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Is Cocoa Production a Main Driver of Children's Work in Ghana?

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ABSTRACT *Child labour in cocoa production remains a major concern. Yet, an overall assessment of the role of cocoa production in child labour, comparing with other household livelihood activities, as well as a more nuanced view on the work that is done by children, is lacking. Using data from the Ghana Living Standards Survey 2017, we model the probability of children's work based on cocoa production and a set of other variables at child, parental, household and community level. We specify children's work in different ways to better interpret employment conditions, compare effects across gender and age of the child, and address potential bias by controlling for measurement error and using an instrumental variable estimation and a coefficient stability approach. We find that cocoa production increases the probability of working on the own farm but not exceeding allowable work time or in harmful conditions. The effects are similar for boys and girls but are much larger for older children. Other farm-household activities, especially food crop production and livestock ownership, are much more strongly associated with children's work, often under more harmful conditions. This implies that solely targeting the cocoa sector might run the risk to transpose child labour to other activities.*

KEYWORDS: cocoa supply chains; child labour; decent work; international agri-food trade; Africa

JEL CODES: J43; J81; Q12

1. Introduction

Consumers in high-income countries are increasingly concerned about the sourcing and production practices of the food they buy (Grunert, Hieke, & Wills, 2014; Vermeir & Verbeke, 2006). This is especially the case for global supply chains with large differences in living standards between primary producers in the Global South and end consumers in the Global North (Aksoy & Beghin, 2004). Decent employment conditions among farmers and farm workers have been put under scrutiny in policy and scientific debates, with particular attention to child labour (Gereffi & Lee, 2016). These concerns are especially strong for cocoa supply chains and chocolate consumption. Up to 1.5 million children (corresponding to 45% of children living in farm-households in cocoa growing regions) are estimated to work on cocoa farms in 2018 in Ghana and Côte d'Ivoire, which are the two most important cocoa exporting countries (Sadhu

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et al., 2020). Many programs and policies have been set up over time to ban child labour in the cocoa sector, but their success seems to be limited (Thorsen & Maconachie, 2023).

There might be two reasons behind the failures of these initiatives. First, an overall assessment of the role of cocoa production in child labour remains lacking. While the share of child labour among cocoa farm-households seems very high, studies typically do not compare with farm-households who are not involved in cocoa production. Theoretically, cocoa production might both increase or reduce the demand for child labour (Beshir & Maystadt, 2023; Cogneau & Jedwab, 2012), so empirical evidence is needed to assess its overall effect. In addition, other livelihood activities, such as food crop production, livestock rearing or non-farm work, have been documented to influence child labour as well (e.g. Basu, Das, & Dutta, 2010, Bandara, Dehejia, & Lavie-Rouse, 2015; Beegle, Dehejia, & Gatti, 2006; Bhalotra & Heady, 2003; Koomson & Asongu, 2016; Oryoie, Alwang, & Tideman, 2017). How these compare to cocoa production has not been investigated yet. If child labour is banned solely in the cocoa sector without using a more holistic livelihood approach, child labour might be simply reallocated to other activities. Such leakage and spillover effects have been observed before in the case of regulations promoting other sustainable development goals, such as the recently adopted EU regulation on deforestation-free supply chains (EUDR) (Köthke, Lippe, & Elsasser, 2023). As the new EU Directive on corporate sustainability due diligence (CSDD) entered into force in July 2024, a.o. prohibiting child labour in chains that supply EU, including cocoa, it is important to analyse to what extent cocoa production is a main driver of child labour to avoid leakage and spillover effects.

Second, a more nuanced view on the work done by children is needed. Child labour is defined by the International Labour Organization (ILO) as work that deprives children of their childhood as well as dignity and is damaging to their physical, health and mental development (ILO & UNICEF, 2021). However, many children, especially in Africa and especially in farm-households, are involved in farm and non-farm work (Sumberg & Sabates-Wheeler, 2023). Specifically for cocoa production, Berlan (2013) and Busquet, Bosma, and Hummels (2021) highlight that work done by children is not necessarily detrimental and may reflect socio-cultural traditions in which children are expected to contribute to the household and can gain valuable farming experience. It is therefore important to distinguish between the different types of work that children are involved in. Yet, most (economic) studies do not consider these nuances.

We contribute to these research gaps by investigating the role of cocoa production on children's work in Ghana. Using nationally representative data from the Ghana Living Standards Survey 2017 (GLSS7), we model the probability of children's work based on cocoa production and a set of other variables at child, parental, household and community level. We specify children's work in four different ways, distinguishing between different types and intensities of activities to better account for the diversity in the work that children perform and their employment conditions. We analyse a sample of 6,518 children between five and 17 years old who live in rural areas in cocoa growing regions, and we compare effects across gender and age of the child. In addition, we address several sources of potential bias, including measurement error and omitted variable bias, by using an instrumental variable (IV) estimation and a coefficient stability approach.

