Parental Time Poverty, Child Work and School Attendance in Ghana

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Abstract

This study examines the relationship between parental time poverty, child work, and school attendance in Ghana using data from the sixth and seventh rounds of the Ghana Living Standard Survey (GLSS6 and GLSS7). Results of the analysis indicate an increasing decline in child enrolment in public schools (from 9% to 6%) among time poor household heads. In addition, parental time poverty increases children's walking hours to and from school and private school enrolment. We observed heterogeneity of parental time poverty on child work in relation to the location of households and gender disaggregation. Child work and school attendance-reducing effect of parental time poverty is mainly prevalent among male children but mixed for location. Our result is robust to the alternative estimation method of addressing endogeneity and further shows that household income is the primary channel through which time poverty influences child work and school attendance.

Keywords Time poverty · Child work · School attendance · Inverse-probability-weighted regression adjustment · Ghana

JEL Codes D1 · C21 · C26 · I20

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1 Introduction

Time poverty is a significant development issue, especially in sub-Saharan Africa (SSA), where individuals work greater number of hours than is desirable¹ (Parra & Wodon, 2010). The concept of time poverty and its applications to welfare issues is gaining the attention of policymakers and researchers (Bardasi & Wodon, 2006; Bardasi & Wodon, 2010; Gates & Gates, 2016; Kalenkoski & Hamrick, 2013; Martey et al., 2021; Orkoh et al., 2020; Williams et al., 2016). The relationship between time and consumption poverty is closely related. One of the main assets of the poor is labour, which can be used for either paid or unpaid work to escape poverty (Bardasi & Wodon, 2010). According to Seymour et al. (2019), time poverty has a differential effect on individual and household outcomes since two individuals may earn the same income using different hours of labour engagement. Household allocation of time among competing needs may result in either a Pareto optimal condition or disadvantaged situation where households become worse off, thus increasing the level of consumption poverty. For example, within a developing context, households are more likely to allocate a more significant proportion of women's time to domestic activities at the expense of their schooling (World Bank, 2012), thus creating less time to invest in remunerative employment opportunities which further exacerbate individuals' poverty levels within the household.

Lack of labour-saving technologies and their affordability are more likely to increase household time spent in domestic² and caregiving activities. Parents' investment in child human capital formation at an early age is necessary for later learning and successes (World Bank, 2003; Heckman, 2000). The literature identifies several strategies that households use to reduce their time and consumption poverty (Bardasi & Wodon, 2010; Bishop-Sambrook, 2016; Burchardt, 2008; Martey et al., 2021; Orkoh et al., 2020). However, the strategies may have either positive or negative effects on child work, school attendance, and travel time to school. For example, households may engage the services of children in on-farm or off-farm work to complement household income. Alternatively, vacant roles created by migrants may influence the time use of the left-behind parents as they take up multiple tasks, thus increasing their time poverty. To reduce parental time poverty, there are high expectations on children's time effort in household activities, which may negatively affect their schooling, health, and learning outcomes. A study by Afoakwah and Koomson (2021) finds that children's travel time to school on foot (especially beyond 30 min) negatively affects their ability to read and write in English or French and their ability to read in their native language. They further found that class hours missed and poor health were the potential mechanisms. Stith et al. (2009) find that parental poverty may contribute to less supportive parenting practices by increasing parental

¹ Following Bardasi and Wodon (2006), we computed time poverty as an indicator where an individual is time poor if the individual spends more than 1.25 or 1.5 times the median combined time spent on paid and unpaid activities.

² Domestic activities include washing of clothes, cooking, fetching water and firewood for cooking while caregiving includes taking care of children and the elderly.

stress and family conflict, thus leading to child maltreatment. Regarding agricultural households, adoption of labour-saving technologies such as pesticides, herbicides, planters, and weeders may reduce the time spent on the farm, which may translate to engagement in other economic and household activities, therefore, improving or deteriorating child welfare outcomes depending on how the saved time is allocated. Alternatively, a household may allocate the saved time in on-farm remunerative opportunities with the expectation of generating income to hire labour to support household activities. In such circumstances, child work and is likely to reduce and improve school attendance and health outcomes.

While the literature on time poverty is growing, the correlation between time poverty, child work school attendance, and travel time to and from school is less explored. Most of the studies are implied based on anecdotal and passive evidence. Given this, our study fills an important gap in the literature. Parental time poverty is likely to influence child work, school attendance, and travel time to school as children may be forced to work at an early age to increase household income. This may affect learning, health, and long-term labour market outcomes.

The Sustainable Development Goals (SDGs) highlights the need to eliminate all forms of child labour,³ and hunger and food security“ and ensure inclusive and equitable quality education and promote lifelong learning opportunities” (United Nations, 2015). However, the implementation of the SDGs has achieved varied results across the globe. For instance, it is estimated that the absolute number of people suffering from hunger in SSA continues to increase (FAO et al., 2019). Progress towards inclusive and quality education is low and further worsen by the COVID-19 pandemic. Similarly, progress made towards reducing child labour has been slow (International Labour Organization, 2018). Despite the strategies employed to achieve the development targets, there is a lack of understanding on how time poverty contributes to these development goals. Strategies focused on addressing household time poverty will have far-reaching effect on achieving the SDG goals.

