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Impact of children's appropriate work participation in cocoa farms on household welfare: Evidence from Ghana

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ABSTRACT

This study examines how children engaged in cocoa farming in Ghana affect household welfare. Data was gathered from 384 cocoa producers using a multistage sampling technique and analysed employing the Cragg double hurdle and propensity score method. The study found that only 2.3 % of cocoa farmers highly used children for cocoa activities. Additionally, household size, cooperative membership, and credit access were found to have significant impacts on both the use and extent of use of children on cocoa farms. Moreover, cocoa farmers who used children experienced improvements in their income, food security and assets compared to those who did not use children. The study also confirms the reality of the practice of employing children on cocoa plantations in Ghana. Harnessing the considerable advantages of credit access and cooperative membership, we emphasize the importance of extension agents sensitizing cocoa farmers about the merits of forming cooperatives. This approach could serve as a means of obtaining group/individual credits to support cocoa production. Furthermore, in light of the notable improvements in the welfare of cocoa farmers, it is imperative for COCOBOD to take decisive action in invigorating the regulation against child labor and instead embrace agricultural technologies as viable alternatives.

1. Introduction

Within economics literature, the topic of child labour in Sub-Saharan African (SSA) agricultural production has gained recognition [1]. Some have suggested that using children on farms is a necessary component of their socio-economic development, however, some people contend that child labour cannot be a proxy for child work [2,3]. The UNICEF convention encourages child work over child labour in agriculture because it fosters children's social advancement. Even though the UNICEF agreement permits child work, it strongly opposes all types of child labour. Therefore, it is vital to comprehend children work in the cocoa industry within the cultural framework of exurban Ghana, where helping with family labour is an integral component of juvenescence and a way for kids to progressively enter the workforce [4,5].

To differentiate between "permissible work", "hazardous work", and "child labour", some studies utilize ILO criteria, whereas others employ Ghanaian guidelines, which have distinct age restrictions and are in line with Ghanaian educational regulations. No person under the age of 18 is allowed to perform dangerous jobs, according to both sets of guidelines [6,7].

Any kind of work that takes from youngsters their dignity, their youth, potential, and is disadvantageous to the development of their physical and mental abilities, is considered child labour [8]. What is viewed as child labour in certain civilisations can be perceived as a kind of responsible upbringing and socialisation in other societies. Children's engagement in economic activities that adversely affect their development and health or disrupt their education is what constitutes child labour [2].

Kapoor [9] views child work as all circumstances and activities, including children doing age-appropriate activities and light work that doesn't hurt them or prevent them from exercising other rights like going to school. ILO asserts that children as young as 12 may engage in

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light employment, which does not compromise their education (ILO Convention 138). According to ILO Convention 138, the worst forms of child labour include using children as slaves, forcing them to work as forcing them into criminal activities, trafficking, prostitutes, and subjecting them to dangerous jobs. According to the ILO requirements, the minimum labour requirements for age five (5) to 11 is "no work", age 12 to 14 is "light work (less than 14 h per week)" while age 15 to 17 is either "medium work (less than 18 h per week)" or "full-time work (less than 43 h per week)". In the Ghanaian requirements, the minimum labour requirements for age five (5) to 12 is "no work", age 13 to 14 is "light work (restricted to no more than 2 h during the school day and no more than 3 h outside the school day)" while age 15 to 17 is either is "medium work (less than 18 h per week)" (fewer than 3 h each day on school days if enrolled in school) or "full-time work (less than 43 h per week)" for those not enrolled in school. It is inappropriate for individuals below 18 years of age to engage in perilous labour [6,7,3,10].

In placing this issue of child labour or child work under perspective, this study conceptualised or defined child work as "light work performed by children aged between 13 and 17" [6]. The scope of work permitted by law as stated by Amoo [6] in a document sanctioned and written for the Ministry of Manpower, Youth and Employment include; filling of nursery bags with black soil, fetching water for spraying and leaving the farm before spraying commences, gathering of cocoa pods, scooping and removal of beans, carting minor loads, watering of seedlings at the nursery, assisting in planting cocoa, weeding/brushing undergrowths with age-appropriate cutlass, plucking within hand-reach pods, breaking cocoa pods with breaking mallet or hitting on the ground, carting load: seedling for planting, water for spraying, cocoa pods for heaping, fermented beans to drying mat and dry beans for sale. These are ensured within the scope of not allowing children of school going age to go to the farm during school hours or go to distant farm before or after school or be withdrawn to do farm work in peak seasons. Again, all children who accompany their parents to the farm must be provided with basic protective clothing. The children must be trained and supervised during the work period. Carrying loads should not exceed 30 % body weight if farm is far.

Children typically help parents with household duties like cooking and babysitting at home or on farms as a way to pass on skills from parents to children. Unfortunately, some parents in underdeveloped countries abuse this phase of the child's advancement. The issue of minors being utilized on cocoa plantations in Ghana at the expense of their socioeconomic advancement has gained attention. According to Owusu and Kwarteye [1], Thorsen and Maconachie [10] and Casely-Hayford [11], in cocoa farms, children are used in several activities such as burning, tree felling, clearing of land, the application of agrochemicals, transporting bulky items, pruning, weeding, collecting and piling up of pods, plucking of pods, preparing the cocoa beans for fermenting, carting of fermented cocoa beans drying the drying mat, scooping, carting of dry beans for sale, and carrying water for applying agrochemicals.

Cocoa farm labour is sourced from the following: household members, the farmers themselves, extension service staff, hired labour and labour exchange [12]. Children make up the majority of family labour in Ghanaian cocoa farms, contributing 14 % of the total labour force [13]. Because of the impact of prices paid to producers, output, and overburdening taxation, farmers employ the cheapest possible labour. Additionally, the fluctuating worldwide price index and the high cost of hiring agricultural labour force cocoa growers to hire minors to cut labour costs [1]. Children in West Africa harvest cocoa pods, cut them open to extract the beans, clear fields using machetes and apply insecticides [1,10]. One in ten children worldwide, or roughly 160 million minors, are thought to be employed as child labourers [8]. In Ghana, it is unfortunately common to find instances of children being employed in cocoa farming. For instance, according to research conducted in 2004 by ILO/IPEC for the West Africa Cocoa and Commercial Agriculture Project (WACAP) on child labour in certain villages in Ghana that cultivate cocoa, on average, 42 children are employed full-time in each community, and in all 42 communities combined, there is a total of 1764 children employed. Among these child laborers, 8.7 % work full-time for six to seven days per week and are unable to attend school.