2. Theoretical framework

Cocoa production might influence children's work through various mechanisms with opposite effects. First, cocoa is a cash crop with higher labour returns than food crops. According to farm-household models that assume utility maximization rather than profit maximization, an increased labor productivity might either lead to a reduction or a decrease in labour, depending on farm-households' preferences for income and leisure (Basu et al., 2010). When cocoa returns increase, households who have higher preferences for leisure will decrease labour (i.e. income

effect prevails) while households who have higher preferences for income will increase labour (i.e. substitution effect prevails). If labour markets do not function well, which is typically the case in rural, remote regions, farm-households might have difficulties in hiring in labour. If they then want to increase labour, they might involve their own children instead (Dammert, de Hoop, Mvukiyehe, & Rosati, 2018; Dumas, 2013).

Several studies explore how cocoa productivity influences child labour and find mixed results. On the one hand, Cogneau and Jedwab (2012) find that the drop in cocoa producer price in 1990 Côte d'Ivoire has led to a higher involvement in work of children in cocoa-producing households (especially boys aged 12-15). Similarly, by simulating a farm-household model, Luckstead, Tsiboe, and Nalley (2019) estimate that eliminating the worst forms of child labour in Ghana would require a cocoa price premium of 2.8% while eliminating regular work would require an 11.8% premium. In addition, Vigneri, Sera, and Cardenas (2016) do not find evidence of child labour-increasing effects from increasing yields in Ghana and Côte d'Ivoire. On the other hand, Beshir and Maystadt, (2023) find that cocoa price booms in Ghana have been associated with school aged children leaving school or delaying their entry to participate in child labour activities. These opposite effects are explained by the relative importance of income and substitution effects in the different contexts.

A second mechanism relates to supply chain factors. Employment conditions in global supply chains, such as cocoa, are typically more governed and monitored than in local supply chains (Feyaerts, Van den Broeck, & Maertens, 2020). When comparing to other globally traded agricultural commodities, cocoa has been especially targeted by corporate social responsibility strategies, private sustainability standards and civil society initiatives that focus on child labour (Thorsen & Maconachie, 2023). Cocoa production might thus decrease child labour compared to other livelihood activities that are more embedded in local supply chains or to the production of other globally traded commodities. However, as only 26% of global cocoa trade is under some form of sustainability commitment, the effectiveness of supply chain factors might be questioned (Parra-Paitan, zu Ermgassen, Meyfroidt, & Verburg, 2023).

A third mechanism relates to cultural norms. In some cocoa-growing regions, children can be rewarded for their work by giving them a portion of the land, thereby incentivizing them to work more (Lambrecht & Asare, 2016). Especially older children can gain valuable cocoa farming experience, which might be highly useful when they will take over the farm from their parents (Berlan, 2013; Busquet et al., 2021). Also gender might matter. Cocoa income is mostly managed by men who may have other preferences for child wellbeing and human capital investments than women (Abdul-Mumuni, Vijay, & Camara, 2019; Cogneau & Jedwab, 2012). These effects might be different for boys and girls, with boys typically more involved in cocoa production (Sadhu et al., 2020).

3. Research background: cocoa and child labour in Ghana

Ghana is the second biggest cocoa exporter in the world, after Côte d'Ivoire, and accounted for 16.3% of global cocoa bean production in 2020 (Boysen, Ferrari, Nechifor, & Tillie, 2023). Cocoa is typically cultivated by smallholder farmers with average cocoa land areas around ten acres and yield levels about 300 kg/ha, which is far below potential levels (van Vliet, Slingerland, Waarts, & Giller, 2021). Poverty is widespread among cocoa farmers, with 30 to 60% of farmers with an income below the extreme poverty line and 70 to 90% below the living income line (van Vliet et al., 2021). Commercialisation is strongly regulated by the state-owned Cocoa Marketing Board (COCOBOD), which controls all purchases, sales and exports of cocoa and sets the cocoa farmgate price in a multi-stakeholder approach (Boysen et al., 2023). Over time, a growing number of companies have adopted public commitments to address sustainability issues in their supply chain (Parra-Paitan et al., 2023). Among these commitments, voluntary sustainability standards have emerged as primary governance tool. Of the nearly 2 million

harvested hectares of cocoa in Ghana in 2021, the share of certified area corresponded to 33% for UTZ, 15% for Fairtrade and 9% for Rainforest Alliance (FAOSTAT database, 2024; International Trade Centre's Standards Map, 2024).[1]

Labour requirements on cocoa farms are seasonal and intensive at the time of harvesting (October-December) and land clearing and weeding (May-June) (Mull & Kirkhorn, 2005). Adult labour is hired on an occasional or permanent basis, but farmers typically face difficulties in finding workers at wage levels they can afford (Vigneri et al., 2016). This labour scarcity is one of the reasons why children work on the own cocoa farm (Barrientos et al., 2008). The most common activities that children assist with are gathering and heaping cocoa pods, breaking cocoa pods and fermentation, drying cocoa beans, weeding, and carting fermented cocoa beans (Sadhu et al., 2020).

As the ILO definition of child labour leaves room for debate, most countries have adopted their own laws, including Ghana. According to the 1998 Children's Act, children under the age of 12 are not allowed to work while children between 12 and 17 are allowed to work up to 18 hours per week (Government of Ghana, 1998). A child is never allowed to engage in hazardous activities or in the worst forms of child labour (e.g. children in bondage or forced labour, commercial sexual exploitation, illicit activities and armed conflict). Over time, many policy and legislation initiatives have been set up to prevent, regulate and abolish harmful children's work in Ghana (Okyere, Boamah, Asante, & Yeboah, 2023). However, many of these efforts have floundered as a complete ban on children's work is deemed to be both unimplementable and unrealistic, especially in informal sectors. For the cocoa sector specifically, several initiatives have been launched to monitor and prevent children's work, which have been described in detail by Thorsen and Maconachie (2023).

