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RISK PREFERENCE AND CHILD LABOUR: ECONOMETRIC EVIDENCE*

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ABSTRACT

The literature suggests that the household invests in the human capital of a child member not only for altruistic reasons but also as insurance against future income shocks. Hence, the allocation of the child's time between school and work is a function of the risk preference of the household head. This paper estimates the effect of parental risk preference on child labour decisions in the household using recall information on child labour and a risk elicitation question. We address endogeneity issues by applying an instrumental variable estimation technique. We find that risk-averse households are more likely to send their children to work. Further analyses suggest that such outcomes are driven by the need to maximise the household's expected income from the child. Evidence from instrumental variable regressions indicates that the relationship between risk aversion and child labour is causal and that risk aversion induces higher probabilities of children working.

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INTRODUCTION

The literature suggests that heads of households invest in options that increase the human capital of their children, such as education. Therefore, because child labour negatively affects educational attainment (Admassie, 2003; Heady, 2000; Putnick & Bornstein, 2015), we expect the household's overall utility to diminish as a result of child work (Basu & Van, 1998). Hence, a fully altruistic household head who is interested in his or her child's well-being will invest all available resources in the child's schooling and leisure.

However, some households may invest in their children not only for altruistic reasons but also as a means of insurance against future income shocks (Lillard & Willis, 1997; Mu & Du, 2015; Strobl, 2017; Willis, 1980). Poor households may depend directly on income from child labour and are known to expect remittance from their adult children (Lillard & Willis, 1997). Therefore, the decision to send a child to school involves, on one hand, opportunity costs in the form of lost income from child labour, and on the other hand, the potential higher future income in transfers from the educated adult child.[1] However, because the child's abilities and motivation to succeed academically and the returns to human capital are uncertain (Tabetando, 2019), investment in the child's education is, therefore, a risky venture for households in developing countries. Hence, the optimal allocations of a child's labour supply and schooling might be affected by the risk attitudes of the head (or heads) of the household.

Despite the potential impact of the parent's risk preference on child labour decisions, the literature has only considered this relationship indirectly. Studies that relate risk preference to

[1] In a two-period scenario without uncertainties with a guaranteed child-to-parent transfer, it is optimal for the household to invest all of the child's time and all available resources in the child's human capital development in the first period.

human capital investment have examined schooling and enrolment-related variables (Belzil & Leonardi, 2013; Checchi, Fiori, & Leonardi, 2014; Mukherjee & Pal, 2016; Tabetando, 2019; Wölfel & Heineck, 2012). However, the findings of these studies may not necessarily explain child work, especially in contemporary developing countries, where various policies have considerably increased school enrolment in recent decades (UNESCO, 2016), while child labour is still prevalent. The contribution of this paper is to directly examine the effect of household risk preference on child labour.

We examine data from the seventh round of the Ghana Living Standards Survey. After controlling for confounding variables and the possible endogeneity between risk aversion and child labour through instrumental variables, our results show that children who live in households that are headed by a risk-averse person are more likely to engage in child labour. We identify the causal effects in two steps. First, we define the child labour variable such that the household's decision is reduced to choosing between human capital enhancing activities (e.g., schooling, apprenticeships or volunteer work) and economic activities (i.e., child labour), that is, work that generates marketable output. As our second step, we adopt the instrumental variable (IV) strategy to account for potential endogeneity issues. In particular, we use the household head's concern for privacy as an instrument for risk preference, because an individual's concern for privacy is correlated with risk preference and has been argued to satisfy the exclusion restriction. The IV estimates show that the probability of child labour is higher for households headed by risk-averse individuals. Moreover, we explore heterogeneous effects and provide evidence that the effect of risk aversion on child labour is higher for older children and enrolled children who are too old for their class.

The remainder of this paper proceeds as follows: Section 2 provides an overview of the literature. Our methodology and its validity are discussed in Section 3, along with the data. We present results and robustness tests in Section 4. Section 5 offers concluding remarks.

LITERATURE REVIEW

The existing literature related to the focus of this research mainly concentrates on the link between income, poverty and related economic variables with child labour (Bandara, Dehejia, & Lavie-Rouse, 2015; Basu & Van, 1998; Dayioğlu, 2006; Duryea, Lam, & Levison, 2007; Frempong & Stadelmann, 2019). The role of behavioural factors, including culture and norms, on the prevalence of child labour, has been explored as well (Delap, 2001; Morrow & Boyden, 2010). However, the effect of diverse household preference parameters remains underexplored in the empirical literature. This paper contributes to this knowledge gap by studying the impact of household risk preference on child labour.

