme through income increases, if any.

#### **4. Evaluation design and data collection**

We estimate the effects of the THP programme using a quasi-experimental design. We focused on the cohort of 2017 when BJS provided treatment support to 100 ultra-poor households. We conducted a follow-up survey on those households in December 2018 to collect post-intervention data.<sup>5</sup> To control for counterfactuals, we also surveyed 101 near-eligible households. During the PRA, these households were identified as ultra-poor or poor households (i.e. the bottom two wealth ranks of the PRA). However, an in-person survey of the households found them ineligible for programme enrolment as they did not meet the selection criteria. It needs to be mentioned here that we did not conduct any baseline survey, but the data collected by BJS for selection purposes have been used as the benchmark information. BJS collected data on demographic characteristics, asset holding, income, employment, housing conditions, etc., during beneficiary selection. These data were collected through household visits after the completion of PRA. The follow-up survey collected information on demographic characteristics of household members, employment and earnings of all members aged more than six years, productive and non-productive physical assets, financial assets, food security, food expenditure, women's empowerment, social inclusion, and others. It needs to be mentioned here that the BJS staff collected the follow-up survey data, and we, the research team, were responsible for strict monitoring of the data collection process. BJS staff were also provided training on the survey instrument.

Annex [Table A1](#) reports selected baseline characteristics of treatment and comparison (near eligible) groups. The statistics show that at baseline, 87% of women from the treatment group were widowed or separated or divorced against 65% among the comparison group, indicating that the THP programme successfully selected demographically vulnerable women. Treatment and comparison groups were similar at baseline in terms of the amount of owned land. Around 97% of treatment households were food insecure at baseline compared to 86% of the comparison group, indicating that the programme had successfully targeted food-insecure families as well. In addition, treatment and comparison groups were also similar at baseline in terms of having their own houses. Further analysis shows (not reported in the table) that in 57% of treatment households, primary females were the sole earners at baseline.

## 5. Analytical technique

To estimate the effect of the intervention, we use Propensity Score Matching (PSM), which has become a widely used approach to estimate the causal treatment effect for different interventions where Randomized Control Trials (RCT) are difficult to administer. In an observational study, treatment and comparison groups are often drawn from different populations (Dehejia and Wahba 1999). It helps to create an artificial counterfactual to compare the programme's effect. Following Raza, Das, and Misha (2012), we took the comparison group from the near-eligible households who were poor but failed to comply with all the programme enrolment criteria.

PSM constructs a statistical treatment and comparison group with a similar value of propensity scores and this matching allows one to estimate the Average Treatment Effect on Treated (ATT). It considers the observed characteristics that remain unaffected by the programme while estimating the propensity score. We use these characteristics from the pre-intervention data on treatment and comparison groups to calculate propensity scores and match two groups, which is an ideal practice (Khandker, Koolwal, and Samad 2009). As we are intending to estimate the causal effects, mean differences in outcomes between participants and non-participants are not recommended. The characteristics of the two groups might be different without any intervention, which is known as the selection bias problem and PSM is one of the possible solutions to this problem (Caliendo and Kopeinig 2008).

The propensity score equation is as follows:

$$P(Z) \equiv Pr\{D = 1|Z\} = E\{D|Z\} \quad (1)$$

Where,

D takes a value of 0 or 1, indicating whether the observation falls within the treatment or comparison group, and Z represents variables displaying the pre-treatment characteristics.

The steps we followed to use PSM are (i) estimating a Probit model using the available baseline data;<sup>6</sup> (ii) checking balancing properties of the data by testing whether the two groups have the same distribution (mean) of propensity scores; and (iii) estimating the matching equations using the common support restriction to ensure that matches are formed only where the distribution of the density of the propensity scores overlap between the participant and non-participant groups. Finally, we use STATA's `psmatch2` command to match propensity scores between treated and untreated groups through the nearest neighbourhood matching technique.