4. Data and methods

4.1. Ghana Living Standards Survey 2017

We use data from the GLSS7, which was implemented between October 2016 and October 2017 by the Ghana Statistical Service.[2] The overall objective of this survey is to estimate the living standards of Ghanaian households. The survey includes structured household and community questionnaires, covering several modules on e.g. demographics, labour and agriculture. Some of these modules, like demographics and labour, are asked at the individual level. The sampling strategy entails two stages, with the primary stage selecting 1,000 communities (or enumeration areas – EAs) using a probability proportionate to population size, and the secondary stage selecting randomly 15 households within each EA. All datasets, questionnaires and additional information are publicly available.[3] We limit our sample to children aged five to 17 who live in rural areas in the six cocoa growing regions in Ghana (Western/Central/Eastern Region, Volta, Ashanti and Brong Ahafo). We retain 6,518 children in total (3,176 girls and 3,342 boys) in 2,764 households and 328 EAs.

4.2. Defining and measuring children's work

To account for the different types and intensities of the activities children are involved in, we specify children's work in four different ways: 1) child work, 2) child work in agriculture, 3) child labour, and 4) hazardous child labour. Child work is defined as participation in any economic activity for pay, profit, or for family gain, even if it is only for one hour. Child work in agriculture is defined as participation in activities on the own household farm. Child labour is defined according to the national legislation, taking into account whether the child exceeds allowable work time (i.e. no economic activities allowed for children under the age of 12, and a maximum of 18 hours per week for children between 12 and 17). Hazardous child labour is defined as any economic activity where the child has been exposed to either operating heavy

equipment or working with dangerous tools or unprotected handling of synthetic pesticides and fertilizer. All these specifications are binary variables, relating to the seven days before the interview. They are based on the labour module, which is asked at the individual level for every household member older than five years.

4.3. Modelling drivers of children's work

We analyse the drivers of children's work by estimating the following model:

$$Y_{ijk} = \beta_0 + \beta_1 C_{ijk} + \beta_2 X_{ijk} + \varepsilon_{ijk}$$

where Y_{ijk} is a variable indicating one of the four specifications of children's work status of child i in household j in community k, C representing our main variable of interest of cocoa production, specified as a binary variable indicating if the child lives in a household involved in cocoa production,[4] X a set of control variables, and an error term ε. We estimate a probit model because of the binary nature of our dependent variables and report average marginal effects. We estimate four models in total, each for a different specification of children's work. Following Abadie, Athey, Imbens, and Wooldridge (2023), we cluster standard errors at the household level, as our main variable of interest (cocoa production) is at the household level and 86% of the children in our sample have other siblings present in the sample.

The set of control variables includes characteristics at child level (gender, age and currently enrolled in school), parent level (presence of mother and father in the household and whether mother and father completed at least primary education), household level (number of children younger than five years, number of children between five and 17 years, number of adults older than 17 years, an asset index (based on a principal component analysis on a range of durable assets and housing conditions) and landholdings), and community level (distance to nearest market, and presence of primary and junior high school). We also include variables for other livelihood activities: production of other industrial crops (cashew nut, coconut, coffee, colanut, cotton, ginger, kenef, oil palm, rubber, sugar cane and tobacco), production of food crops (with maize, cassava and plantain as most common crops), ownership of livestock and ownership of non-farm enterprises. These variables are based on our theoretical framework and other empirical studies, both in Ghana and elsewhere, and capture demand for (child) labour, schooling opportunities and parental preferences (e.g. Anker, 2000; Bandara et al., 2015; Basu et al., 2010; Beegle et al., 2006; Beshir & Maystadt, 2023; Bhalotra & Heady, 2003; Dumas, 2013; Koomson & Asongu, 2016; Nkamleu & Kielland, 2006; Oryoie et al., 2017). As we have a large set of control variables, we check for multicollinearity. We find an average variance inflation factor (VIF) of 1.85, with no variable having a larger VIF than 10,[5] indicating that there are no problems of multicollinearity. Finally, we include dummies for the different regions and ecological zones (savannah, forest and coastal) as well as controls for month of interview, presence of agricultural extension officers and proxy respondent status (see section 4.4).

According to our theoretical framework, the effect of cocoa production might be different across the gender and age of the child. Therefore, we investigate heterogeneous effects of cocoa production by analysing four subsamples: 1) girls, 2) boys, 3) children between 5 and 11 years old, and 4) children between 12 and 17 years old.

4.4. Reducing measurement error of children's work

When analysing children's work, it is important to account for potential measurement errors, which may occur due to social desirability bias, respondent bias and recall bias. We try to control for these different sources of bias in the following ways. First, social desirability bias may happen if respondents do not give 'true' answers to more sensitive questions. This might lead to

overall underestimations of the prevalence of child labour. For example, Jouvin (2023) shows that cocoa farmers in Côte d'Ivoire are twice as likely to report child labour on their farms using a list experiment than when they are questioned directly. However, the coefficients in our model will only be biased if social desirability bias is not random across children and households. It might be that cocoa farm-households are more likely to underreport child labour, given that they have been targeted by many sustainability initiatives and they are strongly aware that child labour is officially not allowed. As we limit the sample to cocoa-growing areas, we believe that this exposure is relatively uniform across cocoa and non-cocoa growers, but we cannot rule out that this is non-random across certified and non-certified growers. Therefore, we include a control variable indicating whether the community is visited by agricultural extension officers to control for possible law enforcement and monitoring in order to reduce social desirability bias.