Theoretical contributions help to elucidate the relationship between risk preference, human capital investment and child labour. The *old-age-security* hypothesis suggests that in developing countries, households may invest in children (quantity and quality) to level consumption over time (Lillard & Willis, 1997; Willis, 1980). This is done with the anticipation that middle-aged and working children will remit transfers to elderly members of the household. One perspective is that since adult members want to maintain their level of consumption when their incomes decrease in their old age, the lack of insurance and pension markets may increase the demand for human capital investment and, as a consequence, reduce child labour (Lillard & Willis, 1997; Sovero, 2018). Another strand of the literature suggests that to the extent that access to credit helps households to mitigate the effect of adverse economic shock, financial market development should decrease the incidence of child labour (Dehejia & Gatti, 2005). The *repayment* hypothesis explains another motivation for households to invest in the child's human capital instead of in child labour. This hypothesis assumes a family capital market, where the household provides the child with grants and loans as an investment in the child's human capital, and the child is expected to repay those investments in the future (Lillard & Willis, 1997). In such models, we expect investment in human capital

to increase if the probability of repayment is high. However, like other investment portfolios, human capital investments are not risk-free. Apart from unforeseen events, like death and unemployment, the child may be disloyal to the family and fail to repay the loan. Rogers and Swinnerton's (2004) theoretical contribution predicts that transfers from the child to the parent decreases when the parent's income is high. In Ghana, researchers Ahiakpor and Swaray (2015) found, among other factors, that expected remittances from the child and the parent's discount rate affects the household's investment in education.

Baland and Robinson (2000) showed, theoretically, that even when parents are altruistic, child labour rates could still be inefficiently high when there is no parent-to-child-bequest and capital markets are imperfect. They explained that this occurs because parents are not fully able to internalise the negative effect of child labour (Baland & Robinson, 2000; Dessy & Pallage, 2005). Pouliot (2006) expanded on Baland and Robinson's (2000) model to show that when the return to human capital is associated with high uncertainties, child labour rates will be high. This result holds, even when there are no credit constraints on the household (Pouliot, 2006). Empirical work on the link between parental expectations and child labour confirms this theoretical position (Ahiakpor & Swaray, 2015; Mukherjee & Pal, 2016). Thus, uncertainties about returns to human capital may reduce investment in schooling and increase the supply of child labour. Such uncertainties are influenced by general economic conditions, individually known characteristics and evaluations of the likelihood of the household being affected by such circumstances. For instance, in a high unemployment scenario, an altruistic but risk-averse household, in equilibrium, may choose a positive amount of child labour to maximise the expected returns on investment in the child.

Empirically, several studies have examined the link between household risk preference and human capital investment. The focus of these studies has mainly been on education, especially school enrolment at the primary and secondary school level. In general, the findings point to a

negative relationship between parental risk aversion and children's educational outcomes at different levels (Belzil & Leonardi, 2013; Checchi et al., 2014; Wölfel & Heineck, 2012). Checchi et al. (2014) interpreted their results as a reaction of risk-averse parents to the uncertainties of their children's prospects when they do not fully recognise the children's abilities. We take a different view of the nexus. We argue that as strong as the relationship between education and child labour appears, one cannot extend the findings from these studies to child labour for apparent reasons: child labour literature suggests that children from poor households in developing countries combine school and work (Dessy & Pallage, 2005; USDOL, 2019). This observation has usually attributed the need for additional income to the cost of living and cost of schooling (Dessy & Pallage, 2005). Even though governments in some developing countries have adopted policies to increase school enrolment rates, child labour remains predominant in some of these countries.[2] Thus, school enrolment is not systematically negatively correlated with child labour. However, in order to understand the causes of child labour in developing countries, child labour needs to serve directly rather than indirectly as the variable to be explained. We contribute to the literature by studying the role of risk preferences in the context of Ghana, a country that has followed a free and compulsory basic education policy since 1995. Our paper contributes to understanding the persistence of child labour in developing countries. The study also provides insights into how risk preferences of the household translate the economic environment to child labour.

[2] For example, over 90% of the children in our sample are in school, while 16% engage in child labour.

DATA AND METHODOLOGY

Data and country context

For our research analysis, we used individual and household-level data from the seventh round of the Ghana Living Standards Survey (GLSS-7), which was administered by the Ghana Statistical Service in 2016 and 2017. There is a high child labour prevalence in Ghana due to unfavourable economic circumstances, like poverty and rudimentary agriculture. The child labour rate in the country is about 25%, according to the United States Department of Labor (USDOL, 2019). Generally, child labourers in Ghana work in the agriculture and fishing industries, especially in the rural areas, where these activities are the primary sources of livelihood for the people. However, about 92% of children in Ghana attend school, and the primary completion rate is about 94% (USDOL, 2019). Schooling, especially at the primary level, has remained highly subsidised since 1995, but public schools sometimes lack the necessary teaching materials to produce skilled graduates (Alagidede, Baah-Boateng, & Nketiah, 2013).