As mentioned earlier, we did not conduct any baseline survey. BJS, however, collected some baseline data for beneficiary selection purposes. We use some of this data (the reported six variables in [Table A2](#)) to match treatment and comparison groups. The rationale for choosing these covariates is as follows. First, widowed/separated/divorced women are more likely to be selected by the programme, as their households primarily rely on their income. Second, the age of the leading female members can determine participation. Considering that the physical capability to manage

the assets provided by the programme is essential, we include two other variables (age and physical ability) to match treatment and comparison groups. Third, housing condition, an indicator of economic status, which may affect programme participation, is also examined along with the presence of a physically active female member in the household, which was also a selection criterion used by the programme. We therefore include this in the matching equation. Finally, dependency on earnings from day labour may reflect economic status, affecting programme participation, so it is also included.

Table A2 shows the Probit regression results for matching treatment and comparison groups. Results show that marital dissolution is positively correlated with participation. These results indicate that BJS was more likely to select widowed/separated/divorced women as programme beneficiaries. On the other hand, age is negatively correlated with programme participation. These findings indicate that relatively younger women were more likely to be selected. These findings imply that the PRA approach followed by household visits effectively targets beneficiaries for anti-poverty programmes.

Table A3 shows that the propensity score is skewed to the left for the comparison group and right for the treatment group. Overall, ten observations from the comparison group fall on the off-support region and the rest on the on-support region. Conversely, all observations of the treatment group fall on the on-support region. This is likely because the comparison group was well-off compared to the treatment group at baseline.

After conducting the balancing test, we estimate programme impacts by comparing average outcomes of matched treatment and comparison samples at the end line. We follow Dehejia and Wahba (1999) to estimate the ATT and the equation is as follows:

$$ATT \equiv E(Y_1|D = 1) - E(Y_0|D = 1) \quad (2)$$

Where,

ATT is the average treatment effect on the treated.

$Y_1$  is the value of the outcome variable for participant households/individuals.<sup>7</sup>

$Y_0$  is the value of the outcome variable for non-participant households/individuals.

$D$  takes the value of 1 if the household/individual has participated in the programme and 0 if otherwise.

Equation (2) cannot be estimated directly because  $Y_0$  cannot be observed for the programme participant households. Considering the observable covariates ( $X_i$ ), following Dehejia and Wahba (1999), we obtain:

$$E(Y_{ij}|X_i, T_i = 1) = E(Y_{ij}|X_i, T_i = 0) = E(Y_{ij}|X_i, T_i = j)$$

For  $j = 0, 1$ . Conditional on the observables covariates ( $X_i$ ), there is no systematic difference between participant and non-participant groups at pre-intervention period. This allows us to estimate the treatment effect on the treated. As mentioned previously, we estimate the effects of the THP programme on the following outcomes: employment, income, food expenditures, food security, productive and durable assets, women's empowerment, social inclusion, housing, and sanitation. Appendix Table A4 reports the description of measurements of our outcome variables of interest. Appendix Table A5, on the other hand, reports the endline means and standard errors of the outcome variables.

## 6. Results and discussion

In this section, we present and discuss PSM results. These results are estimated as follows. First, we match treatment and comparison groups using the Probit model, and then conduct balancing tests. Afterwards, programme impacts are estimated by comparing end line outcomes of the matched treatment and comparison groups. For this, we have used STATA's PSMATCH2 command. PSM results are reported in Tables 1–6.

### 6.1. Impact on productive assets

Table 1 reports the estimated impacts of the THP programme on productive assets: cows, goats/sheep, chickens, sewing machines, and cultivable lands. The impacts are estimated using PSM. The results show that the programme has significant positive impacts on the number of goats/sheep and chickens and sewing machines. Treatment and comparison groups own, on average, 1.95 and 0.42 goats/sheep, respectively, and the difference is statistically significant at the one per cent level. Since the programme transferred livestock assets, this result suggests that programme participants found it profitable and held a significant amount of the asset after the programme cycle. In addition, treatment households owned more chickens (2.20) than the comparison group (1.01). Another important productive asset is the sewing machine. After the intervention, the average number of sewing machines owned increased by 0.19 among treatment households compared to the comparison group.

Results in Table 1 also show that the programme has increased the amount of owned cultivable land by 0.86 decimals. This result is consistent with the result found in a study on a similar programme implemented by BRAC in Bangladesh (Rabbani, Sulaiman, and Prakash 2006). This result suggests that programme participants perhaps purchased additional cultivable land after the intervention, a crucial income-generating asset in rural India. According to Datta and Ghosal (2014), 57% and 42% of male and female workers in West Bengal, respectively, were engaged in the Agriculture sector in 2011–2012, indicating the importance of access to cultivable land in rural West Bengal for employment generation among the ultra-poor.