The Ministry of Manpower, Youth, and Employment's (MMYE) child section discovered in 2005 that 685 of the 1671 questionnaires that were distributed were filled out by child workers. This information was obtained through research that was conducted in 5 selected districts. According to a separate survey carried out by the Ghana Statistical Service, 21.8 % of youngsters aged between 5 and 17 are involved in labour, and a staggering 70 % of Ghanaian children participate in monetary actions that are categorised as child labour [14]. In the 2018–19 cocoa season, 83 % of children between the ages 5 and 17 in surveyed farming homes in Ghana's cocoa-growing regions were economically engaged, with 73 % and 60 % engaging in agricultural work and cocoa production activities, respectively [7]. According to MMYE [15], the youngest child, between the ages of 5 and 12, were mostly responsible for weeding, assembling and carrying cocoa pods to locations where pods are broken for fermentation, fetching water for pesticide application, and turning the cocoa beans while they were fermenting. Children from 15 to 17 years made a substantial contribution to the mistletoe pruning, pod-breaking, and pod-harvesting. Between the ages of five (5) and 17, there are 168 million child labourers worldwide or 11 % of all children. With a participation rate of 21.4 %, SSA has the lofty percentage of child labour. According to this, child labour is practised by one in every five children in the subregion. SSA also leads in the percentage of youngsters working in dangerous jobs, with 10.4 % of its child population engaged in such employment [16].

Despite numerous industry assurances to minimize child labour, it has increased in the Ghanaian and Ivorian cocoa sectors over the past ten years, according to a report on child labour in West African cocoa by Al Jazeerah [17]. Aboa and Ross [18] also noted that the cocoa industry employs around 2.1 million youngsters in Cote D'Ivoire and Ghana, including both younger children who undertake a variety of chores and older children who perform dangerous jobs. There have been claims of an upsurge in incidents of child labour in Ghana's cocoa industry. For instance, it is believed that over 700,000 children work in Ghana's cocoa industry, frequently performing hazardous tasks like lifting weighty loads and using sharp equipment [19]. The issue of child labour in Ghana's cocoa industry persists despite the government's efforts and those of the relevant major parties to curb it. The data on child labour has been rising steadily for reasons such as illiteracy, poverty, and other social and economic issues [20]. Social norms that support child labour, a lack of educational possibilities for kids, a lack of consciousness of the concerns surrounding child labour, and many other challenges are some of these social and economic issues. Through its corporate social responsibility initiatives, Mars International took steps to address the different causes and effects of child labour in West African cocoa farms. The company dedicated nearly $1 billion to a responsible sourcing strategy [17]. The evidence presented above from the literature shows that there is child labour in the cocoa industry. Despite the economic value and relevance of cocoa, the prevalence of child labour has consistently endangered its production. Since child labour impacts children's lives, development, and communities, the issue needs to be addressed in the cocoa industry. However, there hasn't been much research done on how the use of children on cocoa farms affects household welfare. This study, therefore, set out to address this gap in the existing literature; 1) assess the extent of use children on cocoa farms 2) assess farmers' access to livelihood assets 3) assess farmers' household food security status 4) determine the effects of use of children on

cocoa farms on farmers' access to livelihood assets and 5) determine the effects of employing children on cocoa farms on the household food security of farmers.

2. Materials and methods

Ghana offers a perfect setting for this study due to its high rate of child engagement in Sub-SSA [21]. Despite the absence of a regular child labour study in the nation, the 1999 Ghana Living Standard Survey (GLSS 4) report revealed that 1.4 million children were employed nationwide, or 27.8 % of all children in the nation [22]. In the study, the area under investigation was Atwima Nwabiagya North Municipality. In the Ashanti region, the municipal can be found in the Western part and has Barekese as its capital. It is bounded to Offinso District to the north, Atwima Mponua District and Ahafo Ano south district to the West, Kwabre District and Kumasi Metropolis to the East, Bosomtwe – Atwima Kwanwoma Districts and Amansie-West to the south. The Municipal covers a large total land area of about 276.6 km^2 representing 14.38% of the region's total land.

To conduct the study, a descriptive correlational research design was employed. The descriptive correlational research was used because this study examined the relationship between two or more variables without manipulating them. It also described patterns between variables as they naturally occur. The variables were typically quantitative (numerical). The study aimed to survey all cocoa growers in the Atwima Nwabiagya North Municipality, but since the population size was unknown, the researchers used Cochran's formula to determine an appropriate sample size. The formula is;

$$n_0 = \frac{z^2 pq}{e^2}$$

Where; n_0 = the sample size, e = the expected level of exactness (i.e., the margin of error), Z = is the chosen critical value of expected confidence level, p = the projected part of a feature that represents the population, With the z score for the 95 % confidence level selected is 1.96, q = 1 – p, e = 0.5, p = 0.5, q = 1–0.5 = 0.5

$$n_0 = \frac{(1.96)^2(0.5)(0.5)}{(0.05)^2}$$

$$n_0 = 385$$

The research sampled three hundred and eighty-five (385) cocoa growers from selected communities within the Municipal using a multi-stage sampling method. In the first stage, the study area was chosen using simple random method. Out of the total list, Atwima Nwabiagya North Municipal was selected. In the second stage, four (4) communities were selected using purposive sampling technique (Kontonmire, Hyiahu Besease, Kapro and Paroso). This is because out of the list of cocoa farming communities, those communities had high production levels. The snowball sampling technique was used in the third stage to select cocoa growers from all the four societies, ultimately achieving the desired sample size.

Data was analysed using percentage, mean, frequency, standard deviation, Cragg double hurdle and propensity score matching. In measuring the level of usage of children for cocoa activities, a list of cocoa activities was generated by the researchers and farmers were asked to tick the degree to which they allow children to assist them on a three-point Likert scale: never (1), sometimes (2) and always (3). A composite extent of activities children are involved in was generated for every cocoa farmer. Out of the total number of cocoa farm activities, those who used children in less than 40 % of the farm activities were classified as low, those who used children between 41 % and 80 % of the farm activities were classified as moderate while those who used children above 80 % of the farm activities were classified as high [23].

Household welfare was measured using three indicators; income, household food security and access to livelihood assets. To assess the food security of cocoa farmers over the previous four weeks, the Household Food Insecurity Access Scale (HFIAS) was employed in the study. Following the standard method used by USAID, the HFIAS consisted of nine questions or attributes. The responses to each question or attribute on the HFIAS were classed on a four-point scale, with 0 meaning "No," 1 indicating "Rarely" (one or two times in the past four weeks), 2 denoting "Sometimes" (three to ten times in the past four weeks), and 3 representing "Often" (more than ten times in the past four weeks) [24]. For each farmer, the HFIAS score was computed by totalling the codes for the rate of recurrence for each question, with the score ranging from 0 to 27. Lower scores indicated greater food security, whereas higher scores suggested higher levels of food insecurity among cocoa farmers.

