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Article

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DEVELOPMENT ECONOMICS | RESEARCH ARTICLE

Child labor and its determinants: An empirical test of the luxury axiom-cum the wealth paradox theory

Kidanemariam Gebregziabher^{1*}, Muuz Hadush¹ and Kebede Abrha¹

Abstract: The paper was motivated to test whether the high child labor prevalence observed in Ethiopia is explained by the poverty (luxury) hypothesis or wealth paradox theories. The data for this study is the Young Lives project, consisting of 1803 children units (a total of 7212 children in four rounds). Major determinants of child labor: household characteristics, shocks, poverty or wealth proxy indicators, and area and time fixed effect variables are controlled. The study employs a Feasible generalized least squares (FGLS) econometric technique to estimate the causal relationship between child labor; household characteristics, poverty, and wealth indicator variables. Both drought and income losses were found to be positive and significant almost across all specifications. Resource or asset ownership indicators, such as land, access to credit, and TLU) were found to be positively related to child labor, consistent with the wealth paradox. However, the wealth index, except in the two quartiles found to be negative and significant at 1 percent, consistent with the luxury axiom. One more result that is interesting is the significant differences between boys and girls in the type of tasks children engaged in. Girls' dominance in household chores and boys in economic activity. Moreover, the current high level of child labor participation rate of 45 percent is very alarming. Finally, the household head's educational status also has a strong negative impact on child labor. In view of, the moral obligation of societies and government; future economic benefit of investing in children, policy be directed towards pro-poor development programs especially targeting children's welfare, promoting adult education, and introducing agricultural insurance schemes to reduce the extent and intensity of child labor.

Subjects: Rural Development; Economics and Development; Adult Education and Lifelong Learning

Keywords: child labor; feasible generalized least squares; luxury axiom; wealth paradox

JEL code: J08; J01; F66; J48

1. Introduction

Child labor is a widespread phenomenon in the world, especially in less developed countries (Emerson & Souza, 2003). According to the latest global estimates, 160 million children were in child labor (aged 5 to 17 years) at the beginning of 2020; accounting for almost 1 in 10 of all children in the age category.

Out of the total working children, 79 million children—nearly half of them—were in hazardous work that directly endangers their health, safety, and moral development (United Nations Children Fund, 2021). In terms of regional distribution, Sub-Saharan Africa accounted for 24 percent, followed by Asia and Pacific and Latin America, and the Caribbean 6 percent and 5.6 percent respectively of the working children population. The situation in Ethiopia, despite the continued and sustained economic growth that lasted for more than 15 years (until the last five economic slowdowns); and pro-poor development approaches, child labor is still one of the worst in the world (United Nations Fund for Children, 2023). According to United Nations Fund for Children (2023), 45 percent of children between the ages of 5 and 17 work, and is one of the highest incidences in the world.¹

Due to, the moral outrage of child labor, and its detrimental effect on child schooling and on countries' human capital formation and future development; the commitment of governments and international organizations can be said encouraging (World Bank IBRD, 2011). Accordingly, the willingness of these two organs to enact and fund development interventions is moving positively (Baraño, 2022; Basu & Tzannatos, 2003a; World Bank IBRD, 2011; Young, 2002).

That is why nowadays, child development is at the center stage of the development agenda of government and international communities. A series of international conventions, such as the U.N. Convention on the Rights of the Child (1989), the International Labor Organization (ILO) Convention 182 on Elimination of the Worst Forms of Child Labor (1999), and the U.N. Millennium Declaration (2000) with its emphasis on poverty reduction and universal education enacted. The United Nations' Sustainable Development Goals (UN SDGs) accorded to end child labor in all its forms by 2025 (SDG8, Target 8.7), can be taken as a sign of international community commitments. All these documents share a common concern and strongly urge for abolishing global poverty and investing in children (Basu & Tzannatos, 2003a).

However, despite all these efforts; amid high economic growth and prosperity; increased global awareness, and proliferated endorsements of different acts, still child labor remained a persistent problem in the world of today, dominantly in the developing world (Basu & Tzannatos, 2003b; United Nations Children Fund, 2021). It seems against these backdrops, following the work of Grootaert and Kanbur (1995); and Basu and Van (1998) a growing theoretical and empirical work on child labor started to be observed (for review see Bourdillon, 2006).

A substantial body of literature argues that the main cause of child labor is poverty. According to Basu and Van (1998), no household will be willing to send its child to work if the level of income from non-child labor is reasonably sufficient to cover the cost of living. This is not to say other factors, such as the availability of good schools, simple incentives, the future benefits of schooling, and other factors, do not have a role in parent decisions (Edmonds, 2005; Emerson & Souza, 2003). Despite all the stated intermediary factors according to Basu and Van (1998), the primary cause of child labor remained to be poverty. This is what they termed the luxury axiom. In child labor literature, there is a lot of evidence that supports this view (Basu, 1999; Basu & Van, 1998; Basu & Tzannatos, 2003b; Edmonds, 2005; Emerson & Souza, 2003; Ray, 2000).

However, some recent evidence has cast doubt on this explanation of child labor. Bhalotra and Heady (2003) have challenged the luxury axiom using some evidence from Ghana and Pakistan. In their study, they found that child labor increases with the size of land a household possesses (Dumas, 2007). Since land, was strongly correlated with a household's income, this finding seems to contradict the commonly held proposition that child labor involves only the poorest households.

Hence, given the growing global concern about child labor and the urgent need to end child labor, it is important for us to understand the causes of child labor rights. Hence, the above debate deserves serious scrutiny. The present paper builds on the above reviewed works by developing a rigorous theoretical model, to motivate an empirical analysis based on a panel data set from Ethiopia.

The rest of the paper is, organized as follows. Section 2 discusses relevant literature. Section 4 discusses data sources and methodology. Section 4 presents and discusses the empirical results, and section 5 concludes.

2. Literature review

The literature on child labor can be broadly grouped into two: the luxury axiom and the wealth paradox theory. The luxury axiom asserts that poor families cannot afford to dispense with child labor if they are to meet their subsistence needs. Implying, as household income increases, child labor declines in favor of schooling and other leisure activities. According to luxury axiom, child labor is necessary to support the family not only on a regular basis but also in response to idiosyncratic and covariate shocks (Beegle et al., 2009; Edmonds, 2005).