### 6.2. Impact on employment

Table 2 reports the estimated effects of the intervention on working-age (15–65 years old) members' time devoted to different earning activities. Results show that the intervention increases the time devoted to agriculture (land cultivation), agricultural day labouring, livestock rearing, and small business. As the intervention increases the amount of cultivable land, and the number of goats/sheep, and poultry, the positive effects on the time devoted to land cultivation and livestock and poultry rearing are expected. Results also show that the intervention increases the total time dedicated to all earning activities, suggesting that the critical resource of the ultra-poor, labour, was underutilised without the intervention. The magnitude of the effect on the total time devoted to all earning activities is 56% of the comparison group's mean. These results are also comparable with Bandiera et al. (2017). However, as mentioned earlier, the programme's target group evaluated in this paper is more vulnerable than the sample households covered by Bandiera et al. (2017), suggesting that the THP programme is effective for the vulnerable segment of ultra-poor households.

**Table 1.** PSM impact estimates for productive assets.

	(1) Matched Treatment Group	(2) Matched Comparison Group	(3) Difference (ATT)
No. of cows	0.1919	0.1474	0.0444 (0.076)
No. of goats/sheep	1.949	0.416	1.533*** (0.273)
No. of chickens	2.202	1.014	1.187** (0.546)
No. of sewing machines	0.212	0.022	0.190*** (0.052)
Amount of cultivable land (decimals)	0.879	0.020	0.858** (0.339)

Note: Standard errors in parentheses. \*\*\*significant at the 1% level, \*\*significant at the 5% level, and \*significant at the 10% level. The results are estimated using PSM.

**Table 2.** PSM impact estimates for working age (15–65 years old) members' time (hours per month) devoted to different earning activities.

Earning activities:	(1) Matched Treatment Group	(2) Matched Comparison Group	(3) Difference (ATT)
Agriculture (land cultivation)	10.61	0.216	10.39*** (3.166)
Agricultural day labouring	19.99	5.351	14.64*** (4.66)
Non-agricultural day labouring	11.47	21.67	-10.2* (6.096)
Livestock rearing	35.00	15.2	19.8*** (5.12)
Poultry rearing	5.6	3.12	2.48 (1.94)
Working as housemaid	14.88	8.42	6.46 (5.65)
Handicrafts	15.53	18.55	-3.02 (6.404)
Small business	13.19	2.32	10.86*** (4.14)
Others	14.02	14.91	-0.898 (7.206)
All earning activities	140.3	89.77	50.52*** (12.47)

Note: Standard errors in parentheses. \*\*\*significant at the 1% level, \*\*significant at the 5% level, and \*significant at the 10% level. The results are estimated using PSM.

### 6.3. Impact on income, food expenditure, savings, and food security

Table 3 presents the estimated impacts of the THP programme on income, food expenditure, savings, and food security. We report both household and per capita income. Results show that household income significantly differs between the treatment and comparison groups. The treatment group earns Rs 1699 more per month than the comparison group, which is statistically significant at the one per cent level. The magnitude of the effect is 99% of the comparison group's mean. Analysis of per capita income shows that the programme increases per capita monthly income by Rs 1061 (first row and third column of Table 3), which is 122% of the comparison group's mean per capita income. Our results are consistent with the conceptual framework (mentioned in Section 3) and reveal that providing the poor with productive resources might widen their opportunities and help them to escape from poverty. Similar programme evaluations in Bangladesh depict long-term positive effects of programme participation, particularly on income. For example, Das and Misha (2010) show that beneficiaries have increased per capita income by 27% two years after receiving the programme support. Therefore, it indicates that the THP programme has a larger effect on income than similar programmes implemented in other contexts.