Second, respondent bias may occur when answers are not given by the individual but rather by a proxy respondent (Kilic, Van den Broeck, Koolwal, & Moylan, 2022). Using information from proxy respondents (usually the parents or another adult who knows the children well) may be preferable to self-reported information from children for ethical and data quality reasons, especially for young children. However, proxy respondents are prone to underreport the time spent by children working (Dammert & Galdo, 2013), especially for girls (Galdo, Dammert, & Abebaw, 2021). Therefore, we also include a variable indicating the proxy respondent status of the child.

Third, recall bias might occur when respondents have to recall their activities for a long period of time, which can be especially problematic in case of irregular activities, like children's work. In such cases, it is better to rely on a shorter recall period (Arthi, Beegle, De Weerdt, & Palacios-López, 2018; Bardasi, Beegle, Dillon, & Serneels, 2011). That is why we choose our recall period based on seven days and not on the past 12 months, and control for the month of interview in all of our models. This also accounts for seasonality effects, in case children are more likely to work in certain months, especially in case of agricultural activities.

4.5. Addressing omitted variable bias

Another main source of bias in our model might be omitted variable bias, as participation in cocoa production is probably not random and might be correlated with various farm-household characteristics. If these characteristics are not controlled for, the effect of cocoa production may be biased. We attempt to reduce this bias by controlling for a large set of variables that are expected to both influence children's work but also households' participation in cocoa production. In addition, we conduct two robustness checks. First, we estimate an IV regression with the share of cocoa farm-households in the community as IV. The rationale behind this IV is that cocoa production is spatially clustered because of its specific agri-climatic requirements (Abdulai et al., 2018; Bunn et al., 2019). We test whether it is a strong, relevant IV and whether the exclusion restriction holds (see Supplementary Materials). Second, we apply a recently developed coefficient stability approach (Diegert, Masten, & Poirier, 2023). This allows us to calibrate sensitivity parameters by comparing the magnitude of selection on observables with the magnitude of selection on unobservables. Unlike other coefficient stability approaches, like Oster (2019), this method allows the omitted variables to be correlated with the included controls (i.e. allowing for endogenous controls).

5. Results and discussion

5.1. Descriptive statistics

Table 1 presents statistics about cocoa production in the different cocoa growing regions, based on our sample of 6,518 children. Less than 20% of the children live in households that are

Table 1. Cocoa production across regions based on sample of rural children 5–17 years (n = 6,518)

	All	Western region	Central region	Eastern region	Volta	Ashanti	Brong ahafo
Cocoa production (%)	18.89	23.34	27.39	23.13	2.92	14.54	25.36
Cocoa gross revenues (GH₵)	5,188	6,555	5,610	4,088	1,659	4,382	5,675
Cocoa share (%)	42.64	55.13	45.99	29.92	21.26	40.87	44.66
Cocoa area (acres)	8.87	10.46	7.45	8.12	2.92	9.56	9.69
Male hired workers for cocoa (#)	1.89	2.47	1.91	1.95	0.49	2.50	0.91
Female hired workers for cocoa (#)	0.91	0.74	0.72	1.28	0.07	1.63	0.39

Statistics are corrected using sampling weights and conditional on cocoa production.

involved in cocoa production, but this prevalence is higher in some regions (Western, Central and Eastern Regions, and Brong Ahafo) than in others (Volta and Ashanti). Cocoa farm-households earn on average 5,188 GH₵ gross revenues from cocoa, corresponding to nearly half of their overall gross revenues. This is a bit lower than the 61% reported in 2012 (Boysen et al., 2023), suggesting either that cocoa-growing households have become less dependent on cocoa sales or that cocoa sales have decreased over time. There is variation across regions, with revenue shares ranging from 21% in the Volta region to 55% in the Western region. Households cultivate cocoa on average on nine acres, with cocoa areas substantially smaller in the Volta region (about three acres). While we do not have data on household labour spent on cocoa production, we have limited data about the hired workers during the past 12 months. On average, about two male workers and one female worker are hired, with lower numbers in Volta and Brong Ahafo.

Table 2 compares different statistics for children's work across children living in cocoa and non-cocoa farm-households. Overall, 19% of the children in our sample have been engaged in an economic activity during the past seven days (i.e. child work). There are small gender differences with boys having a slightly higher probability (21%) than girls (17%), but especially differences across age stand out with children between 12-17 a probability of 31% and children between 5-11 only 9%. When involved in child work, children work on average 17 hours per week, which is non-negligible. This also holds for the younger children who work on average 15 hours per week. Statistics for child work in agriculture follow a similar pattern with 15% of the children who worked on the own household farm during the past seven days. This means that child work takes mostly place in the agricultural sector (81%), like most employment in rural Ghana (Yeboah & Jayne, 2018). When looking at child labour and hazardous child labour, the share of children involved becomes relatively small (9% and 8% respectively). However, this means that halve of the children who work exceed the nationally allowed working hours and/or work in dangerous and unsafe conditions. For none of the children's work statistics we find significant differences across cocoa growing status.