The Ghanaian economy is characterised by a large informal sector, undeveloped credit and insurance markets with high interest rates. Given these characteristics, many poor households in the country depend on earnings from child labour to supplement their incomes (Hilson, 2010; Koomson & Asongu, 2016). The reliance on child labour income increases the opportunity cost of schooling and human capital development. High unemployment rates in the formal sector exacerbate this condition and reduce the household's expected return on education. As argued by Emerson and Knabb (2013), parents rely on beliefs, expectations and their human capital to balance their allocation of schooling and working time for the child. We expect that, given imperfect foresight and the household's inability to fully internalise the full negative effect of work on the child's human capital development, a risk-averse household would increase its supply of child labour under these adverse economic circumstances.

Variables and empirical strategy

Child labour

A child labourer in this study is a youth between the ages of 5 and 15 who engaged in economic activity in the seven days before the household's completion of the survey. Because we are interested in studying a household's willingness to forego income from child labour, we defined economic activity as any work for which the end product is mainly or partly for barter or sale, and we excluded all work that is solely for the household's consumption.[3] This definition may understate the extent to which child labour occurs in the country: for example, it does not account for children who work on home chores so that adult members can supply their labour in the market. However, this definition makes the process of drawing inferences on the motivations for risk-averse parents' behaviours regarding child labour supply more straightforward.[4] We inferred whether risk-averse households prefer a guaranteed current income to an uncertain future income from the child. In the regression models, we measured the variable "childlabour," which is equal to one if the child engaged in economic activity.

Risk preferences

To measure the risk preferences of the household, we relied on an experimental question in the survey that elicited the investment choice of the respondents in the GLSS-7 data set. The question asks:

Suppose you want to invest some money. Which of the following options do you prefer?

- *Option 1:* Invest in a business where I can't lose money but profits are low.

[3] Our baseline results, contained in Table S3, remain relatively the same when we include all forms of work.
[4] The literature and international conventions do not provide clear suggestions on how to treat non-commercial activities, like household chores and family farm support, so our definition avoids this conventional difference.

- *Option 2:* Invest in a business where there is a small chance I can lose money but profits are potentially high.

The risk preference variable is then an indicator variable, where one indicates the individual chose Option 1, and zero indicates the individual chose Option 2. Those who chose Option 1 (low risk and low profits) are considered risk-averse.

It is noteworthy that as is typical in such surveys, these hypothetical business ventures do not present any real benefit or loss to the respondent (Sovero, 2018); hence, the response may not capture the respondent's actual risk preference. However, studies that have examined the relationship between self-reported and actual risk preferences have found strong correlations and consistency between the two measurements (Binswanger, 1981; Dasgupta, Mani, Sharma, & Singhal, 2019). We also addressed this potential measurement error problem by re-estimating the models using the IV method.

Empirical strategy

We estimated the regression model in equation (1):

$$Childlabour_i = \alpha + \beta Risk_i + \boldsymbol{CHILD_i'\gamma} + \boldsymbol{HH_i'\theta} + \boldsymbol{REG_i'\omega} + \boldsymbol{TIME_i'\phi} + \epsilon_i \qquad (1)$$

where child labour, $Childlabour$, is regressed on the household head's risk preference, $Risk$, child-level control variables, $\boldsymbol{CHILD}$, a vector of household-level control variables, $\boldsymbol{HH}$, and a set of geographic and temporal fixed effects, $\boldsymbol{REG}$ and $\boldsymbol{TIME}$.

The vector $\boldsymbol{CHILD}$ contains the age and gender of the child, whether the child is in school and the child's health status. The household-level variables in $\boldsymbol{HH}$ are the age and gender of the household head, household size, per capita real total household expenditures, education status of the head, ownership of a business enterprise, health and employment status of the head, and whether the household took a loan and for what purpose. $\boldsymbol{REG}$ contains dummies for the region

of residence. Finally, we controlled for the month and year of the interview in the $\boldsymbol{TIME}$ vector. We estimated a linear probability model for equation (1).[5]

A common concern in studies of this nature is the extent to which the coefficient of interest, β, in equation (1) represents the causal effect of risk preference on child labour. One threat to identification, as we have already noted, is that answers to a hypothetical question of the form we use here could induce measurement error. Omitted variable bias or (less likely) reverse causality could also be relevant.