**Table 3.** PSM impact estimates for income, savings, and food security and expenditures.

	(1) Matched Treatment Group	(2) Matched Comparison Group	(3) Difference (ATT)
Per capita monthly income (Rs)	1933.73	872.75	1060.99*** (167.02)
Monthly household income (Rs)	3413.35	1713.87	1699.47*** (262.01)
Per capita daily food expenditure (Rs)	40.70	19.72	20.97*** (2.15)
Savings (Rs)	6675.6	764.4	5911.25*** (951.36)
Can manage two meals a day (yes = 1, no = 0)	0.980	0.680	0.300*** (0.063)

Note: Standard errors in parentheses. \*\*\*significant at the 1% level, \*\*significant at the 5% level, and \*significant at the 10% level. The results are estimated using PSM.

**Table 4.** PSM impact estimates for durable assets.

	(1) Matched Treatment Group	(2) Matched Comparison Group	(3) Difference (ATT)
Fans	1.18	0.561	0.620*** (0.101)
Bicycles	0.343	0.232	0.111 (0.0929)
Chairs	0.828	0.472	0.356** (0.154)
Tables	0.171	0.067	0.105* (0.057)

Note: Standard errors in parentheses. \*\*\*significant at the 1% level, \*\*significant at the 5% level, and \*significant at the 10% level. The results are estimated using PSM.

**Table 5.** PSM impact estimates for housing, sanitation, and social inclusion.

	(1) Matched Treatment Group	(2) Matched Comparison Group	(3) Difference (ATT)
No. of rooms used	1.21	1.25	-0.032 (0.0798)
Value of house (Rs)	82183.7	42324.5	39859.2*** (12354.74)
Uses sanitary latrine (Yes = 1, No = 0)	0.929	0.632	0.300*** (0.0687)
Got invitation from non-relative neighbour last year (yes = 1, no = 0)	0.646	0.400	0.246*** (0.080)

Note: Standard errors in parentheses. \*\*\*significant at the 1% level, \*\*significant at the 5% level, and \*significant at the 10% level. The results are estimated using PSM.

**Table 6.** PSM impact estimates for women empowerment.

Women can take decision on:	(1) Matched Treatment Group	(2) Matched Comparison Group	(3) Difference (ATT)
Land buying/selling/renting out (Yes = 1, No = 0)	0.939	0.933	0.0060 (0.0452)
Lending/borrowing (Yes = 1, No = 0)	0.9361	0.923	0.0127 (0.050)
Children's education (Yes = 1, No = 0)	0.851	0.889	-0.038 (0.091)
Son's/daughter's marriage (Yes = 1, No = 0)	0.9375	0.879	0.058 (0.0833)

Note: Standard errors in parentheses. \*\*\*significant at the 1% level, \*\*significant at the 5% level, and \*significant at the 10% level. The results are estimated using PSM.

We also find that the programme positively impacts savings (Table 3). Treatment households have average savings amounting to Rs 6,676, which is higher than comparison households.<sup>8</sup> The magnitude of the effect on savings we have documented in this study is higher than the effect reported by previous studies (Bandiera et al. 2017; Krishna, Poghosyan, and Das 2012) evaluating a similar programme in Bangladesh.

An important indicator of food sufficiency is per capita daily food expenditure. Our result shows that per capita daily food expenditure increases by Rs 20.97 due to the intervention (Table 3). Another indicator of food security is self-perceived food security. During the survey, respondents were asked whether they were able to manage two meals a day. Among the treatment group, 98% of households reported that they could manage two meals a day, whereas the corresponding proportion among the comparison group was 68% (Table 3). The difference (30 percentage points) is statistically significant at the one per cent level. This result implies that the THP programme effectively reduces poverty and vulnerability of ultra-poor households.

These results suggest that the intervention can be replicated in other similar contexts to address ultra-poverty as the ultra-poor are less likely to benefit from widely available anti-poverty programmes such as microfinance (Rahman and Razzaque 2000; Morduch 1998).

#### **6.4. Impact on durable assets**

Table 4 reports the estimated impacts (PSM results) of the THP programme on selected durable assets (fan, bicycle, chair, and table). Results show that the programme positively affects the number of fans, chairs, and tables. These results again confirm that the intervention improves the welfare of ultra-poor households.