It is difficult to compare our statistics with other studies on Ghana, as they use the GLSS Round 6 conducted in 2012 with a different labor module and analyse the whole population (including all regions and both urban and rural areas). Sadhu et al. (2020), who use their own survey and focus specifically on cocoa producing households and child labour, find for the 5 to 17-year old children from agricultural households in cocoa farming areas in Ghana that 55% was involved in child labour and 51% in hazardous child labour during the 2018/2019 season. While these differences are large compared to our statistics from the GLSS7, they might be explained by differences in survey setting (e.g. responses were provided by the children themselves based on a 12 month recall period) and differences in the population of interest (e.g. the study does not specify the cocoa farming areas). Still, the GLSS7 might not always capture children who work, so we are careful in interpreting our shares in an absolute way.

Table 2. Different specifications of children's work across cocoa and non-cocoa farm-households

	Total (n = 6,518)	Cocoa HH (n = 1,267)	Non-cocoa HH (n = 5,251)	P-value
Child work (%)				
All	18.65	20.99	18.11	0.328
Girls	16.55	17.36	16.37	0.722
Boys	20.63	24.19	19.77	0.266
Age 5-11	9.01	9.33	8.94	0.844
Age 12-17	30.81	35.47	29.72	0.240
Hours in child work (cond.)				
All	16.56	14.34	17.16	0.111
Girls	14.76	12.82	15.22	0.201
Boys	17.92	15.30	18.70	0.113
Age 5-11	14.54	13.13	14.88	0.303
Age 12-17	17.30	14.73	18.02	0.110
Child work in agriculture (%)				
All	15.17	17.64	14.60	0.228
Girls	12.22	14.25	11.77	0.342
Boys	17.96	20.62	17.31	0.331
Age 5-11	7.70	8.41	7.54	0.631
Age 12-17	24.60	29.10	23.53	0.197
Child labour (%)				
All	9.15	9.01	9.18	0.929
Girls	7.69	7.03	7.84	0.672
Boys	10.53	10.75	10.47	0.911
Age 5-11	8.14	9.02	7.93	0.586
Age 12-17	10.42	8.98	10.76	0.559
Hazardous child labour (%)				
All	7.81	7.42	7.90	0.803
Girls	6.28	5.33	6.50	0.519
Boys	9.25	9.26	9.25	0.996
Age 5-11	6.81	7.31	6.69	0.740
Age 12-17	9.07	7.55	9.43	0.525

Statistics are corrected using sampling weights and compared across cocoa production status using t-tests. Significant differences are indicated with *($p < 0.1$), **($p < 0.05$) and ***($p < 0.01$).

Table 3 shows the variables at child, parent, household and community level across children living in cocoa and non-cocoa farm-households. Overall, 85% of the 5 to 17-year old children are enrolled in school, which confirms the large improvements made in terms of primary and secondary schooling in rural Ghana (Janssens, Van den Broeck, Maertens, & Lambrecht, 2019). Children in cocoa households are more likely to be enrolled in school (87%) compared to children in non-cocoa households (85%). They are more likely to have their father present in the household (65% vs 56%), but less likely to live in a household where the father and the mother completed primary education (25% vs 34%; 28% vs 37%). There are no differences in terms of household composition but cocoa households are relatively wealthier (based on the asset index). This is in line with our theoretical framework that cocoa is a cash crop with higher labour productivity. Cocoa households are also more involved in other farm activities: they have more landholdings (7.7 acres vs 4.5 acres) and they are more likely to produce other industrial crops (14% vs 5%) or to own livestock (53% vs 38%). There are no differences in terms of food crop production or ownership of a non-farm enterprise, which is in general relatively common (63% and 44% respectively). Cocoa households live further away from markets (11.3 km vs 7.8 km), but schooling infrastructure at community level is similar. However, their communities are more likely to be visited by agricultural extension officers (71% vs 52%). The questions on child labour were answered by a proxy respondent (usually the father or mother) for 67% of the children in our sample, with no differences across cocoa production status.

Table 3. Control variables across cocoa and non-cocoa farm households

	Total (n = 6,518)	Cocoa HH (n = 1,267)	Non-cocoa HH (n = 5,251)	*P*-value
Girl	0.49	0.47	0.49	0.279
Age	10.77	10.88	10.75	0.433
Currently enrolled in school	0.85	0.87	0.85	0.086*
Father lives in the household	0.58	0.65	0.56	0.000***
Father completed primary	0.32	0.25	0.34	0.000***
Mother lives in the household	0.78	0.79	0.78	0.711
Mother completed primary	0.35	0.28	0.37	0.000***
HH members <5 y (#)	0.74	0.69	0.76	0.281
HH members 5-17 y (#)	2.98	2.89	3.00	0.423
HH members >17 y (#)	2.67	2.74	2.66	0.450
Asset index	−0.19	−0.05	−0.23	0.023**
Landholdings (acres)	5.12	7.70	4.52	0.001***
HH produces ind. crops	0.06	0.14	0.05	0.000***
HH produces food crops	0.63	0.65	0.62	0.538
HH owns livestock	0.41	0.53	0.38	0.003***
HH owns non-farm enterprise	0.44	0.40	0.45	0.223
Distance to nearest market (km)	8.50	11.33	7.84	0.021**
Primary school in community	0.90	0.89	0.91	0.563
Junior High School in community	0.76	0.78	0.75	0.675
Proxy respondent	0.67	0.66	0.68	0.738
Ag. ext. officer in community	0.56	0.71	0.52	0.001***

Statistics are corrected using sampling weights and compared across cocoa production status using t-tests. Significant differences are indicated with *($p < 0.1$), **($p < 0.05$) and ***($p < 0.01$).