Farmers' decisions on whether to use children on cocoa farms and the extent of such use can be modelled using various statistical approaches such as the Cragg double hurdle model [25], Tobit model [26] or Heckman model [27]. The Tobit model assumes that the factors influencing both decisions have the same effect, while the Heckman model allows for a two-step decision-making process and different explanatory variables [26,27]. While the Heckman model assumes that every observation has a nonzero outcome in the second step, the Cragg double hurdle model, which is similar in nature, considers the likelihood of zero observations in the second step [25]. Cragg double hurdle was chosen because it is modified version of the Tobit model and offers flexibility. To determine whether the Cragg double hurdle or Tobit is appropriate for the data, we run the likelihood ratio test (LR). The log likelihood of the probit, truncated and Tobit models were used (Asante et al., 2017). The LR statistic is written as:

$$\boldsymbol{LR} = -\boldsymbol{2}(\boldsymbol{LL_{Probit}} + \boldsymbol{LL_{Truncated}} - \boldsymbol{LL_{Tobit}})$$

where $\boldsymbol{LL}$ = log likelihood of probit, truncated and Tobit models. If the LR should exceed the chi-square distribution, the Cragg double hurdle is used. In some cases, both the Heckman and Cragg models can be used. However, if the inverse Mill's ratio (λ) of the Heckman model is insignificant, it suggests no selection bias and hence, the Cragg model is used. In this study, Cragg double hurdle model was employed. From Table 7, the LR statistic is greater than 5 % significant level and λ is insignificant confirming the use of Cragg double hurdle over the Tobit and Heckman models.

Following Asante et al. [28,29] and Belotti et al. [30], the Cragg model was used to investigate the use of youngsters on cocoa plantations by farmers in two distinct steps. In the first step, the farmer makes a detached decision on whether to use children or not. This decision is affected by a range of institutional and socioeconomic factors. In the second step, the farmer makes an unceasing decision on the proportion of youngsters to use on cocoa plantations. In the double hurdle model, the use of children is assessed via the probit model in the first stage as:

$$W_i^* = \beta_i X_i + \varepsilon_i$$

$$W_i = \begin{cases} 1 \text{ if } W_i^* > 0 \\ 0 \text{ if } W_i^* \leq 0 \end{cases}$$

where W_i and W_i^* = observed and unobserved dependent variable (1 for use of children and 0 = otherwise), respectively; β = parameters to be estimated; X = set of explanatory variables; ε = error term.

The unceasing decision model, which represents the second step, is computed using truncated regression and written as:

$$G_i^* = a_i x_i + \mu_i$$

$G_i^* = G_i^*$ if $W_i = 1$ and $G_i^* > 0$

$a_i \approx N(0,1), \mu_i \approx N(0, \sigma^2)$

Where G_i^* = dependent variable (number of children used in cocoa farms divided by total number of children).

Both the first and second models are empirically written as:

$$UC = \beta_0 + \beta_1 Gen + \beta_2 Age + \beta_3 HHZ + \beta_4 EconAct + \beta_5 YrsCult + \beta_6 CopeMem + \beta_7 CredtAc + \beta_8 CoFarmz + \beta_9 Edu + \beta_{10} FarmDiz + \mu_i$$

Where UC = dependent variable as either the binary or the unceasing decision variable. Table 1 contains a presentation, definition, and description of all other variables.

To assess the influence of using children on household welfare, specifically food security, income and asset score, propensity score matching (PSM) was employed. PSM enables a comparison between farmers who use children and those who do not in terms of their outcomes. The computation of PSM involved two stages. In the first stage, a binary probit model was employed to measure the likelihood of using children on cocoa farms. Thus, 1 for use of children and 0 otherwise [31,32]. The model is specified as:

$$UC = \beta_i X_i + \varepsilon_i$$

Where UC = decision status where 1 for users and 0 for non-users β_i = parameters to be estimated, X_i = explanatory variables (i.e., socioeconomic and institutional factors), ε_i = disturbance term.

The second step of the PSM analysis involved the application of matching econometrics to determine whether or not using children on cocoa farms has unequivocally resulted in a noteworthy increase in the aforementioned outcome variables [33]. When evaluating the impact of an intervention, one of the challenges is finding comparable groups of treated and control individuals. However, matching econometrics offers a promising solution to this issue by assessing the expected treatment effects [32,33]. Matching is a commonly employed approach to determine the average treatment effects of a binary treatment on a continuous scalar outcome. It relies on a non-parametric regression technique to generate a counterfactual based on the assumption of selection on observables [34]. Propensity score matching, which matches households or farmers with similar observable features in both the control and treated groups, is used to assess the impact of using children as the disparity between the average values of the outcome variables.

Drawing from existing research on impact studies [34,32,33], consider y_1 as outcome variables (food security and income) for *i*th farmer subject to treatment ($U = 1$) and y_0 as food security and income for *i*th farmer in the control group ($U = 0$). The observed outcome is specified as:

$$y = Uy_1 + (1 - U)y_0$$

y_1 = observed when $U = 1$, y_0 = observed when $U = 0$.

The mean effect of the treatment (i.e., use of children) on the treated population needs to be determined, and it is defined as:

$$ATT = E(y_1 - y_0|U = 1) = E(y_1|U = 1| - E(y_0|U = 1))$$

To be valid, matching estimators necessitate the fulfilment of specific assumptions. These estimators are based on the Conditional Independence Assumption (CIA), which assumes that the decision to hire children is randomly dependent on observed covariates X, as follows:

$$(y_1, y_0) \perp U|X$$

This assumption indicates that the result that would have been observed for the treated group (i.e., the group that used children) is the same as the observed outcomes for the control group (i.e., the group that did not use children) inscribed as:

$$E(y_0|X, U = 1) = E(y_0|X, U = 1 = E(y_0|X)$$

The Conditional Independence Assumption (CIA) is crucial in eliminating the possibility of self-selection into the program due to unobserved advantages of using children. This assumption necessitates that the group of observable variables (X) encompasses all variables that influence the outcome in both the untreated and treated groups together. With the CIA in place, the average treatment effect (ATT) can be determined as follows:

$$ATT = E(y_1 - y_0|X, U = 1) = E(y_1|X, U = 1| - E(y_0|U = 1))$$

In this analysis, three main Propensity Score Matching (PSM) approaches are utilized, which include nearest neighbor matching (NNM), kernel-based matching (KBM) and caliper matching, as mentioned earlier. Employing multiple matching procedures increases the chances of obtaining the best match, as is the process of identifying the best match [35,34,32].

Moreover, the sensitivity analysis was conducted on the matching estimators after the PSM estimations. This analysis aimed to address the potential issue of hidden bias in the PSM approach due to omitted confounding variables [35]. To test the sensitivity of significance levels, a measure of the degree of sensitivity, denoted as e^y which quantifies the extent of departure without hidden bias. Various values of e^y calculations were performed to determine the critical impact level at which significance would no longer be present and to test the sensitivity of significance levels. This helps to assess the robustness of the estimated treatment effects and identify potential influences of unobservable covariates. The rbounds syntax was used to perform the sensitivity analysis of the PSM results [35].