#### **6.5. Impact on housing and sanitation and social inclusion**

Since the programme increases the income of ultra-poor households, it may improve their housing and sanitation conditions. Table 5 presents the estimated effects of the programme on housing, sanitation, and social inclusion. We find that there is no statistically significant difference in the average number of rooms used by treatment and comparison groups. Results, however, show that the value of the main house differs significantly between these two groups. We also find that beneficiary households are more likely to use sanitary latrines than their non-beneficiary counterparts. The use of sanitary latrines improves health outcomes (Joshi and Amadi 2013), suggesting that the THP programme may improve the health of the ultra-poor in the long-run.

Abrams and Hogg (2004) state a relationship framework in which social life moves on and seeks inclusion and belongings. So social inclusion means a social network in the society where they live. Table 5 shows whether respondent women got invitations to social occasions, a measure of social inclusion, from non-relative neighbours last year. Again, we find a significant positive impact of the programme on invitations. After the intervention, invitations to social occasions increased by 25 percentage points among beneficiary women compared to their non-beneficiary counterparts.

#### **6.6. Impact on women's empowerment**

Ibrahim and Alkire (2007) propose a shortlist of internationally comparable indicators to estimate agency and empowerment, which include (i) control over personal decisions, (ii) domain-specific autonomy, (iii) household decision-making, and (iv) the ability to change aspects in one's life at the individual and communal levels. Though not directly related to the conceptual framework, we attempt to analyse whether the programme affects women's empowerment because there might be some indirect connections. For analysing women's empowerment, we use the household decision-making-related indicators that encapsulate decision making regarding (i) land buying/selling/renting-out, (ii) lending and borrowing money, (iii) children's education, and (iv) sons'/daughters' marriage. Table 6 reports the estimated effects on these indicators. More than 80% of both control and treatment women said they had the freedom regarding decision-making on these four issues unlike the control groups. The differences between the treatment and comparison groups are not statistically significant though women from treatment households contribute more to decision-making than their comparison counterparts. It needs to be mentioned here that about 87% of treatment women are widowed/separated/divorced. So, these women were likely to be empowered in decision-making regarding various issues without intervention. So, our results seem to be expected.

### **7. Conclusion**

Livestock rearing has largely contributed to earnings, consumption, and food security (Murphy and Allen 2003; and Randolph et al. 2007). Besides, generating income from livestock has predominantly

been a female-centric activity in rural households (McPeak and Doss 2006). Female members in a household who manage and generate income through animal farming/rearing have enhanced bargaining power within households, consequently leading to positive effects on their children's health, nutrition, and educational outcomes (Quisumbing and Maluccio 2003). Thus, transferring livestock assets to ultra-poor women can achieve socio-economic well-being at the individual and household levels. This paper examines the effects of a poverty alleviation programme that transfers livestock assets to ultra-poor women in West Bengal, India.

Our results suggest that the intervention has significant positive impacts on the livelihoods of the ultra-poor through increasing productive asset-bases, income, and food expenditures. Moreover, these results have implications for long-term poverty reduction and the human capital development of children.

With increasing income, the demand for meat and milk generally increases (Delgado 2003). As many developing countries are experiencing significant growth in national income, the need for farm products (meat and milk) is likely to increase over time. Hence, transferring livestock assets to ultra-poor households is unlikely to put downward pressure on their prices through the general equilibrium effect, thereby contributing to sustainable improvement in the livelihoods of ultra-poor households. Therefore, our results suggest that the livestock transfer programme can be scaled up to attain the SDG goal of extreme poverty reduction.

Our results are for West Bengal of India, where rural households heavily rely on income from livestock. In many developing countries such as Bangladesh, Nepal, and Pakistan, livestock rearing is a popular income-generating activity (Bandiera et al. 2017; Joshi 1992; Rehman et al. 2017). Hence, the findings of our study imply that the THP programme can be replicated in other similar contexts to address ultra-poverty and economically empower vulnerable women. Our results also show that BJS successfully targeted more vulnerable households compared to other similar programmes. This suggests that BJS's THP programme replication in different similar contexts may more effectively target ultra-poor households. The main limitation of our study is that it explores the short-run impacts of the THP programme. Further study should be conducted to estimate the long-run impacts.