5.2. *Effects of cocoa production on children's work*

Table 4 presents the results of the probit models estimating the probability of being involved in child work, child work in agriculture, child labour and hazardous child labour. We only find a significant effect of cocoa production on child work in agriculture, but not for the other specifications of children's work. A child living in a cocoa farm-household has a 4.4 percentage point (pp) higher probability of working on the own farm. Compared to the average probability of child work in agriculture of 15.2%, this corresponds to a relative increase of 28.3%. This is quite substantial and implies that cocoa production does increase the labour done by children on the farm. We do not find a significant effect on child work in general, indicating that this increased labour demand is allocated specifically to farm work. However, we also do not find significant effects on child labour or hazardous child labour, suggesting that the work done by children because of cocoa production does not entail excessively long working hours or harmful conditions. By specifying the work done by children in four different ways, we are able to better capture these nuances that are important to interpret the welfare implications of children's work.

These results are in line with our theoretical framework and corroborate previous studies. On the one hand, cocoa production increases labour demand on the own farm because of its higher returns. Our results suggest that farm-households in Ghana have higher preferences for income than leisure, so the substitution effect prevails. This was also found by Beshir and Maystadt for their study on human capital investments on child development in Ghana (2023). Given that cocoa-households hire in few workers (see Table 1), they probably face difficulties in finding workers and involve their children instead. On the other hand, cocoa production does not expose children to (hazardous) child labour, which can be explained by household preferences or by employment conditions in cocoa supply chains being more closely monitored. By quantifying this effect, our study confirms the qualitative studies by Berlan (2013), Busquet et al. (2021) and Thorsen and Maconachie (2023), who highlight a more nuanced view on the work done by children in cocoa production.

Table 4. Probit estimation results with different specifications of children's work

	Child work	Child work in agriculture	Child labor	Hazardous child labor
Cocoa production	0.023	0.044 ***	0.012	0.008
	(0.017)	(0.015)	(0.012)	(0.011)
Girl	−0.029***	−0.047***	−0.024***	−0.028***
	(0.009)	(0.008)	(0.007)	(0.007)
Age	0.031***	0.023***	0.006***	0.006***
	(0.001)	(0.001)	(0.001)	(0.001)
Currently enrolled in school	−0.036***	−0.009	−0.071***	−0.056***
	0.013	(0.012)	(0.009)	(0.008)
Father lives in the household	−0.046*	−0.033	−0.025	−0.023
	(0.025)	(0.022)	(0.017)	(0.016)
Father completed primary	−0.008	0.005	−0.005	0.001
	(0.019)	(0.018)	(0.013)	(0.012)
Mother lives in the household	0.002	0.011	0.000	0.003
	(0.016)	(0.014)	(0.011)	(0.010)
Mother completed primary	−0.054**	−0.051**	−0.033*	−0.029*
	(0.024)	(0.022)	(0.017)	(0.016)
HH members <5 y (#)	0.016**	0.015**	0.013**	0.009*
	(0.007)	(0.007)	(0.005)	(0.005)
HH members 5-17 y (#)	0.013***	0.012***	0.007***	0.007***
	(0.004)	(0.004)	(0.003)	(0.003)
HH members >17 y (#)	−0.017***	−0.008*	−0.007**	−0.006*
	(0.005)	(0.004)	(0.003)	(0.003)
Asset index	−0.011	−0.024***	−0.007	−0.004
	0.009	(0.008)	(0.006)	(0.006)
Landholdings (acres)	0.000	0.001	0.000	0.000
	0.001	(0.001)	(0.000)	(0.000)
HH produces ind. crops	−0.012	−0.012	−0.003	0.000
	0.022	(0.020)	(0.015)	(0.014)
HH produces food crops	0.078***	0.102***	0.058***	0.060***
	0.014	(0.014)	(0.011)	(0.010)
HH owns livestock	0.063***	0.052***	0.029***	0.029***
	0.014	(0.013)	(0.010)	(0.009)
HH owns non-farm enterprise	0.043***	−0.011	−0.009	−0.009
	0.013	(0.012)	(0.009)	(0.009)
Distance to nearest market (km)	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Primary school in community	−0.033	−0.039*	−0.016	−0.011
	(0.023)	(0.021)	(0.017)	(0.015)
Junior High School in community	−0.011	−0.002	0.006	0.007
	(0.018)	(0.017)	(0.013)	(0.012)
Proxy respondent	−0.047***	−0.047***	−0.023***	−0.017**
	0.012	0.011	(0.009)	(0.008)
Ag. ext. officer in community	0.035***	0.047***	0.024**	0.018**
	0.014	0.013	(0.010)	(0.009)
Number of observations	6518	6518	6518	6518
Pseudo R^2	0.19	0.22	0.17	0.18

Child work is defined as participation in any economic activity, while child work in agriculture is defined as participation in activities on the own household farm. Child labour is defined according to the national legislation, taking into account whether the child exceeds allowable work time while hazardous child labour is defined as any economic activity where the child has been exposed to dangerous or unsafe conditions. Significant average marginal effects are indicated with $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Robust clustered standard errors are presented in parentheses. All models control for month of interview, region and ecological zone.