Contrary to the “luxury hypothesis”, some authors have proposed a concept described as a “wealth paradox”. Bhalotra and Heady (2003), Parsons and Goldin (1989), Rogers and Swinnerton (2004), Nkamleu (2006), and Dumas (2007), are among others, the proponents of wealth paradox theory. The wealth paradox theory asserts that child labor is higher in families that have access to land and livestock in rural areas; and small business enterprises in urban areas than in poor families lacking those assets. Moreover, child labor seems to increase during periods of economic growth in households endowed with productive assets. They reason out why these families would choose to use child labor instead of hiring. Reasons include first, the risks of moral hazard, shirking, and theft are lower with child labor than with hired hands (Deolalikar & Vijverberg, 1987; Foster & Rosenzweig, 1994). Second, too rigid and burdensome nature of the labor market in rural areas (Basu et al. (2010)). Third, some believe that child labor is not bad or harmful but can lead to enhanced work habits, discipline, and even human capital accumulation (Emerson & Souza, 2007; Raju, 2005). Finally, others argue child labor persists due to the institutional failure to implement the rights of children (Cunningham, 1995).

Economists differ not only on the causes of child labor but also on the perception of child labor. One strand argues against child labor, by saying that children should go to school and any time committed for labor is at the expense of schooling time and thereby human capital formation (Basu, 1999, 2003). However, others favor child labor, by saying that there are some learning effects as they work, or working children can support their families and, most importantly themselves (Beegle et al., 2009).

Regarding the empirical work, Basu and Van (1998) was one of those who provided an early empirical study, which examines the luxury axiom in an attempt to highlight the fact that poverty caused child labor. A similar empirical study was also conducted by some scholars (Basu & Van, 1998; Blunch & Verner, 2001; Nkamleu, 2006) focusing on whether poverty influences child labor or not in developing countries. In a similar vein, Blunch and Verner (2001) revisited the link between poverty and child labor in Ghana. Cummings (2016) using data from Mexico, reported per capita income and the lack of a minimum level of well-being to have a significant and positive impact on the probability of working. Bhalotra and Heady (2003) using data from Pakistan and Ghana found a significant positive effect of log consumption (a proxy for wealth) on the probability of child labor for Ghana, and the opposite for Pakistan. Almost all these research findings resonated with the positive relationship between poverty and child labor.

Recent pieces of literature are also emerging supporting the wealth paradox theory. Rogers and Swinnerton (2004), Nkamleu (2006) and Dumas (2007), Edmonds and Schady (2012) and Basu et al. (2010) argued that greater possession of land wealth by households was responsible for higher participation of children in child labor, hence casting doubt on the hypothesis which says child labor is caused by poverty. Their paper suggested the possibility of an inverted U relationship between land possession and child laboring using data from northern India. Bhalotra and Heady (2003) in a study on Ghana and Pakistan found that child labor use was mostly observed in the richest households. The finding was based on the observation that children in land-rich households

are more likely to work and attend school less compared to the children in land-poor households, attesting to the wealth paradox theory.

Most of the empirical works reviewed, approached child labor participation as if driven by either poverty or asset/wealth (Fernandez & Aboejo, 2014; Krauss, 2003; Lima et al., 2015; Seiichi et al., 2013; Ul-Haq et al., 2020). However, the issue of child labor is as simple as that. Understanding the complex nature of child labor, and departing from either or approach, we tried to capture the wealth/asset, poverty, and various shocks to improve our model specification and enhance the robustness of our results.

Second, some researchers apply probit/logit, to understand the determinants of child labor. For instance (Buchmann, 2000; Das & Mukherjee, 2019; Kiral & Tiras, 2013; Magdalena et al., 2021; Patrinos & Psacharopoulos, 1997; Psacharopoulos, 1997; Villavicencio, 2005), have applied a logit or probit model to estimate the determinants child labor participation. While we acknowledge, that every statistical model has its own unique methodological limitations, our GLSE, is better suitable for fitting datasets that exhibit heteroscedasticity and/or autocorrelation.

Third, except (Basu et al., 2010; Krauss, 2003; Lima et al., 2015) most of the estimations relied on the mean value of variables (wealth, asset holding wage/income), as if variables operate the same at all of their distribution: upper, mean and lower tails (Shumetie & Mamo, 2019; Ul-Haq et al., 2020, 2021). Hence, to understand how the two wealth indicator variables TLU and wealth index behave outside their mean value it is a noble contribution to the ongoing luxury-wealth paradox debate by incorporating their quartile forms.

Finally, a few studies (Senbet, 2010; Shumetie & Mamo, 2019; Thévenon & Edmonds, 2019) have analyzed the issue of child labor in Ethiopia which is the second most populous country, more than 120 million population and a country with one of the highest rate of child labor participation (45 percent). Hence, our panel, data set with high geographical representation, is more reliable and robust compared to preceding studies.

3. Data sources and methodology

3.1. Data sources

Ethiopia is one of the countries, which enjoyed sustained economic growth (averaging 9 percent per annum) for more than 2 decades. Even with the current economic slowdown, its average economic growth of 6.2 percent is above the African economic growth average of 3.8 percent (Africa, 2023). Despite all this high and sustained economic growth Ethiopia is one of the countries in the world with an unprecedented child labor rate of 45 percent. This makes Ethiopia a unique country for understanding the causes of child labor. Motivated by these conditions, in 2002, the Young Lives research team in Ethiopia selected a cohort of 2,000 children aged between 6 and 18 months (young cohort) and a control cohort of 1,000 children aged between 7.5 and 8.5 years (old cohort). Using a methodology known as sentinel site surveillance system 20 sentinel sites (using a purposive sampling strategy) across the country were selected. Following site selection, 100 households with a 1-year-old child and 50 households with an 8-year-old child in each site were selected. Once sites were selected, household selection within each sentinel site was done using simple random sampling. Accordingly, the selection procedure was as follows (Alemu et al., 2003):