Therefore, we employed the IV technique as our identification strategy by exploiting an individual's regard for privacy as an instrument for his or her risk preference. The specific measurement instrument relates to the extent to which a person is willing to reveal his or her date of birth. While potentially surprising as an instrument (as many instruments are), such a choice follows Bonazzi and Grèzes (2018), who referred to a person who has a high level of concern about privacy and personal information disclosure as risk-averse. Similarly, Frik and Gaudeul (2018) found a correlation between disclosure of private information and financial risk aversion. A person who is less willing to reveal his or her date of birth is considered to be more risk-averse. Indeed, econometric tests show that disclosing the date of birth explains stated risk preferences. For the exclusion restriction to hold, a person's willingness to disclose his or her date of birth must not have any direct or another indirect effect on child labour, apart from its effect on risk preferences, i.e., the instrument must not be correlated with the error term.

[5] A logit or a probit estimation of equation (1) yields similar results.

We re-estimated equation (1) in two stages. In the first stage, we regressed risk preference on regard for privacy, $datebirth$, in equation (2), and all the other control variables in equation (1).

$$Risk = \sigma + \eta datebirth_i + \boldsymbol{CHILD_i'\rho} + \boldsymbol{HH_i'\pi} + \boldsymbol{REG_i'\lambda} + \boldsymbol{TIME_i'\varphi} + \xi_i \quad (2)$$

In the second stage, we estimated a linear probability model, equation (3), of the child labour participation equation as a function of the prediction of $Risk$, i.e., $\widehat{Risk}$ from equation (2) and the remaining control variables in equation (1).

$$Childlabour_i = \phi + \widehat{\Pi Risk}_i + \boldsymbol{child_i'\Sigma} + \boldsymbol{HH_i'\Delta} + \boldsymbol{REG_i'\Gamma} + \boldsymbol{Time_i'\Omega} + \varsigma_i \quad (3)$$

Descriptive statistics

Table 1 contains summary statistics of the main control variables in our regression models. Child labour seems more prevalent among male children than female children in Ghana. While 13.3% of female children from our sample engaged in child labour, the corresponding figure for males was about 15.5%. Children in school were less engaged in child labour (14.4%) in comparison with those who were not in school (20.0%). However, the enrolment rate was about 98.8% in the sample.

Table 1: Summary Statistics of Main Variables

Variable	Not working N = 1,084	Working N = 6,422	Full sample N = 7,506
Child's gender (%)			
Female child	86.67	13.33	49.08
Male child	84.48	15.52	50.92
The child is in school (%)			
No	80.00	20.00	1.20
Yes	85.63	14.37	98.80
The child was ill (%)			
Not ill	85.48	14.52	89.49
Ill	86.19	13.81	10.51
Employment status of household head (%)			
Not working	95.64	4.36	17.71
Working	83.39	16.61	82.29
Household owns an enterprise (%)			

No	86.20	13.80	51.56
Yes	84.87	15.13	48.44
Gender of household head (%)			
Female	87.00	13.00	39.98
Male	84.59	15.41	60.02
Education status of household head (%)			
Not educated	83.04	16.96	36.52
Educated	87.01	12.99	63.48
Health status of household head (%)			
Not ill	85.90	14.10	80.40
Ill	84.16	15.84	19.60
Loan status/purpose (%)			
No loan	85.95	14.05	89.49
Personal loan	86.08	13.92	4.12
Investment loan	79.79	20.21	6.39
Region (%)			
Urban	93.03	6.97	33.65
Rural coastal	82.45	17.55	9.03
Rural forest	86.08	13.92	23.17
Rural savannah	78.66	21.34	34.15
Age of household head (years)	46.80	48.58	47.06
Age of the child (years)	9.65	11.71	9.94
Household size (persons)	6.10	6.64	6.18
Per adult equivalent total expenditure (GH☐)	3,138.21	2,377.39	3,028.33
Per adult equivalent total expenditure (log units s)	7.74	7.49	7.70

Source: Computed from GLSS 7 data

Contrary to the notion that female-headed households are poorer and, hence, have a higher incidence of child labour, according to the data, the rate of child labour was higher in male-headed households (15.41%) than in female-headed households (14.1%), as indicated in Table 1. In addition, the education status of the household head may affect child labour. As depicted in Table 1, about 17% of children who live with uneducated household heads work, compared to 13% of those living with educated heads. As revealed in the survey data, the respondents who took out loans did so for different purposes, and this could affect child labour. As shown in Table 1, *the rate of child labour was higher when the household head had taken out an investment loan*. The table further indicates that child labour is more prevalent in rural coastal and rural savannah areas, followed by forest areas. The data show a positive relationship

between child labour poverty. The average size of the households in our sample was about six people, and they lived on an average of GH₵3,028 per annum.