## Notes

1. According to Grant et al. (2004), several terms are used to identify those who experience poverty most intensely – ultra-poor, extremely poor, hardcore poor, destitute, poorest of the poor, and declining poor. Hence, the ultra-poor and hardcore poor are similar. Nonetheless, in this paper, we refer to the ultra-poor.
2. <https://www.census2011.co.in/census/state/west+bengal.html#:~:text=Of%20the%20total%20population%20of,West%20Bengal%20state%20was%2062%2C183%2C113.>
3. Similarly, the proportion of single-membered households at baseline was also higher for our study sample in comparison to Bandiera et al. (2017) (36% vs. 19%) (Das and Seraj 2009).
4. Bandhan, a microfinance institution based in West Bengal, India, also implements a programme known as THP but Bandhan's THP programme's targeting criteria are different from those used by BJS's THP programme. To be eligible as a beneficiary of Bandhan's THP programme, a household must meet three of the following five criteria: the primary source of income has to be informal labour or begging; landholdings must be below 20 decimals (10 katthas, 0.2 acres); the household owns no productive assets other than land; no able-bodied males are in the household; school-aged children work instead of attending school (Banerjee et al. 2011). Further, the household (1) must have an able-bodied female member, and (2) must not be associated with any microfinance institution or receive sufficient support from the government (Banerjee et al. 2011). Unlike Bandhan's THP programme, BJS's THP programme uses income as one of the prime selection criteria. As mentioned previously, households selected by BJS's THP programme are likely to be more vulnerable compared to those selected by Bandhan's THP programme. This perhaps implies that an anti-poverty programme should use income as a selection criterion.
5. The survey, however, could successfully visit 99 households.
6. For estimating the probability of participation versus nonparticipation in a binary treatment case, Logit and Probit models usually yield similar results (Caliendo and Kopeinig 2008). We, however, choose the Probit model.
7. All outcome variables except for employment and women's empowerment are at the household level.

8. The savings were mostly at the bank/post office (83% and 75% for the treatment and control groups, respectively). The rest were at home and other places.

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## Disclosure statement

No potential conflict of interest was reported by the authors.

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## Appendix

**Table A1.** Baseline characteristics of treatment and comparison groups.

	Treatment	Comparison	Difference
Main female member is widowed/separated/divorced (Yes = 1, No = 0)	0.869	0.653	0.215***
Amount of owned land (decimal)	5.060	5.770	-0.710
Has own house (Yes = 1, No = 0)	0.717	0.762	-0.045
Wall of main house is made of brick (Yes = 1, No = 0)	0.394	0.505	-0.111
Household is food insecure (Yes = 1, No = 0)	0.970	0.861	0.108***

Note: \*\*\*significant at the 1% level, \*\*significant at the 5% level, and \*significant at the 10% level.

**Table A2.** Probit regression results.

	Coefficient	Standard error	p-value
Main female is widowed/separated/divorced (yes = 1, no = 0)	0.811	0.241	0.001
Wall of main house is made of brick (yes = 1, no = 0)	-0.282	0.192	0.141
Main earning source is day labouring (yes = 1, no = 0)	-0.316	0.208	0.128
Age of main female member	-0.020	0.010	0.041
Household has a physically active female member (yes = 1, no = 0)	0.087	0.562	0.877
Live in owned house (Yes = 1, No = 0)	0.185	0.226	0.412
Constant	0.281	0.660	0.671

**Table A3.** The interior bound, the number of treatment and comparison households for each block.

Interior of block of pscore	Comparison	Treatment	Total
0	11	1	12
0.2	27	12	39
0.4	43	51	94
0.6	19	34	53
0.8	1	1	2
Total	101	99	200

**Table A4.** Measurement of outcome variables.

Outcome variables	Measurement
Income	Both per capita monthly income and total household income per month are use.
Employment	Engagement in any earning activity last month
Food expenditure	Per capita food expenditure per day
Food security	Whether can manage two meals a day
Productive assets	Land, cows, goats, chickens, sewing machines, savings
Durable assets	Electric fans, chairs, tables, bicycles
Housing and sanitation	No. of rooms used, value of main house and use of sanitary latrine
Social inclusion	Whether invitation was received from non-relative neighbour last year
Women's empowerment	Whether women can make decisions about buying/selling assets, lending/borrowing, children's education and sons'/daughters' marriages