3.1.1. First stage: selection of sites

Selection of five regions out of a total of nine. The main criterion for selecting the five research sites was national coverage. The five selected regions/Administrations of Ethiopia (Tigray, Amhara, Oromia, Southern Nations, Nationalities and People (SNNP), and Addis Ababa) account for 96 percent of the national population. Selection of three to five districts (weredas) in each region (20 districts in total) with a balanced representation of rural-poor, urban-poor, and relatively less poor rural and urban households was done. Due to a lack of official statistics, households' income status

classification and selection were made through consultation with local officials in each district. In each district, at least one peasant association (in rural areas) or kebele (the lowest level of administration in urban areas) was made to be selected. Since districts themselves are too wide in terms of population and extension to be considered as sentinel sites; a peasant association or kebele was considered as a sentinel site when it was possible to find at least 100 households with a 1-year-old child and 50 households with an 8-year-old child. If there were not enough households to fulfill the criteria the peasant association or the kebele was considered as the center point around which the sentinel site was established. This happened in five cases (Young Lives, 2007).

3.1.2. Second stage: selection of households

A village within each sentinel site was randomly selected and all the households on the periphery were interviewed until 150 eligible households were located. The dataset for this study has been limited to the younger cohort age group only beginning from round two and dropping totally the old cohort group. This is mainly because the first-round younger cohort consists of children below 5 years and the old cohort groups have reached the age of 22 years old exceeding (during the 5th round) the international child age category (Alemu et al., 2003; Young Lives, 2007). For more detailed sampling procedure information, see the Young Lives website.

3.2. Theoretical model

Basu and Van (1998) developed the model of multiple equilibria and government intervention, known as the “luxury and substitution axioms”. The Basu and Van (1998) model depicts two-equilibrium: in the first equilibrium, children work and in the second situation where adult wages are high, children do not work. The underlying assumption behind the Basu and Van model is that child labor would decrease as household resources rise; implying poverty as the main predictor of child labor. Hence, poverty reduction interventions, and well-functioning labor, land, and credit markets are expected to improve the livelihoods of poor households and other things remaining constant, leading to the reduction of child labor participation.

Despite a number of subsequent studies that support the luxury hypothesis, some studies such as Bhalotra and Heady (2003) using data from Pakistan and Ghana have uncovered a negative relationship between poverty and child labor, known as the “Wealth Paradox” in the child labor literature (Bhalotra & Heady, 2003; Nkamleu, 2006). The authors use farm size as a proxy for household welfare, which goes with the importance of land as a store of wealth in agrarian societies’ context (Bhalotra & Heady, 2003). According to this theory, this apparent paradox can be explained by labor and land market failures. They further argue that children in the context of developing countries tend to have economic values and children are a valuable asset to support parents’ agricultural activities. Hence, parents whether to send children to school or keep them outside school is based on a cost-benefit analysis: comparing current income from child labor (h_0) versus future income after schooling (h_1) (equation 3.1–3.2).

Households will thus choose to invest in the education of their children up to the point where the marginal benefit from an additional year of schooling equals the marginal cost of an additional year of schooling; see Khandker et al. (2013) for a detailed description of the model. The outcome of this decision—schooling or work is again determined by various individual, household, and community characteristics (Equation 3.5), which can be framed as follows (Blunch & Verner, 2001).

$$C_{i=h_0, h_1} = C(h_0, \tau_i h_1); \quad (1)$$

$$C_i = h_0 \text{ if } \tau_i^{-1} MB h_1 < \tau_i^{-1} MB h_0 \quad (2)$$

$$C_i = h_1 \text{ if } \tau_i^{-1}MBh_1 > \tau_i^{-1}MBh_0 \quad (3)$$

$$C_i = h_0 = h_1 \text{ if } \tau_i^{-1}MBh_1 = \tau_i^{-1}MBh_0 \quad (4)$$

Where C_{h_0} is when the household decides to send the child to work and generate $\{h_0\}$ amount income flow,

C_{h_1} to school and earn (h_1) in the future.

τ_i = Discount factor

h_0 current income flow to the household by sending children to work or own farm and business activities

h_1 = future income flow due to current investment on children minus cost of education discounted by τ_i

$\tau_i^{-1}MBh_1$ = Discounted marginal benefit from an additional year of schooling equals the marginal cost of an additional year of schooling,

MBh_0 = Marginal benefit of sending children to work in the current period.

The household decision C_i is conditioned by the potential income flow from the two alternative income flows, h_0 and h_1 .

Accordingly,

$$C_i = (h_i(f(X_{it+} + \varepsilon_{it}))); \quad (5)$$

$$X_{i,t} = w(HC_{i,t}, SV_{i,t}, WV_{i,t}, LF_{i,t}, TF_{i,t})$$

$HC_{i,t} = g(\text{School_dis}, \text{Enrollment}, \text{Study_hrs}, \text{School_hrs}, \text{C_sex}, \text{C_age}, \text{HHHAge}, \text{HHHEdu}, \text{HHHsex}, \text{Familysize});$

$$SV_{i,t} = f(\text{Shock_drt}, \text{Income_L});$$

$$WV_{i,t} = h(\text{wealthindex}, \text{TLU}, \text{land}, \text{credit});$$

$$LF_{i,t} = \text{Regions} = i \dots 5$$

$$\text{Time} = 1 \dots 4 \text{ (rounds)}$$

$\varepsilon_{i,t}$ = the error time with a distribution as explained in equation (Equations 3.6.1–3) below.

By capturing these explanatory variables, we tried to control for as wide a spectrum of variables in their linear and quartile forms.