Figure 1 reports the distribution of risk preferences in Panel 1 and the distribution of child labour over the two risk types in Panel 2. About 83.7% of the children live in households where the head preferred the safer business option, while 16.3% of them are in households whose head instead preferred to invest in business option 2, which had some level of risk but a higher profit potential. The rate of child labour among the risk-averse group was 15.6%, which is over 7% higher than the rate for the risk-taker group. A chi-square test of significance showed that the difference between child labour participation rates between the two groups of risk preferences was statistically significant (p = .000). The figure, therefore, suggests a positive relationship between parental risk preference and child labour.

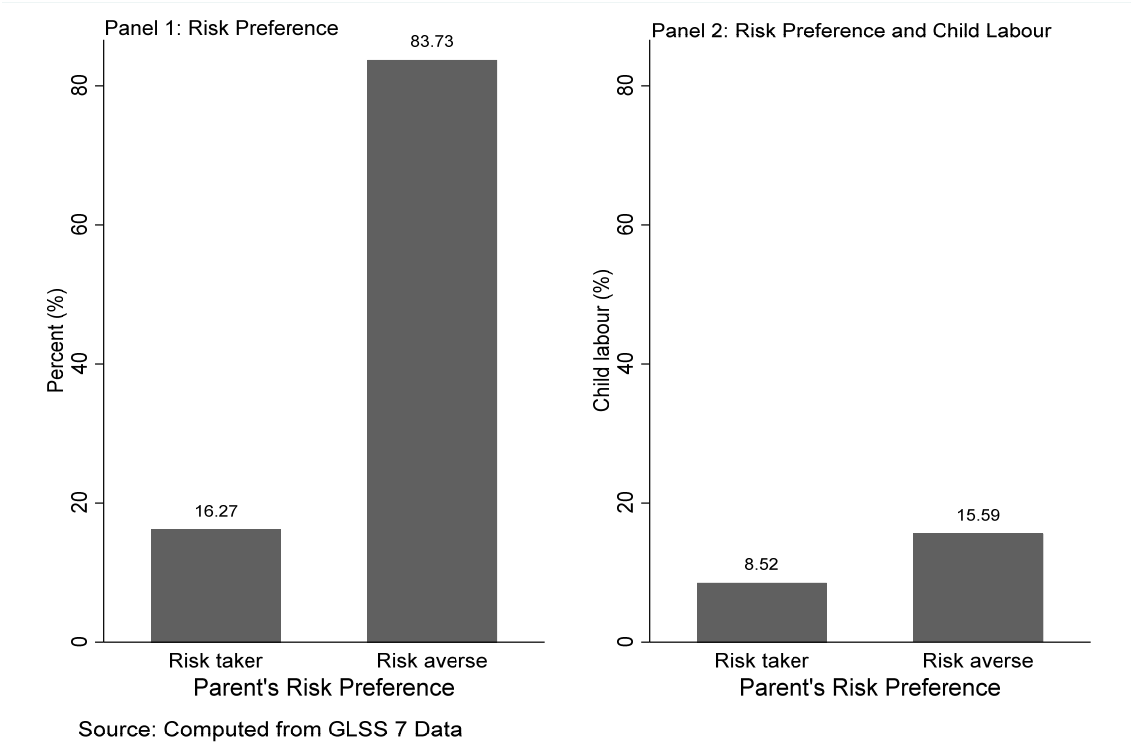

Figure 1: Relationship Between Parent Risk Preference and Child Labour

Validity test of the risk preference variable

The validity of our results relies on the extent to which the risk preference variable captures actual risk behaviour. Economic theory suggests that risk-averse individuals may demand insurance against uncertainties**.** We can directly check the prediction in the data set because we have information on the household's aggregate expenditure on insurance, including housing and health. We conducted this test in a regression framework, where the head's risk preference explains the demand for insurance and the logarithm for the insurance expenditure. Table S1 in the Supporting Information contains the result of the regression test. We estimated a positive and significant effect of risk preference on household insurance demand. Both ordinary least square (OLS) and IV estimates showed that households headed by risk-averse individuals tended to spend more on insurance. The insurance expenditure was about 1.3 log points higher in households where the head chose to invest in Option 1, compared to those where the head chose Option 2. The probability of holding an insurance policy was also higher, by about 38%, when the head was risk-averse.