We conduct several robustness checks to validate the stability of our findings, including an IV regression, a coefficient stability approach and a re-analysis with data from the GLSS6. In all these analyses, we find that cocoa production increases only children's likelihood of working on the own farm but not under the form of child labour. In GLSS6, it even reduces the likelihood of (hazardous) child labour and does not increase farm work. These robustness checks are described in detail in the Supplementary Materials and presented in Tables S1–S7.

5.3. *Heterogeneous effects of cocoa production across gender and age*

The main effects for gender and age are presented in Table 4 while Table 5 presents the summarized results of cocoa production for the split samples. We find that girls have an overall lower probability of working than boys, with a decrease of 2.9 pp for child work, 4.7 pp for child work in agriculture, 2.4 pp for child labour and 2.8 pp for hazardous child labour. This is in line with other studies from Ghana (Abdul-Mumuni et al., 2019; Afriyie, Saeed, & Alhassan, 2019). However, children's work refers to economic activities and does not encompass household chores. As girls contribute more to these types of tasks, their total workload might be higher. We find that the effects of cocoa production are similar for boys and girls. It only increases their work in agriculture (4.8 to 7.5 pp for girls and 4.0 to 9.3 pp for boys, but difference is not statistically significant). This seems to be in contrast to our theoretical framework and other studies that describe a higher demand for boys on cocoa farms (Sadhu et al., 2020). Our finding might be due to the fact that we do not distinguish between cocoa or other farm activities, suggesting that boys are more involved in cocoa related tasks and girls more in other crop related tasks.

Age increases the probability of any type of children's work, whether for girls or for boys. Moreover, the cocoa effects are entirely driven by children aged 12-17. For younger children, cocoa production does not even influence child work in agriculture. For older children, however, cocoa production does increase all forms of the work done by children, including child

Table 5. Summarized results of cocoa production on different types of children's work for different subsamples based on gender and age

Subsample	Child work	Child work in agriculture	Child labor	Hazardous child labor
Panel A: Results from probit models				
Girls	0.016	0.048***	0.002	−0.002
	(0.021)	(0.018)	(0.015)	(0.013)
Boys	0.030	0.040**	0.017	0.015
	(0.021)	(0.020)	(0.016)	(0.015)
5-11 years	−0.005	0.005	−0.002	−0.008
	(0.016)	(0.015)	(0.015)	(0.013)
12-17 years	0.067**	0.099***	0.025*	0.025*
	(0.026)	(0.024)	(0.015)	(0.014)
Panel B: Results from IV models				
Girls	0.008	0.075*	0.018	0.009
	(0.046)	(0.043)	(0.026)	(0.022)
Boys	0.061	0.093*	0.030	0.024
	(0.051)	(0.048)	(0.035)	(0.033)
5-11 years	−0.024	−0.005	−0.011	−0.017
	(0.031)	(0.030)	(0.030)	(0.027)
12-17 years	0.108*	0.195***	0.069**	0.064**
	(0.065)	(0.060)	(0.032)	(0.031)

Significant coefficients are indicated with $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Robust clustered standard errors are presented in parentheses. Estimation results are summarized results from probit models and IV model with share of cocoa farmers in community as instrument. The full models are presented in Tables S8–S15.

work in general (6.7 to 10.8 pp increase) child work in agriculture (9.9 to 19.5 pp increase), child labour (2.5 to 6.9 pp increase) and hazardous child labour (2.5 to 6.4 pp increase). This is in line with the cultural norms explained in our theoretical framework, with older children being more expected to help their families. Yet, it also calls for more attention to ensure that the working conditions of older children are better respected.

5.4. Other factors related to children's work

Table 4 presents other factors related to children's work as well. First, when comparing our effects of cocoa production to other livelihood activities, we find that these are often much more strongly correlated with children's work than cocoa production. This holds especially for food crop production and livestock ownership, as the effects for child work in agriculture are higher compared to cocoa production (an increase of 10.2 pp and 5.2 pp respectively), and the effects for the other specifications of children's work, including child labour and hazardous child labour, become significant. These findings highlight that children are more likely to work under harmful conditions because of activities for own household consumption or for the domestic market than because of cocoa production. It implies that when child labour is banned in cocoa production, it might be reallocated to these activities. Our results are in line with other studies that document better employment conditions in global supply chains (i.e. export-oriented activities) than in local supply chains (i.e. domestic-oriented activities), due to more monitoring and/or higher returns (e.g. Fabry, Van den Broeck, & Maertens, 2022; Suzuki, Mano, & Abebe, 2018). On the other hand, the production of industrial crops is never significant in our models. This suggests that cocoa production is more associated with work done by children compared to these other crops, which might be due to differences in supply chain factors.