3.3. Econometric model specifications

This study intends to empirically test the luxury axiom-cum wealth paradox theory to ascertain whether the poverty or wealth status of parents has any effect on the incidence of child labor. The empirical literature on child labor is mainly interested to see the relationship between poverty and

wealth as the most important predictors of child labor at the household level. Since our datasets have come from various states with high levels of variation: land size, population, agricultural potential, urbanization, and other units' variation scale, it seems reasonable to expect the variance for each of the panels to differ and thence high level of heterogeneity in our data generating and estimation process. Hence, the classical OLS regression model consistency and efficiency rests on whether the following conditions are fulfilled or not.

$$E[\varepsilon_{i,t}] = 0 \quad (6)$$

$$Var[\varepsilon_{i,t}] = \sigma^2 \quad (7)$$

$$Cov[\varepsilon_{i,t}, \varepsilon_{i,s}] = 0 \text{ if } t \neq s \text{ or } i \neq j \quad (3.6.3)$$

And this implies that the variance-covariance matrix of the error term, conditional on the covariates are constant as below:

$$\Omega = \begin{bmatrix} \sigma^2 & 0 & \dots & 0 \\ 0 & \sigma^2 & \dots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \dots & \sigma^2 \end{bmatrix} \quad (8)$$

Whether or not the panels are balanced, the 0 matrices may be rectangular. However, due to the nature of the dataset and as our test result showed, our dataset suffered from a high level of heteroscedasticity across panels, thence the variance-covariance matrix of the error term (Equation 3.7.2) should be specified in such a way that recognizes the problem. The structure of the matrix should look like;

$$\Omega = \begin{bmatrix} \sigma_1^2 & 0 & \dots & 0 \\ 0 & \sigma_2^2 & \dots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \dots & \sigma_N^2 \end{bmatrix} \quad (9)$$

Secondly, it is possible that the error terms of panels could be correlated (Equation 3.7.3), in addition to having different scale variances. However, our test results failed to reject the null hypothesis of no strong correlation, as a result, our specification will make no effort in this regard. Finally, similar to the problem of heteroscedasticity the null hypothesis that the residuals are not serial correlated is also rejected. Accordingly, the structure of the variance-covariance matrix of the error term should be specified as follows;

$$\Omega = \begin{bmatrix} \sigma_1^2 & \sigma_{1,2} & \dots & \sigma_{1,N} \\ \sigma_{2,1} & \sigma_2^2 & \dots & \sigma_{2,N} \\ \vdots & \vdots & \ddots & \vdots \\ \sigma_{N,1} & \sigma_{N,2} & \dots & \sigma_N^2 \end{bmatrix} \quad (10)$$

To address, the two fundamental estimation problems; we applied heteroscedasticity and auto-correlation consistent standard errors estimator (Feasible Generalized Least Squares-FGLS). The general idea behind FGLS is that in order to obtain an efficient estimator of $\hat{\beta}$, we need to transform the model so that the transformed model satisfies the Gauss-Markov theorem assumptions. Moreover, the random effect maximum likelihood estimator (REMLE) which accounts for random effects, and results remain qualitatively as well as quantitatively almost identical, showing the robustness of our results. In both exercises, we use the same control variables drawn from the

existing literature (Dar et al., 2002; Edmonds, 2006; Kruger & Berthelon,). Based on the above discussion, the basic model (Equation 3.8) of child labor hours: household chores, economic and total labor is specified below;

$$C_i = \begin{cases} CL_{Choresit} = X_{i,t} + \varepsilon_{i,t} \\ CL_{Economic}_{i,t} = X_{i,t} + \varepsilon_{i,t} \\ CL_{Total}_{i,t} = X_{i,t} + \varepsilon_{i,t} \end{cases} \quad (11)$$

Where $i = \dots, n$ is the number of units (or panels) and $t = \dots, T_i$ is the number of rounds for panel i . The values of $X_{i,t}$ are as specified above (Equation 3.5).

Finally, our definition of child as well as child labor follows the ILO definition. According to ILO, a person of age less than 17 years is taken to be a “child”. A child is a “laborer” if she/he is “economically active” regardless of his/her occupational status (wage-earners, own account workers, unpaid family workers, etc.,). Household work performed in parental homes is not counted as child labor; household chores in this paper (International Labour Organization, 1996).

4. Results and discussion

4.1. Descriptive analysis

The list of variables used in our analysis and the value represented are indicated in Table 1. When we compare the distribution of children by child labor status (Table 2), using the simple t-distribution, the difference is very clear. Out of 17 variables, 16 of them are significantly different (15 of them at a 1 percent level of significance). The descriptive summary statistics indicate some interesting indications. Out of the total sampled children, 37.8 percent of the working children (economic activities participants) work for 3.6 hours per day on average. The average distance to school (in walking minutes) of the two groups was found to be 26 minutes and 22 minutes for working (economic as well as household chores) and non-working respectively. Comparing the two groups in terms of school enrolment status, working children showed a higher-level performance (73 percent) compared to non-working children (57 percent), which is against our expectations. Gender composition of the labor participants, 67 percent were males, showing male dominance in the labor market and household chores mainly reserved for females. The average age of labor participant children was also found to be higher (by 2 years) compared with their counterparts.

In terms of family size, households with labor-participant children tend to have higher (9 percent) family size than, non-participants. By residence, children living in rural areas, do have five times more labor participants compared to urbanites. Using drought and income loss shocks as proxies for the state of poverty, the results were found to be mixed: labor participants were found to experience higher drought shock occurrence non-participants had higher income loss. Finally, using tropical livestock unit (TLU) and composite wealth index (Appendix A) as proxies for wealth and overall asset-holding status of households, consistent with a prior expectation those households with relatively higher levels of wealth index showed lower child labor participation, but higher child labor participation rate in the households with higher TLU holdings.

In Table 2, we observe a balanced distribution of the decomposed standard deviation between and within components; showing that the problem of heteroscedasticity (between) and autocorrelation (within) problems are equally important.

In summary, households with labor participants have larger family sizes, higher drought incidence, and tropical livestock holdings, but non-participants dominate in terms of wealth index. However, given the non-random distribution of child labor participation, these did not indicate what determines child labor participation. Further in-depth econometric analysis is needed to address causality.