Table 1
Variables utilized in the model, their measurement, and anticipated signs.

Continuous Variables	Measurement	Expected sign	Mean	Std. Dev
Age	Years	+/−	46.37	13.14
Education	Years	–	8.79	6.03
Household size	Number	+/−	6.61	3.35
Economic active members	Number	+/−	2.53	1.22
Cocoa cultivation	Years	–	16.42	11.12
Cocoa farm size	Acre	+	9.51	5.19
Farm distance	Kilometer	–	11.63	11.19
Categorical variables			Frequency	Percentage
Gender	1 for male and 0 female	+/−		
Male			273	71.09
Female			111	28.91
Credit access	1 for yes and 0 no	–		
Yes			110	28.65
No			274	71.35
Cooperative membership	1 for yes and 0 no	–		
Yes			255	66.41
No			129	33.59

Source: Field Survey, 2022

Table 2
Descriptive statistics of cocoa farmers.

Continuous Variables	Use of children	Do not use children	Mean difference
Age	46.57 (13.16)	45.65 (13.15)	0.918
Education	8.81 (6.20)	7.71 (5.42)	0.102**
Household size	6.76 (3.40)	6.07 (3.12)	3.12***
Economic active members	2.53 (1.25)	2.53 (1.12)	−0.002
Cocoa cultivation	17.02 (11.56)	14.28 (9.15)	2.737***
Cocoa farm size	9.41 (5.17)	9.86 (5.26)	−0.454
Farm distance	11.32 (8.01)	12.72 (7.88)	−1.396
Categorical variables			X^2-*value*
Gender			1.025
Male	217 (79.49)$^+$	56 (20.51)$^+$	
Female	83 (74.77)$^+$	28 (25.23)$^+$	
Cooperative membership			22.83***
Yes	205 (80.39)$^+$	50 (19.61)$^+$	
No	95 (73.64)$^+$	34 (26.36)$^+$	
Credit access			7.99**
Yes	84 (76.36)$^+$	26 (23.64)$^+$	
No	216 (78.83)$^+$	58 (21.17)$^+$	

Values in brackets are standard deviation. Values in brackets with + are percentages. Source: Field Survey, 2022

3. Results and discussion

Overall, most farmers (71 %) were male with average age and family size of 46.37 years and 6.6 persons, respectively (Table 1). This confirms the widely held notion that men dominate cocoa production. The age of the respondents suggest that farmers are relatively younger and active, and have relatively high household size. The average years of education was 9. This implies that cocoa farmers have completed basic education and capable to appreciate the adverse effect of use of children on cocoa farms. A typical farmer has spent 16.42 years in cocoa cultivation which suggest number of experiences gathered by the farmers. The mean cocoa farm size and farm distance was 9.51 acres and 11.63 km, respectively. While 28.6 % of the cocoa farmers had credit access, 66.4 % belong to cooperatives. This confirmed low credit access which could affect the decision of farmers to employ children on cocoa farms.

Table 2 provides the descriptive statistics of cocoa growers. The results revealed that there is significant variation among users and non-users of children on cocoa farms. The mean age of users and non-users of children was 46.57 years and 45.65 years respectively. This implies that most of the farmers are in their youthful ages and the difference between the groups is insignificant. Past studies indicated that younger farmers tend to use less of children on cocoa farms. Plausibly because young farmers may have been exposed to rules regarding child labour. Among the two groups, most user farmers (72.3 %) were male higher than those who do not use children of 66.6 %. A notable difference exists in education between users and non-users of children. For instance, user cocoa farmers have higher years of education, thus 8.81 years greatly than 7.71 years for non-users. This may be due to the fact that the literate farmers are better equipped to appreciate the repercussions of using children on cocoa farmers and may negatively affect the decision to use children on cocoa farms. The finding is in line with that of Okpukpara and Odurukwe [20], which revealed a negative correlation between child labour and education. The mean household size of use of children was 6.76 greater than 6.07 persons of those who do not use children. This is not surprising because large household could mean labor intensive and hence, most of them may assist on cocoa activities. The mean size of cocoa farm of users was 9.41 acres lower than 9.86 acres of those who do not use youngsters on cocoa plantations. However, majority of cocoa growers who use youngsters have worked for about 17.02 years more than 14.28 years of those who do not use children. While most farmers (59.5 %) who use children were cooperative members, about 30.9 % of farmers who do not use children had more credit access. More farmers who do not use children on cocoa farms travelled longer distance of 12.72 km on average than users.

Table 3 displays the cocoa farmers' perceptions regarding the employment of children under the age of 18 on their cocoa farms. From the 384 cocoa growers interviewed, the usage of children was low for 284 farmers (74 %). Ninety-one (91) farmers (23.7 %) moderately used

Table 3
Extent of usage of children for cocoa activities.

Extent of Usage	Frequency	Percentage (%)
Low (1–40 %)	284	74.0
Moderate (41–80 %)	91	23.7
High (81–100 %)	9	2.3
Total	384	100.0

Source: Field Survey, 2022

Table 4
Access to livelihood assets.

Livelihood Assets	Disagree N (%)	Neutral N (%)	Agree N (%)
Financial Assets			
Access to regular income	101 (26.3)	131 (34.1)	152 (39.6)
Access to savings	189 (49.2)	78 (20.3)	117 (30.5)
Access to insurance	281 (73.2)	36 (9.4)	67 (17.4)
Access to investments	285 (74.2)	38 (9.9)	61 (15.9)
Access to credit	305 (79.4)	56 (14.6)	23 (6.0)
Human Assets			
Access to information on the use of children for farm work	37 (9.6)	61 (15.9)	286 (74.5)
Access to formal or informal education	37 (9.6)	78 (20.3)	269 (70.1)
Access to COCOBOD training programmes	44 (11.5)	97 (25.3)	243 (63.3)
Access to labour	66 (17.2)	78 (20.3)	240 (62.5)
Access to health facilities	124 (32.3)	78 (20.3)	182 (47.4)
Social Assets			
Participation in cooperative	72 (18.8)	72 (18.8)	240 (62.5)
Participation in communal activities	89 (23.2)	77 (20.1)	218 (56.8)
Trust in social norms	137 (35.7)	69 (18.0)	178 (46.4)
Assistance from family and friends	151 (39.3)	60 (15.6)	173 (45.1)
Natural Assets			
Access to water	16 (4.2)	34 (8.9)	334 (87.0)
Access to food	23 (6.0)	45 (11.7)	316 (82.3)
Access to land	28 (7.3)	78 (20.3)	278 (72.4)
Access to wildlife and forest	70 (18.2)	67 (17.4)	247 (64.3)
Access to livestock	72 (18.8)	70 (18.2)	242 (63.0)
Physical Assets			
Access to accommodation	19 (4.9)	66 (17.2)	299 (77.9)
Access to processing facilities	348 (90.6)	16 (4.2)	20 (5.2)
Access to farm equipment	50 (13.0)	103 (26.8)	228 (59.4)
Access to transport facilities	152 (39.6)	87 (22.7)	145 (37.8)
Access to protective clothing	251 (65.4)	38 (9.9)	95 (24.7)

Source: Field Survey, 2022

Table 5
Household food insecurity access score.