Second, we discuss the other characteristics at child, parental, household and community level. Current enrolment in school is negatively associated with child work in general and (hazardous) child labour, but not significantly with child work in agriculture. This might be because school enrolment and farm work can be compatible, as the school holidays largely coincide with the peak moments in cocoa production. Of the parental characteristics, only the education level of the mother is significant. Having a mother who completed at least primary education reduces the probability of child work with 5.4 pp, child work in agriculture with 5.1 pp, child labour with 3.3 pp and hazardous child labour with 2.9 pp. This is consistent with other studies from Ghana who show that educated mothers have different preferences for child wellbeing (Abdul-Mumuni et al., 2019; Janssens et al., 2019). Also, their increased access to the labour market probably reduces their reliance on children's income. In line with economic farm-household models, having (young) siblings increases the likelihood of children's work, while more adults in the household reduce this. We also find that the higher the living standards (as proxied by the asset index), the lower the likelihood of child work in agriculture, but this effect is insignificant for child labour. Landholdings do not have a significant effect on any type of children's work, which might be explained by opposite income and substitution effects, as shown by Bhalotra and Heady (2003) and Basu et al. (2010). None of the community characteristics are significant, except for the presence of agricultural extension officers, which is positively associated with all types of children's work. This might indicate that officers are more likely to visit communities where a lot of work happens, including the work done by children. Having a proxy respondent decreases the likelihood of reporting child work with 4.7 pp. This is in line with the study by Dammert and Galdo (2013), although they find a larger difference of 17.1 pp for Peru in 2007.

6. Conclusions

Using data from the GLSS7 from Ghana, we investigate whether cocoa production is a main driver of children's work. We find that cocoa production increases the probability of working

on the own farm with 4.4 to 8.7 pp, corresponding to a relative increase of 28.3% to 46.5%. An important nuance is that it does not increase the probability of surpassing allowable working hours or working under unsafe, harmful conditions. The effects are similar for boys and girls, but are much larger for older children (12 to 17) than for young children (aged 5 to 11). Moreover, other farm-household activities, especially food crop production and livestock ownership, are much more strongly associated with children's work, often under more harmful conditions.

Our findings call for more nuanced statements in the debate of child labour and cocoa. On the one hand, we find that cocoa production is not a main driver of child labour in Ghana. Solely targeting child labour in the cocoa sector might therefore not be the most effective way without running the risk that child labour is transposed to other activities, such as food crop production or livestock rearing. It also begs the question whether consumers in high-income countries care about child labour in general, or whether they only care about child labour taking place in the production of food they consume. This implies that regulations that seek to eliminate child labour in supply chains, such as the EU CSDD directive, should not only focus on simply prohibition but also on overall livelihood supporting measures. On the other hand, it is important to acknowledge the different forms children's work can take, which are not all considered as harmful. Regulations on employment in general and child labour in particular are often regarded from a Western perspective. Producing countries and farm-households should have a say as well in legislation and public-private initiatives to ensure a more effective improvement of working conditions for children.

Our findings are based on Ghana, but may have external validity for other cocoa producing countries, especially in Africa. The overall effect in other contexts will depend on how households will change labor when returns increase, how well (rural) labour markets function, how employment conditions are monitored in supply chains, and how children's work is perceived through different cultural norms. Furthermore, our study entails some limitations and scope for future research. First, we rely on self-reported data on children's work. While we address different sources of measurement error as best as possible, we cannot rule out that the reported data do not reflect reality. Particularly differences between certified and non-certified cocoa growers in exposure to sustainability initiatives might lead to social desirability bias (Jouvin, 2023), but the GLSS7 does not contain information about certification. Real-life monitoring might be more accurate but is not deemed to be feasible given the national scope of the GLSS. Overall, the quality of monitoring, especially in sustainability initiatives, leaves room for improvement (Meemken, Sellare, Kouame, & Qaim, 2019). Second, the GLSS does not contain detailed data on labour in agricultural production, so we cannot link children's work directly to cocoa production. Other types of surveys, such as the Living Standard Measurement Surveys – Integrated Surveys on Agriculture (LSMS-ISA), include more details. It would be interesting to use these surveys to collect more evidence on intra-household (farm) labour allocation, thereby not only distinguishing between men and women, but also between children and adults. Third, we specify cocoa production as a simple, binary variable. Given the variety of farming practices and supply chain factors in cocoa (Ingram, Van Rijn, Waarts, & Gilhuis, 2018; Parra-Paitan et al., 2023; Renier et al., 2023; Tennhardt, Lazzarini, Weisshaidinger, & Schader, 2022), further research might explore how these influence children's work. For example, specialized surveys may look into the effects of certification and other sustainability initiatives to reduce child labour, which is out of scope for this paper given the data limitations of the GLSS on this topic.

Notes

1. These numbers cannot be added up to derive the total share of certified area, as some farms are multiple certified.
2. As one of our robustness checks, we re-run our analysis with data from the GLSS6, which was conducted from October 2012 to October 2013. This is explained in detail in the Supplementary Materials.

3. To be retrieved from https://www2.statsghana.gov.gh/nada/index.php/catalog/97/study-description.
4. We also tested other specifications, such as cocoa area and its square, but we did not derive additional insights.
5. Presence of father has the highest VIF, which is 6.11.

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