Table 1. Variable definition

Variable	Variable code	Description
Child	Child	Child aged 5–17 years (United Nations Children Fund, 2021)
Child labor chores	CL_Chores	children's participation in domestic work or chores (Dziadula & Guzmán, 2020).
Child labor Economic	CL_Economic	Child labour” work participation paid and unpaid outside domestic chores or work; that deprives children of their childhood, their potential and their dignity, and that is harmful to physical and mental development (Hilowitz, 2004).
Total child labor	CL_Total	Sum total hours spent on house chores and economic activities.
Luxury axiom		Luxury axiom is defined as “a family will send the children to the labor market only if the family's income from non-child-labor sources drops very low,” (Basu and Van (1998).
Wealth paradox		Wealth paradox a concept which tried to show a positive monotonic relationship between child labour and wealth (especially land size) or income (Bhalotra & Heady, 2003).
Index	wealthindex	Wealth index composed of housing quality, access to services and consumption (see Appendix) (Young Lives, 2007).
School Distance	School_dis	Distance to school (in walking minutes)
Child Enrolment	Enrollment	Child Enrolment status (1=enrolled)
Study Hours	Study_hrs	Hours spent for study by child
School Hours	School_hrs	Hours spent at School by a child
Child sex	C_sex	Child sex (1=male, 0 otherwise)
Child age	C_age	Child age in years
Head age	HHHAge	Household Head (HH) age in years
Head's Education	HHHEdu	Household Head's Education in years
Head sex	HHHsex	Household head's sex (1= Male)
Family size	Familysize	Household family size (HHFS)
Residence	Residence	Area Residence (urban = 1)
Regions	Regions	Tigray = 1, Amhara = 2, Oromiya = 3 SSNP = 4, Addis Ababa = 5
Shock-Drought	Shock_drt	Shock-Drought (1=shock, 0 otherwise)
Income loss	Income_L	Loss_Source_Income (job, business etc.,)
Livestock Unit	TLU	Tropical Livestock Unit
Own land	Land	Own land (1= yes, 0 otherwise)
Credit	credit	Access to Credit (1=access to credit)
Survey round	time	1 st round = 2014, 2 nd = 2015, 3 rd round, 4 th round 2017

Table 2. Comparison of covariates using t-test: child labor participants and non-participants

Variables	Group	Number of observations	Mean	Standard error	t-value
School_dis	Non-participants	4,483	21.941	0.287	-7.715***
	Labor participants	2,727	25.891	0.457	
	Total	7,210	23.435	0.249	
Enrollment	Non-participants	4,483	0.573	0.007	-13.217***
	Labor participants	2,727	0.726	0.008	
	Total	7,210	.631	.006	
Study_hrs	Non-participants	4,483	1.143	0.017	1.870*
	Labor participants	2,727	1.094	0.019	
	Total	7,210	1.125	0.013	
School_hrs	Non-participants	4,483	4.282	0.047	-0.288
	Labor participants	2,727	4.303	0.045	
	Total	7,210	4.290	0.034	
C_sex	Non-participants	4,483	0.444	0.007	-19.364***
	Labor participants	2,727	0.673	0.009	
	Total	7,210	0.530	0.006	
C_age	Non-participants	4,483	9.328	0.058	-23.493***
	Labor participants	2,727	11.418	0.062	
	Total	7,210	10.118	0.045	
HHHAge	Non-participants	4,483	44.454	0.170	-9.094***
	Labor participants	2,727	46.911	0.205	
	Total	7,210	45.383	0.132	
HHHEdu	Non-participants	4,483	5.783	0.116	-9.769***
	Labor participants	2,727	7.916	0.205	
	Total	7,210	6.590	0.107	
HHHsex	Non-participants	4,483	0.732	0.007	-12.695***
	Labor participants	2,727	0.858	0.007	
	Total	7,210	0.780	0.005	
Familysize	Non-participants	4,483	5.790	0.031	-11.318***
	Labor participants	2,727	6.331	0.035	
	Total	7,210	5.995	0.023	

(Continued)

Variables	Group	Number of observations	Mean	Standard error	t-value
Residence	Non-participants	4,483	0.504	0.008	37.621***
	Labor participants	2,727	0.105	0.006	
	Total	7,210	0.353	0.006	
Shock_drt	Non-participants	4,483	0.185	0.006	-14.857***
	Labor participants	2,727	0.337	0.009	
	Total	7,210	0.242	0.005	
Income_L	Non-participants	4,483	0.098	0.005	6.140***
	Labor participants	2,727	0.057	0.044	
	Total	7,210	0.082	0.003	
TLU	Non-participants	4,483	2.588	0.061	-27.812***
	Labor participants	2,727	6.464	0.148	
	Total	7,210	4.054	0.071	
Land	Non-participants	4,483	0.628	0.007	-29.961***
	Labor participants	2,727	0.929	0.005	
	Total	7,210	0.742	0.005	
wealthindex	Non-participants	4,483	0.407	0.003	25.099***
	Labor participants	2,727	0.296	0.003	
	Total	7,210	0.365	0.002	
Credit	Non-participants	4,483	0.233	0.006	-21.796***
	Labor participants	2,727	0.473	0.010	
	Total	7,210	0.324	0.006	

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ indicates level of significance at 1, 5 and 10.

Source: (Young Lives, project and Own compilation).

4.2. Econometric results and discussion

The descriptive analysis presented in Table 2 and Table 3 indicated that there are substantial differences in the underlying characteristics of working and non-working children, in their household characteristics, wealth status, and area of residence. However, based on a simple comparison of means, it is impossible to identify the main determinants of child labor and make sound policy recommendations. In this section, we present an econometric analysis to estimate our disaggregated outcome variables: household chores, economic, and total child labor hours. The household chores refer to the number of hours/days the child spends in activities such as family members caring, cooking, fetching water, and cleaning. Economic activities on the other hand capture the number of hours/days the child spends in a paid job as well as own farm and business activities.