**Table A5.** Descriptive statistics of outcome variables.

	Treatment	Control	Difference	p-value
<b>Income, food expenditure/security and savings:</b>				
Household income (Rs/Month)	3413.4 (207.1)	1654.9 (126.2)	1758.5 (241.4)	0.000
Per capita income (Rs/Month)	1933.7 (138.5)	775.9 (70.8)	1157.9 (154.7)	0.000
Per capita food expenditure (Rs/per day)	40.7 (1.849)	19.0 (0.827)	21.7 (2.012)	0.000
Can manage two meals a day (Yes = 1, No = 0)	0.980 (0.014)	0.693 (0.046)	0.287 (0.049)	0.000
Savings (Rs)	6675.6 (936.8)	763.0 (129.2)	5912.7 (936.6)	0.000
<b>Productive asset:</b>				
No. of cows/bulls	0.192 (0.051)	0.139 (0.042)	0.053 (0.066)	0.422
No. of goats/sheep	1.949 (0.238)	0.564 (0.101)	1.385 (0.257)	0.000
No. of chickens	2.202 (0.467)	1.198 (0.213)	1.004 (0.510)	0.050

(Continued)

**Table A5.** Continued.

	Treatment	Control	Difference	<i>p</i> -value
No. of sewing machines	0.212 (0.046)	0.030 (0.017)	0.182 (0.049)	0.000
Amount of cultivable land (decimals)	0.879 (0.338)	0.069 (0.053)	0.809 (0.339)	0.018
<b>Durable assets:</b>				
No. of fans	1.182 (0.078)	0.574 (0.051)	0.608 (0.093)	0.000
No. of bicycles	0.343 (0.063)	0.277 (0.051)	0.066 (0.081)	0.413
No. of chairs	0.828 (0.107)	0.554 (0.083)	0.274 (0.134)	0.043
No. of tables	0.172 (0.045)	0.079 (0.027)	0.093 (0.053)	0.081
<b>Working age members hours (per month) devoted to:</b>				
Agriculture (land cultivation)	10.6 (3.1)	2.6 (1.8)	8.0 (3.4)	0.020
Agriculture day labouring	20.0 (4.0)	6.5 (1.6)	13.5 (4.1)	0.001
Non-agriculture day labouring	11.5 (3.0)	18.0 (3.5)	-6.5 (4.7)	0.171
Livestock rearing	35.0 (3.7)	10.3 (2.3)	24.7 (4.2)	0.000
Poultry rearing	5.6 (1.6)	1.6 (0.7)	4.0 (1.7)	0.016
Working as housemaid	14.9 (4.4)	8.3 (2.5)	6.6 (4.8)	0.173
Handicrafts	15.5 (3.8)	16.6 (3.9)	-1.1 (5.5)	0.840
Small business	13.2 (3.9)	1.3 (0.9)	11.9 (3.6)	0.001
Others	14.0 (4.1)	13.2 (3.8)	0.8 (5.6)	0.886
All earning activities	140.3 (8.6)	78.5 (6.7)	61.8 (10.7)	0.000
<b>Social inclusion, housing and sanitation:</b>				
Got invitation from non-relative neighbour last year (Yes = 1, No = 0)	0.646 (0.048)	0.426 (0.049)	0.221 (0.069)	0.002
No. of rooms used	1.214 (0.042)	1.253 (0.050)	-0.038 (0.065)	0.560
Value of house (Rs)	82183.7 (9170.6)	53642.4 (7184.4)	28541.3 (11635.8)	0.015
uses sanitary latrine (Yes = 1, No = 0)	0.939 (0.024)	0.636 (0.049)	0.302 (0.055)	0.000
<b>Women can take decision on:</b>				
Land buying/selling/renting out (Yes = 1, No = 0)	0.939 (0.024)	0.880 (0.033)	0.059 (0.041)	0.146
Lending/borrowing (Yes = 1, No = 0)	0.936 (0.025)	0.860 (0.035)	0.076 (0.044)	0.082
Children's education (Yes = 1, No = 0)	0.863 (0.049)	0.723 (0.066)	0.139 (0.081)	0.089
Son's/daughter's marriage (Yes = 1, No = 0)	0.942 (0.033)	0.680 (0.067)	0.262 (0.073)	0.001

Note: figures in the parentheses are standard errors.