Response	No	Rarely	Sometimes	Often	Total
Worry about enough food for the family	231 (60.2)	114 (29.7)	35 (9.1)	4 (1.0)	384 (100.0)
Member of household not able to eat, lack of resources	242 (63.0)	95 (24.7)	36 (9.4)	11 (2.9)	384 (100.0)
The family only eats a small assortment of foods.	232 (60.4)	105 (27.3)	43 (11.3)	4 (1.0)	384 (100.0)
Household members eat food that you did not want	238 (62.0)	101 (26.3)	38 (9.9)	7 (1.8)	384 (100.0)
Household members eat a reduced meal that they felt wasn't needed	235 (61.2)	102 (26.6)	44 (11.4)	3 (0.8)	384 (100.0)
Less food is consumed by household members during the day	233 (60.7)	101 (26.3)	42 (10.9)	8 (2.1)	384 (100.0)
A household member has no food to eat of any kind	258 (67.2)	82 (21.4)	36 (9.3)	8 (2.1)	384 (100.0)
Household members sleep hungry because there was not enough food	258 (67.2)	77 (20.1)	43 (11.2)	6 (1.5)	384 (100.0)
household member goes an entire day without eating anything	262 (68.2)	77 (20.1)	40 (10.4)	5 (1.3)	384 (100.0)

Source: Field Survey, 2022

children and 9 farmers (2.3 %) were highly using children in farming activities. The low usage of children by cocoa farmers could be ascribed to the introduction of the National Plan of Action (NPA) by the government of Ghana as an effort to eliminate child labour [36]. The results conflict with those of Asamoah et al. [36], who claimed that a disproportionately high number of farmers in Ghana exploited child labour in the production of cocoa. They observed that children were engaged in tasks like weeding, transporting cocoa saplings to the farm, pruning, collecting water to spray the farms, and conveying fermented beans to drying mats, all of which drew compensation. Owusu and Kwarteye [1] linked age, a home's total number of children and the number of adults to the level of child usage on cocoa fields (see Table 4).

The data presented in Table 4 reflects respondents' perspectives on their access to different financial assets. Among the respondents, 39.6 % agreed that they have access to regular income, while 30.5 % agreed that they have access to savings. Access to insurance was agreed upon by 17.4 % of respondents, while 15.9 % agreed on having access to investments. A smaller proportion, 6 %, agreed that they have access to credit. These findings illustrate varying levels of agreement among respondents regarding their access to different financial assets, with access to regular income and savings receiving relatively higher agreement percentages compared to access to insurance, investments, and credit. In line with Togunde and Carter [37], children's permitted work provides support to their families monetarily. According to Basu and Van [38], child labour results from poverty and happens when a family's or a household's income is lower than the minimum necessary for subsistence. Farmers must therefore increase their financial resources to decrease the use of children on their farms.

In terms of human assets, 74.5 % of respondents notably agreed that they have access to information on the use of children for farm work, while 70.1 % agreed on having access to formal or informal education. Regarding access to COCOBOD training programs, 63.3 % of respondents agreed. Access to labor was affirmed by 62.5 % of respondents. In contrast, 47.4 % agreed that they have access to health facilities, with a significant proportion (32.3 %) expressing disagreement in this regard. This data underscores variations in respondents' perceptions and experiences related to human assets, with relatively higher levels of agreement concerning education and training access compared to health facilities.

In terms of social assets, 62.5 % of respondents notably agreed that they participate in cooperatives, while 56.8 % indicated participation in communal activities. Trust in social norms was affirmed by 46.4 % of respondents, with a significant proportion (35.7 %) expressing disagreement in this regard. Additionally, 45.1 % agreed that they receive assistance from family and friends, with 39.3 % disagreeing with this statement. These findings illuminate the varying perspectives and engagement levels of respondents concerning different social assets, underscoring the significance of cooperative participation and communal activities and highlighting the nuanced nature of trust in social norms and support from personal networks. According to Omeje et al. [39], households with heads who were active in political and social groups appeared to be have greater awareness of the risks associated with child labour, which was imitated in their way of life.

In terms of natural assets, a significant majority (87.0 %) of respondents agreed that they have access to water, while 82.3 % affirmed access to food. Additionally, 72.4 % acknowledged having access to land, although 20.3 % remained neutral on this aspect. Access to wildlife and forest resources was recognized by 64.3 % of respondents, with 18.2 % expressing disagreement. Moreover, 63.0 % indicated access to livestock, with a similar percentage (18.8 %) in disagreement. These findings underscore the community's strong connection to essential natural assets, such as water and food, while also highlighting varying perspectives on land, wildlife, and livestock access, reflecting the nuanced nature of these natural resources. This is consistent with the findings of Owusu and Kwarteye [1] and Thorsen and Maconachie [10].

In terms of physical assets, a substantial majority (77.9 %) of respondents agreed that they have access to accommodation, with a small percentage (4.9 %) in disagreement. Access to processing facilities, however, exhibited a stark contrast, with 90.6 % of respondents disagreeing and only 5.2 % agreeing. In terms of farm equipment, 59.4 % of respondents confirmed access, whereas 13.0 % disagreed. Access to transport facilities yielded varied opinions, with 37.8 % agreement and 39.6 % disagreement. Finally, access to protective clothing demonstrated the highest disagreement at 65.4 %, with 24.7 % agreement and 9.9 % neutrality. These findings illuminate the diverse levels of access and availability of physical assets among the surveyed population, highlighting disparities in resources such as processing facilities and protective clothing, which warrant further attention and potential intervention [9,10].

Generally, a higher percentage (60–68 %) of families have not experienced any food insecurity conditions (Table 5). A higher percentage of 68.2 % of no occurrence was experienced for "household member goes an entire day without eating anything". Both "household member sleep hungry because there was not enough food" and "household member has no food to eat of any kind" experienced 67.2 % of no occurrence. Only a few (1–3%) of the households often experienced food insecurity conditions. Only a small portion of the household (0.8 %) often eat a lesser meal than what they need (see Table 5).

Depending on the length of time it persists, food insecurity can range from Secure to Mild to Moderate to Severe. Food secure households have enough food and rarely worry about not having the resources to get enough food. Being food insecure for only a brief amount of time during the day or night is referred to as mild insecurity. These households were thought to be upset about not having enough food in their home

Table 6
Categories of household food insecurity access score.