Table 3. Summary Statistics of variables used

Variable		Mean	Std. Dev.	Min	Max	Observations
CL_Chores	Overall	2.105	1.929	0	13	N = 7210
	Between		1.198	0	7.25	n = 1803
	Within		1.512	-3.900	9.85	T-bar = 3.99
CL_Economic	Overall	1.351	2.180	0	15	N = 7210
	Between		1.521	0	7.5	n = 1803
	Within		1.563	-6.149	12.60	T-bar = 3.99
CL_Total	Overall	3.456	2.803	0	16	N = 7210
	Between		1.740	0	9.25	n = 1803
	Within		2.198	-5.544	12.95	T-bar = 3.99
School_dis	Overall	23.435	21.169	0	99	N = 7210
	Between		11.359	2.75	70.75	n = 1803
	Within		17.865	-25.315	88.18	T-bar = 3.99
Enrollment	Overall	0.631	0.483	0	1	N = 7210
	Between		0.171	0	1	n = 1803
	Within		0.4515	-0.120	1.38	T-bar = 3.99
Study_hrs	Overall	1.124	1.096	0	9	N = 7210
	Between		0.559	0	3.75	n = 1803
	Within		0.943	1.876	7.37	T-bar = 3.99
School_hrs	Overall	4.290	2.883	0	11	N = 7210
	Between		1.614	0	9	n = 1803
	Within		2.389	2.710	12.54	T-bar = 3.99
C_sex	Overall	0.530	0.499	0	1	N = 7210
	Between		0.499	0	1	n = 1803
	Within		0	0.530	0.53	T-bar = 3.99
C_age	Overall	10.118	3.801	4.333	16	N = 7210
	Between		0.310	9.271	10.97	n = 1803
	Within		3.788	4.056	15.84	T-bar = 3.99
HHHAge	Overall	45.383	11.190	14	89	N = 7210
	Between		9.446	20.5	83.5	n = 1803
	Within		6.003	5.383	82.38	T-bar = 3.99

(Continued)

Table 3. (Continued)

Variable		Mean	Std. Dev.	Min	Max	Observations
HHHEdu	Overall Between Within	6.590	9.048 7.715 4.729	0 0 -15.160	30 29 28.34	N = 7210 n = 1803 T-bar = 3.99
HHHsex	Overall Between Within	0.780	0.415 0.350 0.223	0 0 0.030	1 1 1.53	N = 7210 n = 1803 T-bar = 3.99
Familysize	Overall Between Within	5.995	1.981 1.647 1.101	1 2 0.495	16 13.25 12.74	N = 7203 n = 1803 T-bar = 3.99
Residence	Overall Between Within	0.353	0.478 0.460 0.115	0 0 -0.397	1 1 1.10	N = 7210 n = 1803 T-bar = 3.99
Shock_drt	Overall Between Within	0.242	0.429 0.285 0.320	0 0 -0.508	1 1 0.99	N = 7210 n = 1803 T-bar = 3.99
Income_L	Overall Between Within	0.082	0.275 0.153 0.229	0 0 -0.668	1 1 0.83	N = 7210 n = 1803 T-bar = 3.99
TLU	Overall Between Within	4.054	6.039 4.625 3.884	0 0 -65.051	274 74.10 203.94	N = 7210 n = 1803 T-bar = 3.99
Land	Overall Between Within	0.742	0.438 0.377 0.224	0 0 -0.008	1 1 1.49	N = 7210 n = 1803 T-bar = 3.99
wealthindex	Overall Between Within	0.365	0.190 0.170 0.084	0.006 0.009 -0.039	0.92 0.86 0.87	N = 7194 n = 1803 T-bar = 3.99
Credit	Overall Between Within	0.324	0.468 0.193 0.426	0 0 -0.176	1 0.5 1.07	N = 7210 n = 1803 T-bar = 3.99

***p < 0.01, **p < 0.05, *p < 0.1.

Source: (Young Lives, project and Own compilation).

Finally, the total is the sum of the two. Accordingly, the three outcome variables are estimated separately and the results are presented in Table 4.

The model result presented in Table 4 indicates that the overall chi2 value is significant at 1 percent level significance, which indicates that the sample of data matches the (known or assumed) characteristics of the larger population that the sample is intended to represent. Many of the explanatory variables are highly significant and with the expected sign, except land and household head sex, in affecting the dependent variable: child labor participation. Since our main interest outcome variable is child labor participation in economic activities, our analysis will focus only on economics (Column 2). Results show that almost all the variables, except the two variables mentioned above, were found to be consistent with our expectations and with the existing literature, and were also highly significant. Twenty-three variables were found to be significant at 1 percent, one at 5 percent, and one at 10 percent out of 28 variables. We also applied a REMLE (column 3 Table 4), as a robustness check, and the results remained consistent.

We also included quartile forms of the two wealth indicator variables (TLU and wealth index), to see how households behave (child labor participation) at various values of the variables distribution. Of primary concern in this study is to understand how households' poverty or wealth status at various levels influences household's decision on child labor participation. Our results confirm that households who experienced different shocks (drought and loss of income sources) showed a positive coefficient, and significance at 1 percent, implying any risk that disrupts their livelihood strategies forces households, to send their children to participate in the labor market. Aldaba et al. (2004), Seiichi et al. (2013), and Bandara et al. (2015), echoed similar results. Other interesting variables are the TLU and wealth index in quartiles, as a proxy for wealth. Taking the lower quartile as a base, as TLU increases child labor increases progressively and is significantly at 1 percent. Similar results were also reported by Shumetie and Mamo (2019) in a study conducted in Ethiopia, Seiichi et al. (2013) in rural Cambodia, and Ul-Haq et al. (2020), in Pakistan. In terms of wealth and child labor, child labor increases up to the second wealth quartile and then declines in the third and top quartile, which implies the income effect dominates in the upper quartiles. This indicates that an increase in wealth pushes downward the time children commit to economic activities. The land coefficient has also revealed a negative relationship with child hours.