RESULTS

The relationship between risk aversion and child labour

Table 2, column (1) presents a simple model in which risk preference, month, region and year fixed effects are the only explanatory variables. In column (2), the age of the child, gender, enrolment and health status are the additional explanatory variables. The literature suggests one's wealth and income determine his or her willingness to engage in risky ventures (Barsky, Juster, Kimball, & Shapiro, 1997; Hopland, Matsen, & Strøm, 2016). Income is also a significant determinant of child labour (Basu & Van, 1998; Rogers & Swinnerton, 2004); therefore, in column (3), we included the logarithm for household expenditures as an explanatory variable to control for the wealth effect. Column (4) controls for ownership of an enterprise and access to credit. Finally, column (5) presents a full model with all control

variables. Through all specifications, the relationship between risk aversion and child labour was statistically significant and positive, and the magnitude suggests that less risk aversion is associated with about a five percentage point lower probability of child labour.

Table 2: The Relationship Between Risk Aversion and Child Labour

	(1) Child worked	(2) Child worked	(3) Child worked	(4) Child worked	(5) Child worked
Risk aversion	0.055***	0.056***	0.055***	0.050***	0.050***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Child characteristics	No	Yes	Yes	Yes	Yes
Household expenditures	No	No	Yes	Yes	Yes
Other household economic variables	No	No	No	Yes	Yes
Household demographic variables	No	No	No	No	Yes
Region and time fixed effects	Yes	Yes	Yes	Yes	Yes
N	7506	7506	7506	7506	7506
R^2	0.052	0.104	0.104	0.121	0.123

Notes: Linear probability models are estimated. Standard errors in parentheses are clustered at the enumeration area. * $p < .1$, ** $p < .05$, *** $p < .01$. Child characteristics: age of the child, enrolment status, gender, illness. Other household economic variables: credit, own enterprise. Household demographic variables: age and gender of household head; health, education and employment status of household head; household size. Region and time fixed effects: region dummies, month dummies, year dummies.

In addition to the effect of risk aversion, we point out the following six results for the covariates (results not shown): (1) Expenditure has a negative and significant correlation with child labour, i.e., children from wealthy homes tend to work less.[6] (2) Households that have taken loans for investment (asset acquisition, farming or enterprise) are more likely to have their children work. (3) Child labour rates tend to be higher when the household head is unemployed. (4) Children in urban areas engage in child labour less often than rural children. (5) Older children are more likely to work than younger children. (6) Despite the appearance that child

[6] This lends support to Basu and Van's (1998) luxury axiom.

labour is more prevalent among males than females in Ghana, the regression does not produce a significant difference.

Accounting for children's risk preferences

A child's risk preference may correlate with both child labour rates and the risk preference of the parent (Checchi et al., 2014). The risk behaviour variable is available for all individuals who are 12 years or older in our data set, which permits controlling for the child's risk preference for children within this age group. In Table S2 in the Supporting Information, we present the results for this limited sample. The table does not show any significant effect of the children's risk preferences on their probability of work. The effect of risk aversion of parents remains statistically significant and positive in this sample, which supports our findings in Table 2. This further affirms the notion that child labour is mainly an adult decision in developing countries.

Heterogeneous links between risk aversion and child labour

The main results presented in Table 2 and Table S2 show that the household head's risk preference has a significant association with child labour. However, the data do not suggest reasons that parents demonstrate this behaviour. To explore potential mechanisms and heterogeneous links between risk aversion and child labour, we introduced interaction effects in Table 3.

Table 3: Mechanisms and Heterogeneity of the Relationship Between Risk Aversion and Child Labour

	(1) Child worked	(2) Child worked	(3) Child worked	(4) Child worked
Risk averse	-0.062**	0.039***	0.088	0.026**
	(0.031)	(0.014)	(0.054)	(0.013)
Age of the child	0.014***	0.023***	0.023***	0.021***
	(0.003)	(0.002)	(0.002)	(0.002)
Male child	0.010	-0.009	0.010	0.008
	(0.009)	(0.012)	(0.009)	(0.009)
Child is enrolled in school	0.000	0.007	0.034	

	(0.047)	(0.048)	(0.052)	
Difference between age and grade age				-0.006
				(0.007)
Risk aversion#Age of the child	0.011***			
	(0.004)			
Risk aversion#Male child		0.023		
		(0.016)		
Risk aversion#Child is enrolled in school			-0.038	
			(0.055)	
Risk aversion#Difference between age and grade age				0.019**
				(0.008)
Constant	-0.034	-0.123	-0.158	-0.129
	(0.118)	(0.115)	(0.115)	(0.100)
N	7506	7506	7506	7416
R^2	0.125	0.123	0.123	0.125

Notes: Linear probability models are estimated. Standard errors in parentheses are clustered at the enumeration area. * $p < .1$, ** $p < .05$, *** $p < .01$. Child characteristics: age of the child, enrolment status, gender, illness. Other household economic variables: credit, own enterprise. Household demographic variables: age and gender of household head; health, education and employment status of household head; household size. Region and time fixed effects: region dummies, month dummies, year dummies.