The extent of food security	Frequency	Percentage (%)
Food Secure	231	60.2
Severely Food Insecure Access	8	2.1
Moderately Food Insecure Access	47	12.2
Mildly Food Insecure Access	98	25.5
Total	384	100.0

Source: Field Data, 2022

occasionally or regularly due to a lack of resources. Families in this category may enjoy their favourite food, but when their means of obtaining it turns out to be insufficient, they change to unsavoury foods. Moderate Insecurity occurs when a full day or night goes by without meals. Families in this group either rarely or occasionally had to cut back on their daily food intake or go without food for the entire day and night. A person is said to be in a severe situation when they run out of food and are unable to obtain sustenance for the entire day or night. Table 6 indicates that 60.2 % of the farmers have access to food i.e., they can meet and satisfy the three daily minimum requirements of food security. Mild food insecurity is experienced by 26 % of the respondents. Moderate food insecurity is also experienced by 12 % of the respondents' whiles 2 % of the respondents experience severe food insecurity. The findings corroborate that of Iddrisu et al. [40] who found that21 %, 51 %, 27 % and 1 % of cocoa farmers in Ghana were mildly food secured, food secured, moderately and severely food insecure respectively. The finding, however, disagrees with Danladi and Ojo [41] who found that in Nigeria, 27 %, 20 % 18.3 % and 35 %, of the families were food secured, severely food insecure, moderately food insecure and mildly food insecure, respectively.

The parameters affecting the use and extent of children in cocoa fields were listed in Table 7. The Wald test results shown by the Cragg double model is apt for the data and also all the explanatory variables explained the dependent variable significantly. The model that best matches the study's data was determined using the likelihood ratio test. Results showed that household size, cooperative membership and credit access had substantial effect on both the use and extent of use of youngsters working on cocoa plantations. Variables such as economic active people, years of cocoa cultivation influenced the choice to employ children on cocoa farms. The extent of children use was influenced significantly by years of education and cocoa farm size.

Based on Table 7, an additional year in education will decline the likelihood of extent of children use on cocoa farms by 18.1 %. Thus, an educated farmer tends to educate his/her wards to go to school. This could probably be the fact that as the farmers becomes more educated, he/she might be enlighten to comprehend the importance of education than uneducated farmers. Similar findings with Cudjoe et al. [42] and Abdullah et al. [43]. The result on cooperative membership shows that one additional meeting as cooperative decreases the probability of children use as well as the extent of children use by 7.5 % and 28 %, respectively. This means that cooperative membership had a significantly negative influence on the decision to use children and extent of children use in the study area. Social networks play a vital role in informing farmers with information linked child labour issues which government and donor agencies frowned against it in cocoa production. Cooperatives in rural areas can launch targeted awareness campaigns to educate their members and the wider community about the negative repercussions of child labor. These campaigns can utilize various mediums such as social media, radio, television, and community events to disseminate information and raise awareness. They can share stories, testimonials, and case studies to highlight the harmful effects of child labor on children's physical and mental well-being, education, and future opportunities. Furthermore, cooperatives can actively engage with local communities to empower families and create alternative opportunities to address child labor. This can involve initiatives such as providing access to education, vocational training, and income-generating activities for adults. By empowering families economically and socially, cooperatives can reduce the reliance on child labor as a means of survival and support on their farms, and encourage a more sustainable and inclusive approach to community development. Cudjoe et al. [42] opined that social groups create awareness and caution farmers to desist from using their children on cocoa farms. Gelgo's [44] findings show that an upsurge in the frequency of meetings held by cooperative groups increases the likelihood of educating farmers

Table 7
The extent to which children are used on cocoa plantations and the factors that affect their use.

Variables	Cragg Double Hurdle			Tobit estimates	Heckman	
	Probit estimates		Truncated estimates		Probit estimates	OLS estimates
	Coefficients	Marginal Effect	Coefficients	Coefficients	Coefficients	Coefficients
Age	−0.010	−0.003	0.056	−0.003	−0.010	−0.002
	(0.007)	(0.002)	(0.059)	(0.002)	(0.008)	(0.011)
Credit access	−0.104***	−0.029***	−0.114***	0.087*	−0.104	0.155
	(0.033)	(0.011)	(0.034)	(0.049)	(0.162)	(0.147)
Household size	−0.076**	−0.021**	−0.741***	0.017*	0.076**	−0.012
	(0.032)	(0.009)	(0.237)	(0.009)	(0.034)	(0.072)
Number of economic active people	0.145**	0.041**	0.945	−0.051**	−0.145*	0.012
	(0.074)	(0.021)	(0.605)	(0.024)	(0.084)	(0.150)
Years of cocoa cultivation	0.019**	0.005**	0.058	0.003	0.019*	−0.000
	(0.009)	(0.002)	(0.066)	(0.003)	(0.010)	(0.018)
Cocoa farm size	0.010	0.003	0.026**	−0.004	−0.010	0.001
	(0.014)	(0.004)	(0.011)	(0.004)	(0.014)	(0.014)
Cooperative membership	−0.263*	−0.075*	−0.280**	0.054	0.263*	−0.048
	(0.154)	0.043	(0.112)	(0.046)	(0.153)	(0.285)
Gender	0.144	0.041	0.076	0.060	0.144	−0.001
	(0.159)	(0.045)	(0.120)	(0.048)	(0.160)	(0.182)
Years of education	0.004	0.001	−0.181*	−0.005	−0.004	−0.001
	(0.012)	(0.003)	(0.093)	(0.004)	(0.013)	(0.009)
Farm distance	−0.007	−0.002	−0.022	0.010	−0.007	0.006
	(0.006)	(0.003)	(0.051)	(0.020)	(0.008)	(0.008)
Sigma			0.105***			
			(0.031)			
Inverse Mill's ratio (λ)					−0.087 (0.234)	
Constant	0.797**		0.777***	0.672***		
	(0.381)		(0.282)	(0.117)		
Log pseudolikelihood	−193.850		−449.07	−223.45		
Pseudo R^2	0.390					
Wald chi^2 (10)	115.09		139.78			
Prob > chi^2	0.000		0.000			
Observations	384		384			

Source: Field Survey, 2022. *p < 0.1, **p < 0.05, ***p < 0.01. Robust standard errors in parentheses.

on child labor regulations. Credit access had a negative substantial connection to the choice to use and extent of children use. This implies that additional credit access by farmer increases the probability of both children use and extent of children use by 2.9 % and 11.4 %, respectively. Thus, as credit access increases, the likelihood of using children on cocoa farmers decreases. Farmers who have credit access are able to hired labourers to assist cocoa operations such as pod breaking, harvesting, weeding, and agrochemical applications. However, farmers without credit access would likely use their children to assist on cocoa farms, hence comprising the cocoa quality. According to Ghimire et al. [31], having access to financing has a detrimental effect on the usage of child labour in Ghanaian cocoa fields.