Similarly, access to credit was found to be positive, and significant at 1 percent; supporting the wealth paradox. Therefore, we cannot reject the hypothesis that a household's access to finance which can be used for further asset holdings influence child labor decision. Amin et al. (2004) also reported similar results. The positive sign for access to credit coefficient seems implausible in light of the existing literature, which underscores liquidity constraint as a driving force for child labor participation. For instance, Ray (2000) argued that in emerging economies child labor occurs mainly because of poverty and credit market imperfections. According to Ray, if poor families had access to credit, they would be willing to send their children to school instead of work. However, our results are against Ray's premise. This is mainly, due to the nature of the credit provided to households in Ethiopia, which is targeted at poverty reduction; financing small and micro-enterprise establishments in urban areas, and agricultural inputs purchase in rural areas. These undertakings are labor intensive by their nature, which require additional labor (including child labor). In view of the imperfect labor market, where hired labor is not easily substitutable, due to possible high risks of moral hazard, shirking, and theft and potentially lower with child labor than with hired hands (Deolalikar & Vijverberg, 1987; Foster & Rosenzweig, 1994); our result can be considered as plausible finding. As a result, child labor increases in response to access to credit. Wydick (1999) pointed out similar findings in the Guatemalan context.

All of the education-related variables coefficients (distance to school, child enrolment status, hours spent for study, and hours spent at school) were found to have an inverse relationship and significant at one percent level of significance with child labor. In view of 72 percent of the working children (working 4 hours per day) and also attending school, as school commuting distance

Table 4. Generalized least square regression results of child hours/day spent in domestic activities, economic activities and Total child labor

VARIABLES	(FGLS)			(REMLE)
	Household chores (1)	Economic (2)	Total child labor (3)	Economic (4)
Household Characteristics				
School_dis	0.003***(0.000)	-0.003***(0.000)	-0.001***(0.000)	-0.006***(0.001)
Enrollment	-0.158***(0.031)	-0.952***(0.033)	-1.278***(0.040)	-1.122***(0.077)
Study_hrs	-0.015*(0.009)	-0.260***(0.008)	-0.367***(0.012)	-0.330***(0.025)
School_hrs	-0.074***(0.004)	-0.066***(0.004)	-0.176***(0.005)	-0.112***(0.011)
C_sex	-1.031***(0.019)	0.999***(0.021)	0.024(0.021)	1.107***(0.045)
C_age	0.495***(0.025)	0.218***(0.028)	0.827***(0.029)	0.291***(0.068)
HHHAge	-0.015***(0.001)	-0.002***(0.001)	-0.014***(0.001)	-0.001(0.002)
HHHEdu	-0.025***(0.003)	-0.012***(0.002)	-0.024***(0.003)	-0.003(0.007)
HHHsex	0.171***(0.019)	0.183***(0.021)	0.291***(0.027)	0.213***(0.058)
Familysize	0.029***(0.004)	0.004(0.005)	0.026***(0.005)	-0.007(0.012)
Shock variables-Proxy for Poverty				
Shock_drt)	-0.043***(0.022)	0.138****(0.018)	0.064***(0.031)	0.079(0.052)
Income_L	0.048*(0.025)	0.101****(0.019)	0.254****(0.032)	0.194****(0.073)
Wealth and External Resource Transfer				
Land	-0.038*(0.022)	-0.005(0.021)	-0.074****(0.026)	-0.007(0.064)
Credit	0.015(0.022)	0.111****(0.017)	0.164****(0.026)	0.181****(0.060)
TLU in quartiles				
2	-0.077****(0.025)	0.342****(0.019)	0.372****(0.031)	0.444****(0.068)
3	-0.253****(0.029)	0.747****(0.024)	0.682****(0.033)	0.937****(0.076)
4	-0.409****(0.031)	1.036****(0.028)	0.680****(0.035)	1.158****(0.080)
Wealth index in quartiles				
2	-0.025(0.023)	0.101****(0.026)	0.102****(0.034)	0.077(0.059)
3	-0.033(0.028)	-0.011(0.027)	-0.098****(0.037)	-0.045(0.068)
4	-0.110****(0.035)	-0.131****(0.031)	-0.315****(0.043)	-0.236****(0.087)
Region-Local fixed effect (Tigray=base)				
Amhara	0.178****(0.028)	-0.212****(0.037)	-0.128****(0.039)	-0.212****(0.072)
Oromiya	0.619****(0.028)	-0.723****(0.034)	-0.165****(0.039)	-0.760****(0.072)
SNNP	0.914****(0.032)	-0.769****(0.034)	0.105****(0.036)	-0.812****(0.071)
Addis Ababa	-0.041(0.037)	-0.397****(0.043)	-0.440****(0.040)	-0.392****(0.098)
Residence (urban = 1)	-0.423****(0.029)	-0.333****(0.022)	-0.698****(0.035)	-0.249****(0.076)
Time fixed effect (Survey Rounds)				
2	0.490****(0.077)	1.231****(0.088)	2.065****(0.092)	1.690****(0.213)
3	-1.202****(0.174)	0.877****(0.197)	-0.387*(0.202)	1.048***(0.479)
4	-2.378****(0.248)	0.529*(0.280)	-2.282****(0.285)	0.475(0.677)
Constant	-0.755****(0.140)	-0.854****(0.156)	-2.439****(0.163)	-1.447****(0.377)

(Continued)

Table 4. (Continued)

	(FGLS)			(REMLE)
VARIABLES	Household chores (1)	Economic (2)	Total child labor (3)	Economic (4)
Wald chi2(24)/LR chi2 (28) Prob > chi2	19669.63 0.0000	16066.78 0.0000	57504.72 0.0000	3140.57 0.0000
LR test of sigma_u = 0:	—	—	—	chibar2(01) = 106.1
Panels: Correlation:	Heteroskedastic panel-specific AR (1)	heteroskedastic panel-specific AR (1)	heteroskedastic panel-specific AR (1)	Random-effects
Number of childid1	1,803	1,803	1,803	

Standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

increases the choice becomes either to work (drop attending school) or attending school. The result is consistent with Ravallion and Wodon (2000) and Hfeez & Hussain (2019).

The household head's educational status also has a negative and significant impact on child labor. This is so because education increases the awareness of household heads. Moreover, it is expected that relatively educated parents are expected to earn reasonably higher wages or income as compared to their less uneducated counterparts, and thereby lower child labor. The estimates by Patrinos and Psacharopoulos (1997), Emerson and Souza (2003), Kiral and Tiras (2013), and Ajefu and Massack (2023), support our results. The coefficient for child gender shows an interesting and significant difference, which is consistent with our expectation in light of the cultural norms of gender-based work definition in Ethiopia. In Ethiopia especially in rural areas the role of girls is associated with, caregivers within the household. Many girls work at home while boys work outside the home, such as in farm activities, owning businesses and paid employment.