Older children are more productive than younger children. We would, therefore, expect the effect of risk preference on child labour to be higher among older children if the household is interested in maximising income. Column (1) of Table 3 presents the full model with the interaction term of risk preference and the child's age as an additional explanatory variable. We found that higher age increased the effect of risk preference on child labour by a statistically significant 1.1%. Note that the baseline effect becomes negative, as it stands for the effect of risk aversion for children of zero years. Once children are older than eight years, the baseline effect of -6.2% plus the interaction effect of (1.1*6=) 6.6% yields a positive total effect, which increases with age.

Although we do not estimated a significant difference in child labour supply between male and females, the literature shows that male may work more outside homes (CITE). , we expected the effect of risk aversion on child labour to be higher among male children if the household

was maximising income. However, the results in column (2) do not show any significant difference in the effect of risk preference on child labour among female and male children.

Educational success affects future earnings. Thus, the effect of risk aversion on child labour should be lower if the child is already in school and performs well academically. Column (3) indicates that the relationship between parental risk aversion and child labour is not statistically different between children who are in school and their cohorts who are not in school. In the absence of a direct measure of school performance, such as a test score, we measured performance as the difference between the child's age and the expected age of his or her grade.[7] It was expected children who are too old for their class are more likely to engage in child labour if the household aims to maximise total income from the child. Column (4) shows that the interaction of the age difference and the household head's risk aversion produced a positive and significant effect on child labour. Thus, the results in columns (3) and (4) suggest that the relationship between risk aversion and child labour is more relevant for less academically endowed children.

Causal evidence of an effect of risk aversion on child labour (IV evidence)

We re-estimated the main models in Table 2 using the IV estimation technique to deal with the potential endogeneity bias. Results are presented in Table 4. Our first stage results show a statistically significant and negative effect of date of birth disclosure on risk aversion, an indication that the instrument variable satisfies the relevance requirement. The F-statistic of the weak identification test also suggests a strong correlation between the instrument and the risk preference.

[7] Children who are too old for their grade may have repeated at least a class and are, therefore, less academically endowed.

Throughout all specifications, we found a statistically significant and positive effect of risk aversion on child labour. The results for the full model in column (5) means that the probability of child labour was about 25.6% higher when the household head was considered risk averse because he or she did not indicate a date of birth. We observed that the coefficient of risk preference in Table 4 is, by order of magnitude, larger than what is contained in Table 2. This points to a measurement bias and/or omitted variables bias, which induced the earlier estimates to be biased downwards. The magnitude of the coefficient further shows that the effect of household risk preference on child labour is both statistically and economically relevant.

Table 4: The Causal Effect of Risk Aversion and Child Labour (IV evidence)

	(1) Child worked	(2) Child worked	(3) Child worked	(4) Child worked	(5) Child worked
Risk aversion	0.267*	0.258*	0.256*	0.235*	0.256*
	(0.137)	(0.136)	(0.143)	(0.139)	(0.150)
Child characteristics	No	Yes	Yes	Yes	Yes
Household expenditures	No	No	Yes	Yes	Yes
Other household economic variables	No	No	No	Yes	Yes
Household demographic variables	No	No	No	No	Yes
Region and time fixed effects	Yes	Yes	Yes	Yes	Yes
N	7,506	7,506	7,506	7,506	7,506
Wald F-statistic	12.575	12.640	11.433	11.766	10.849
Under identification (LM statistic)	11.516	11.587	10.539	10.851	10.097
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]

Notes: Linear probability models are estimated. Standard errors in parentheses are clustered at the enumeration area. * $p < .1$, ** $p < .05$, *** $p < .01$. [#] denotes *p*-value of the test statistic. Child characteristics: age of the child, enrolment status, gender, illness. Other household economic variables: credit, own enterprise. Household demographic variables: age and gender of household head; health, education and employment status of household head; household size. Region and time fixed effects: region dummies, month dummies, year dummies.

CONCLUSION

The economic literature indicates that income constraints on households and adverse economic shocks increase the probability of child labour. Moreover, the literature suggests parental risk preference is linked to education decisions. In developing countries, children often participate in both school and work. Hence, behavioural characteristics could have an independent effect on child labour, aside from the indirect impact through education and school enrolment.