Cocoa farm size had a significantly positive effect on extent of children use on cocoa farms. A one-acre increase in the size of each farmer's farm increased their possibility of extent of children use by 2.6 %. Consequently, the bigger the farm, the higher the extent of children use. This is because as cocoa farm size upsurges, more labour will be required, but it might not be accessible to help the cocoa activities, hence the higher the probability of extent of children use. Moreover, the decision to utilize and the extent of children's usage were significantly affected by household size, with a negative impact. Thus, a one extra adult member to the household decreases the chance of children use and extent by 2.1 % and 24.1 %, respectively. Mwangi and Kariuki [45] and Mignouna et al. [46] suggest that the size of a household is often used as an indicator of available labour. This is because households with larger sizes are better equipped to handle labour-intensive tasks such as the adoption of new technologies, as they have more individuals who can contribute to the process. Essentially, larger households have the capacity to alleviate labour constraints that may arise during the introduction of new technologies. A significant positive effect can be observed between years of cocoa cultivation and use of children. This indicates that additional year of farming experience, cocoa farmers are more likely to use children on cocoa farms by 0.5 %. The plausibly reason could be the fact that experienced farmers might have used their children on cocoa farms before without any sanctions and hence, more encouraged to use their children as helping hand on the farms. The utilization of children on cocoa farms was significantly and positively influenced by economically active individuals. The results suggest that one-member engaged in economic active work other cocoa farming tend to increase the likelihood of using children on cocoa farms by 4.1 %. This is not surprising because farmers with household members engaged in economic active work other than farm spent more hours on their jobs and hence, making farmers to use their children on cocoa farms [42].

The effect of use of children on cocoa farms on household welfare was estimated using the PSM. The PSM technique was estimated in two stages. First, the decision to use children on cocoa farms was computed using the probit model. The estimates from the probit model are the same as the first step of the Cragg model presented in Table 7. Therefore, the discussions are also the same. Second, the impact of use of children on household welfare – income, asset score and food security are presented in Table 8. The results revealed that use of children on cocoa farms significantly provides GHS172.68 to GHS233.50 increase in income, a 0.11 %–0.99 % increase in food security and 7.26%–11.65 % increase in asset score. This implies the practice of employing children on cocoa plantations is increasing smallholder cocoa farmers' income, food security and asset score in Ghana. This is not surprising because cocoa farmers used their children on cocoa farms and they believe the participation of children as workers intensifies their attachment to the workforce translating into relatively high income as well as assets creation for the household. Using children as laborers is deemed an acceptable approach to equip them with the necessary traits to become diligent and tough adults who can tackle future work-related obstacles [1]. Although policies frowned against use of children on cocoa farms, however, in reality, cocoa farmers tend to engage their wards in order to save high labour costs and hence, increase yield translating into high income. The result is in line with other studies examining the use of child labour in relation to welfare. For example, Degirmencioglu et al. [47] discovered that in Turkey, children work on family farms from an early age to support the family's agricultural activities and increase household income. Studies have shown that involving children in family farms, including cocoa farming, can boost family income and improve their standard of living [43,48]. As a result, their participation is often seen as a vital approach to ensuring a better future for children and sustaining family businesses [42,48,49].

Table 8
Impacts of children use on household welfare.

Outcome	Use children	Do not use children	ATT	t-stat
Income (GHS)				
Nearness neighbor matching	1585.48	1398.58	186.90	4.16***
Caliper matching	1576.10	1403.42	172.68	4.01***
Kernel based matching	1799.60	1566.10	233.50	6.22***
Food security				
Nearness neighbor	6.01	5.64	0.36	1.69*
Caliper matching	5.59	5.70	0.11	1.66*
Kernel based matching	6.98	5.99	0.99	1.73*
Assets score				
Nearness neighbor	54.76	43.75	11.10	8.16***
Caliper matching	44.15	36.89	7.26	3.33***
Kernel based matching	58.08	46.43	11.65	8.34***

Source: Field Survey, 2022. *p < 0.1, **p < 0.05, ***p < 0.01. ATT = Average Treatment Effect on Treated.

Fig. 1 depict the estimated propensity scores distribution using for children use and non-children use. It shows the number of cocoa farmers who are formed the treated and untreated groups. The figure reveals substantial overlap in the distribution of the propensity scores of both treated and untreated. In order to assess the impact of children's use on household welfare, we examined the propensity scores to ensure that the treated and comparison groups had similar distributions. This was done to test the balance of covariates between the two groups, as explained by Tolemariam [50]. The results, presented in Table 9, revealed that 8 variables showed significant mean differences, indicating that covariate balance was achieved between the treated and untreated groups in terms of children's use on cocoa farms. This suggests that the matching specification was successful in balancing the distribution of covariates between the two groups. Additionally, the overall balance test statistic, assessed through the likelihood ratio test, was found to be insignificant ($chi^2 = 2.51$; $p = 0.991$), confirming that both the treated and untreated groups had similar distributions after matching.

The sensitivity analysis conducted using Rosenbaum's constraints on probability values to assess household welfare among cocoa farmers is presented in Table 10. This analysis aims to examine the extent to which estimated treatment effects are influenced by unobserved variables. Through comparing the treatment effect and propensity score, this test helps us achieve our research objectives [51]. Among the different methods used, kernel-based matching, particularly with the income variable, yields the most robust treatment effect estimates. The results reveal that there are significant impacts of use of children on income, food security and asset score at a 1 % significance level. Moreover, income, food security and asset score remain robust even when accounting for hidden bias up to a certain impact level, such as $\mathbf{e^y = 2}$ when using the calliper matching approach, which gives a significance level of 5 %. Similarly, nearness neighbor matching shows robustness at impact levels of $\mathbf{e^y = 1.75}$ and $\mathbf{e^y = 2}$. Nonetheless, there is a possibility of hidden bias that can influence the calculated treatment effects on income, food security, and asset score, especially when the unobservable impact levels are low, such as $e^y = 1.50$. Furthermore, Rosenbaum [52] suggests that the sensitivity analysis results should be treated as a worst-case scenario, as they can provide essential insights into the uncertainties linked with matching estimators of treatment effects.