Child age was found to be positive and significant at a 1 percent level for all specifications, which is consistent with our expectations. The intuition behind this result is that, as the child grows older, she/he grows physically and works more, and remuneration increases with age.

Larger family size means, in view of the demographic structure of developing countries dominated by younger populations; high family size means a higher level of dependence. High dependence in turn is expected to exacerbate family poverty and thereby child labor. However, against our expectations, the variable was found to be insignificant.

Another important factor, that explains the supply of child labor, is regional characteristics. Regions are not the same in terms of job opportunities, labor market structure, agricultural land size holding and fertility; and even wages for unskilled laborers. In view of the immobile nature of children unlike adults, these factors are expected to have a high influence on child labor participation decisions. For example, child labor might be higher in rural areas where children tend to work for their families. Similarly, child labor outside the home tends to be higher in big cities such as Addis Ababa.

To control for the regional variation and implied degree of job availability, area fixed effect (regions) as well as child's residence (urban/rural) are captured in our models. The regions included in our estimation are Tigray (base), Amhara, Oromiya, SNNP, and Addis Ababa. The results showed that taking Tigray as a base, all regions did show a negative and significant at 1 percent level, compared to the base. This is consistent with the high level of estimated poverty in Tigray which is

29.6 percent (Bureau of Planning and Finance, 2018) compared to the national average of 23 percent (National Planning Commission, 2017). The coefficient for urban in all the specifications was found to be negative with a 1 percent level of significance. This shows that child labor is lower in urban areas (the base category) than in rural areas. This implies that social and economic conditions are better in urban areas than in rural areas. Second, economic opportunities and parental educational status are better and higher in urban areas and children are encouraged to go to school rather than to the labor market.

To see the child labor participation trend, we have included survey round dummies, and accordingly, results show an increase in the first two rounds and a continuous declining trend in the following two rounds. This is consistent with the global trend (United Nations Children Fund, 2021).

5. Conclusion and policy implications

5.1. Conclusion

This paper investigated the poverty hypothesis and wealth paradox capturing the three sets of factors: individual, household socio-economic factors and special and time effects; and how they impact child labor. The first set of individual factors are child age, gender, and educational factors of the children. The second category includes household socio-economic factors, such as access to credit, wealth and asset holding, shocks, household age, gender, and educational level. The final group consists of regional, residential areas, and time factors. The result revealed that poverty (drought shock and income loss) increased child labor prevalence. Landholding showed an inverse relationship with child labor. However, the finding for the wealth index was mixed. Initially, a positive sign at the bottom quartile and a negative sign at the third and top quartile (decreasing at the higher point), which is consistent with the inverse U-shaped relationship hypothesis education-related variables were found to impact child labor hours negatively. However, TLU (all four quartiles) estimations justified the paradoxical wealth effect as advanced by Bhalotra and Heady (2003). Parents' education is associated with less child labor.

5.2. Policy implications

In view, of the high incidence of child labor in Ethiopia, which is one of the highest in the world, on one hand, and poverty is one of the main driving forces for child labor, on the other hand, the following policy recommendations, are in order. First, given the inverse impact of children enrollment and parent's education on child labor government, international communities, and local community development organizations should promote and support adult education and actively participate in promoting (sensitizing, public debate, streamlining adult education in the national development programs) the need for adult education. Second, to ameliorate the adverse effects of the different shocks (drought, and disruption of livelihood sources, such as income losses, etc.,) and reduce its negative impact on child labor, a broader intervention such as crop and livestock insurance, social protection schemes conditional on child school enrollment need to strategize and put into the national development programs. Third, to reduce the child labor demand that goes with the increased number of TLU and the consequential negative impact on children's school enrollment, the agricultural extension system has to educate livestock owners to move into a zero grazing approach, instead of the current free grazing where it entails children to herd animals in open fields to graze freely.

This empirical paper has some limitations, for example (since the data was collected by another project), lack of adult wage, or total household incomes; we could not establish a direct relationship between adult wage and child labor participation. Instead, we resorted to indirect indicators, such as livestock, land, and wealth index (constructed from housing quality, access to services and consumer durables see [appendix](#) for details). Second, households' land holding variable is captured by binary; therefore, we could not see how child labor participation behave across the different level of land ownership distribution. Hence, future data collection and research efforts should address the stated shortcomings.

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I confirm that I have given due consideration to the protection of intellectual property associated with this work and that there are no impediments to publication, including the timing of publication, with respect to intellectual property. In so doing I confirm that I have followed the regulations of our institutions concerning intellectual property.

The two authors had their own share to develop the proposal, analyze and prepare the final version submitted manuscript. I understand that the corresponding author is the sole contact for the editorial process (including editorial manager and direct communications with the office). He is responsible for communicating about the progress, submissions of revisions and final approval of proofs. I confirm that I have provided a current, correct email address which is accessible by the corresponding author and which has been configured to accept email from (kidane.gebregziabher@mu.edu.et)

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Availability of supporting data

I also confirm that the dataset used in this paper is available and accessible upon request from the corresponding author.

Supplemental material

Supplemental data for this article can be accessed online at <https://doi.org/10.1080/23322039.2023.2282890>

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Appendix A

Structure of the young lives wealth index

$$\text{Wealth Index} = \frac{(\text{Housing Quality} + \text{Access to Services} + \text{Consumer Durables})}{3}$$

The index is constructed from three indices: housing quality, access to services, and ownership of consumer durables; assuming the three indicators are of equal importance, the wealth index is computed as a simple average of the three indices. The housing quality is captured by: main material of walls, main material of roof, main material of floor, and household density. Access to service is captured by electricity, drinking water source, sanitation facility and fuel for cooking. Finally, the consumer durable for Ethiopia is captured by items such as radio, television, bicycle, motorbike, automobile, landline phone, mobile phone, table and chair, sofa and bedstead. The average produces a value between 0 and 1, where a higher wealth index indicates a higher socio-economic status (Briones, 2017).