We offer an analysis of parental risk preference on child labour using nationally representative data from Ghana. We used a risk elicitation experimental question to evaluate the parental risk preference. Our validity test shows that the variable contains relevant information on risk behaviour. The econometric analysis further shows that children who live with risk-averse parents are more likely to engage in economic work. We account for possible endogeneity of the risk preference variable by using one's willingness to disclose private information regarding the date of birth. In addition, we find a statistically significant effect of risk preferences on child labour. Furthermore, we argue that the observed relationship is motivated by the parent's interest in maximising personal gains from the child rather than from an altruistic motive of helping the child to gain additional skills outside formal education.

The findings reported in this paper are relevant for research and policy. First, the data and analyses provide empirical evidence about the relationship between risk aversion and child labour. Economic policies on fighting child labour involve poverty-reduction strategies, but they tend to pay less attention to the behavioural characteristics of the parents. Our findings call for an understanding of the behavioural context of the affected households and of how certain traits, like risk preference, can affect the success of proposed policies to reduce child labour.

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SUPPORTING INFORMATION

Table S1: Ordinary Least Square Estimates of the Effect on Risk Preference on Household Demand for Insurance

	(1) Insured (LPM)	(2) Insured (IV)	(3) Log insurance expenditure (OLS)	(4) Log insurance expenditure (IV)
Risk aversion	0.025	0.380**	0.075	1.314**
	(0.017)	(0.150)	(0.065)	(0.533)
Control variables	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes
Month and year fixed effects	Yes	Yes	Yes	Yes
N	3775	3775	3775	3775
R^2	0.066		0.066	
Wald F-statistic		18.675		18.675
Under identification (LM statistic)		16.798		16.798
		[0.000]		[0.000]

Notes: Standard errors in parentheses clustered at the enumeration area. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. [#] denotes p-value of the test statistic. The control variables are the age and sex of the household head, his education, and health and disability status. Whether the head has taken a loan and, the purpose of the loan, whether he owns a bank account, household real food expenditure and social security expenditure, his employment status. The instrumental variable is the willingness of the household head to disclose his date of birth. The analysis is at the household level. Estimates apply sample weight to cater for the relative importance of each observation in the original sample.

Table S2: Linear probability estimate of the effect of risk aversion on child work - Children 12 years and older

	(1) Child worked	(2) Child worked	(3) Child worked	(4) Child worked	(5) Child worked
Risk aversion	0.112***	0.113***	0.109***	0.094***	0.094***
	(0.035)	(0.035)	(0.035)	(0.034)	(0.033)
The child's risk aversion	-0.022	-0.017	-0.017	-0.002	-0.001
	(0.038)	(0.038)	(0.038)	(0.035)	(0.035)
Child characteristics	No	Yes	Yes	Yes	Yes
Household expenditure	No	No	Yes	Yes	Yes
Other household economic variables	No	No	No	Yes	Yes
Household demographic variables	No	No	No	No	Yes
Region and time fixed effects	Yes	Yes	Yes	Yes	Yes
N	1665	1665	1665	1665	1665
R^2	0.100	0.111	0.118	0.162	0.164

Notes: Linear probability models are estimated. Standard errors in parenthesis are clustered at the enumeration area. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Child characteristics: Age of the child, enrolment status, gender, illness. Other household economic variables: Credit own enterprise. Household demographic variables: age and sex of household, head's health, education of head, employment status of the head, household size. Region and time fixed effects: region dummies, month dummies, year dummies.

Table S3: The Relationship between Risk Aversion and Child Labour (All forms of work)

	(1) Child worked	(2) Child worked	(3) Child worked	(4) Child worked	(5) Child worked
Risk aversion	0.053***	0.054***	0.052***	0.048***	0.048***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Child characteristics	No	Yes	Yes	Yes	Yes
Household expenditure	No	No	Yes	Yes	Yes
Other household economic variables	No	No	No	Yes	Yes
Household demographic variables	No	No	No	No	Yes
Region and time fixed effects	Yes	Yes	Yes	Yes	Yes
N	7506	7506	7506	7506	7506
R^2	0.065	0.126	0.127	0.136	0.137

Notes: Linear probability models are estimated. Standard errors in parenthesis are clustered at the enumeration area. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Child characteristics: Age of the child, enrolment status, gender, illness. Other household economic variables: Credit own enterprise. Household demographic variables: age and sex of household, head's health, education of head, employment status of the head, household size. Region and time fixed effects: region dummies, month dummies, year dummies.