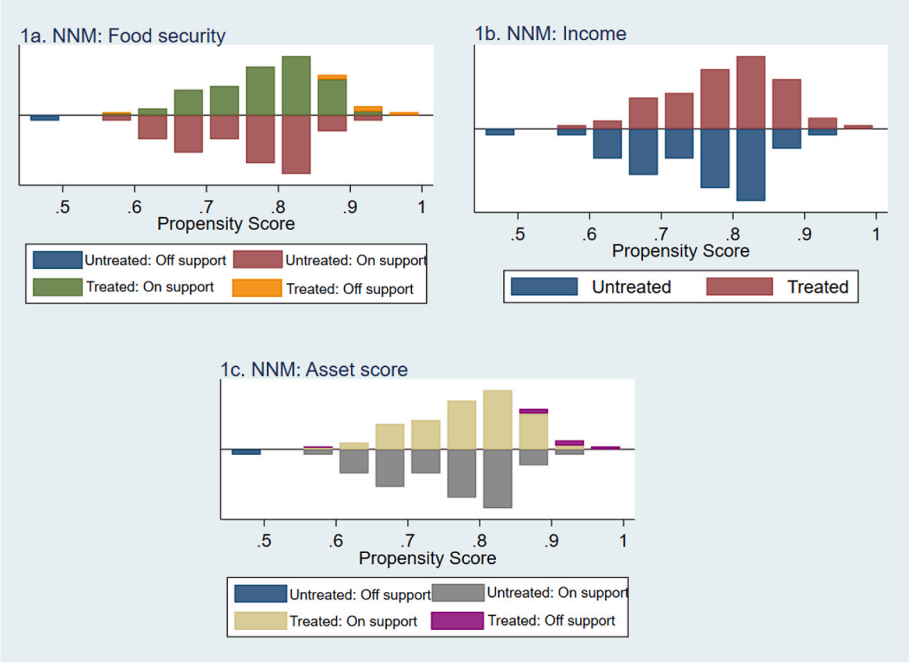

Fig. 1. Histogram of propensity scores.
Source: Field data, 2022

Table 9
Covariate balancing test.

Variable	Mean		*t*-test	
	Control[a]	Treated[b]	%bias	t
Gender	0.711	0.723	2.60	0.33
Age	46.25	46.57	2.40	7.30*
Years of education	9.13	8.81	−5.50	−8.68*
Household size	6.63	6.76	3.9	7.45*
Economic active people	2.55	2.53	−1.60	−9.20*
Years of cocoa cultivation	16.36	17.02	6.40	6.77*
Cocoa farm size	9.38	9.41	0.60	6.27*
Cooperative membership	0.65	0.68	0.03	9.05*
Credit access	0.27	0.28	0.20	10.55*
Farm distance	10.64	11.33	5.90	0.77
Overall balance test				
Chi^2		2.51		
df		9		
p-value		0.991		

[a] Control means that farmers who do not use children on their cocoa farms.
[b] Treated means that farmers who use children on their cocoa farms.
Source: Field data, 2022. *p < 0.1, **p < 0.05, ***p < 0.01.

Table 10
Welfare sensitivity analysis using Rosenbaum's bounds on probability values.

Variable	Maximum limits on the level of significance for various values of e^y				
	$e^y = 1$	$e^y = 1.25$	$e^y = 1.50$	$e^y = 1.75$	$e^y = 2$
	By means of the single closest neighbor				
Income	0.0001	0.0022	0.0321	0.3411	0.7330
	0.00011	0.0003	0.0014	0.0382	0.1251
Food security	0.2251	0.21112	0.03213	0.47612	0.85703
	0.000021	0.000433	0.03034	0.000146	0.00036
Asset score	0.00111	0.11154	0.02208	0.47612	0.68001
	0.000012	0.00656	0.02421	0.003216	0.00656
	By means of all neighbor within a calliper 0.01				
Income	0.00013	0.0241	0.2210	0.6134	0.8073
	0.00012	0.00023	0.00012	0.0205	0.0775
Food security	0.00036	0.02452	0.10531	0.30331	0.56705
	0.0005	0.00022	0.00026	0.01525	0.02137
Asset score	0.00019	0.0155	0.3056	0.7054	0.6128
	0.00014	0.00044	0.00025	0.0466	0.0658
	By means of a bi-weight kernel function and a smoothing parameter of 0.06				
Income	0.00320	0.05246	0.5041	0.5423	0.9723
	0.00013	0.00016	0.00018	0.00982	0.0431
Food security	0.000250	0.02292	0.28704	0.52336	0.7882
	0.000122	0.00266	0.00028	0.00225	0.0289
Asset score	0.00288	0.04378	0.3228	0.3381	0.6554
	0.00019	0.00048	0.00023	0.00745	0.03308

Source: Field data, 2022

4. Conclusion and policy recommendations

The study assesses the impact of employing children on the well-being of cocoa growers in Ghana. Data gathered from 384 cocoa growers were selected randomly and surveyed using structured questionnaires. The study utilized two statistical models, the two-step double hurdle and propensity score matching models. The findings indicate that certain factors, such as household size, cooperative membership, and credit access, significantly influenced the decision to use children on cocoa farms, as well as the extent of their use. The number of economically active individuals in the home and years of cocoa farming were identified as key determinants in the decision to use youngsters on cocoa plantations. Additionally, socioeconomic factors i.e., the size of cocoa plantations and education of the farmers were found to be the main drivers of the degree to which children were engaged on cocoa plantations. Furthermore, the study uncovered that the cocoa farmers who employed children on their farms experienced an improvement in their income, food security and asset score. The research findings indicated that the use of children resulted in GHS172.68-GHS233.50 increase in income, 0.11%–0.99 % increase in food security and 7.26%–11.65 % increase in asset score. Despite the fact that using children for labour is illegal, the study highlights that the reality is that cocoa farmers who use children have experienced positive effects on their well-being. Based on the study's findings, several recommendations have been made. Firstly, it is highly recommended that cocoa farmers become members of co-operatives and have access to credit. This enables them to resist using children on their farms and also provides them with the resources necessary to enhance cocoa production, such as labour and machinery.

Thus, it is crucial for stakeholders and the government in the cocoa sector to invest in cooperatives that can help educate farmers on regulations regarding the use of children on cocoa farms. Secondly, to promote sustainable livelihoods for cocoa farmers, governments and other interested stakeholders are encouraged to provide financial support to enable farmers to access labour or machinery that can replace children on cocoa farms.

While Atwima Nwabiagya was selected as the study site due to its high cocoa production, it is important to acknowledge that research studies often focus on specific contexts or populations and may not fully represent the entire cocoa industry. To mitigate the potential bias resulting from site selection, the study employed rigorous analytical approach such as PSM. This method was utilized to account for confounding factors that could influence the relationship between children's participation and household welfare in cocoa production. By employing PSM technique, the study aimed to enhance the robustness and validity of its findings. However, in order to develop a more comprehensive understanding of children's participation on cocoa farms, it is recommended that further studies be conducted in different regions of Ghana. This broader research approach would provide insights into the variations and nuances of children participation dynamics within the cocoa industry, contributing to a more comprehensive understanding of the issue.

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Declaration of competing interest

The authors affirm that they do not have any known financial or personal conflicts of interest that could have potentially influenced the findings presented in this paper.

Data availability

Data will be made available on request.

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