Lack of empirical studies on the relationship between time poverty, child work, school attendance, and travel time to school may limit formulation of effective policies to address development issues. In this study, we evaluate the effects of time poverty on the number of children schooling (public and private), walking hours to and from school, and child work. Ghana has witnessed a reduction in consumption poverty in 2012–2017 while time poverty increased in the same period (Ghana Statistical Service, 2018). The data further shows that in rural settings, women tend to be more time poor than men, which influences the extent to which they participate in the labour market and home production. Women’s time allocation is directly linked to the entire household’s well-being such as child welfare, domestic care, fetching of water, collection of firewood, and cooking (Black et al., 2013).

Previous studies on time poverty have focused on nutrition, cooking energy choice, eating and physical activity and parenting (Harvey & Mukhopadhyay, 2007;

³ Some of the strategies includes creation of National units for Combatting Child Labour, harmonization of the national legal frameworks with the Child Labour Conventions, adoption of national plans of action for eliminating child labour, and establishment of local vigilance committee (ILO, 2018).

Kalenkoski & Hamrick, 2013; Martey et al., 2021; Seymour et al., 2019) while other studies (Orkoh et al., 2020) examine the relative effect of income and consumption poverty on time poverty. A significant gap in the literature is the implication of parental time poverty on child work and schooling. Our study fills this critical gap by using Ghana as a case study to evaluate the effect of parental time poverty on child work, school attendance and walking hours to and from school. Our results show that time poverty is positively associated with walking hours to and from school and private school attendance, while it is negatively associated with public-school attendance.

The rest of the paper is structured as follows: Section 2 describes the data, while Section 3 presents the empirical specification. Section 4 presents empirical results, followed by a discussion of the results in Section 5. Section 6 provides the concluding remarks.

2 Data and Descriptive Characteristics

2.1 Data

Our study is based on the Sixth and Seventh Rounds of the Ghana Living Standard Surveys (GLSS) implemented by the Ghana Statistical Service (GSS). The data is a nationally representative (covering the former ten regions of Ghana) household survey conducted over 12 months (Ghana Statistical Service, 2018)⁴. The survey is a multipurpose household survey that assesses the living conditions of Ghanaians. The GLSS 6 captured 16,772 out of the 18,000 sampled households while the GLSS 7 captured 14,009 out of the 15,000 sampled households. The data provide comprehensive information on demographic characteristics, education, health, employment, migration and tourism, housing, household agriculture, household energy for cooking and lighting, expenditure and income, governance, peace and security, financial services, credit, and assets. This study focused on the sections that capture household's sociodemographic characteristics, geographical variables, children's school attendance, walking hours to and from school, employment status, child work, and time use.

Our study targeted children below 15 years of age at the basic school level. School attendance is measured as the number of children in a household attending school (private and public) which is a form of human capital accumulation. Since private and public schools reflect differences in resource outlay of parents, we decided to separate them but they both represent school attendance. Attending private school at the basic level may be considered as a "luxury." In terms of academic performance, private schools generally perform better than public schools (Atuahene et al., 2019). The data captured distance to and from school in terms of walking hours. The means of transport to and from school are public (taxi), public ('trotro'), public (bus),

⁴ The administrative regions of Ghana as of the time of the survey was 10 but currently new regions have been created bringing the total number of regions to 16.

Table 1 Poverty status of the sample

Poverty status	GLSS 6 (2012/2013)		GLSS 7 (2016/2017)	
	Mean	SD	Mean	SD
Committed time > 1.25 times median	0.302	0.460	0.347	0.476
Committed time > 1.5 times median	0.167	0.373	0.221	0.415
Committed time > 10.5 h	0.572	0.495	0.030	0.170

Source: Authors' computation using Ghana Living Standard Survey (GLSS) datasets

Fig. 1 Time poverty and consumption poverty – GLSS 6. Source: Authors construction using Ghana Living Standard Survey (GLSS) datasets

metro bus, train, boat/ferry/canoe, school bus, private car, motorcycle, bicycle, and on foot. Table A1 in the appendix shows the distribution of the means of transportation by location for the 2016/2017 survey period. The GLSS 6 (2012/2013) data did not capture means of transportation to and from school. Therefore, the description is based on GLSS7. About 88% of the children below 15 years walk to and from school on foot. Per location disaggregation, the percentage of children walking to and from school on foot is higher for rural households (93%) than urban households (78%).

The construction of time poverty followed the conventional methods recommended in the literature (Bardasi & Wodon, 2010; Foster et al., 1984; Seymour et al., 2019). Detailed descriptions and computations of time poverty have been published elsewhere (Martey et al., 2021). Table 1 shows the different indicators

Fig. 2 Time poverty and consumption poverty – GLSS 7. Source: Authors construction using Ghana Living Standard Survey (GLSS) datasets

of time poverty based on the time poverty cut-offs of the sampled households between 2012/2013 and 2016/2017. The mean time poverty for 2016/2017 is relatively higher than in 2012/2013 except for the time poverty estimation based on committed time greater than 10.5 h. Table A2 shows the description of independent variables included in the time poverty model, rationale and expected sign.

Figures 1 and 2 show Ghana's administrative regions and describe the relationship between time and consumption poverty in 2012/2013 and 2016/2017 respectively for each of the administrative regions. The map color represents the differences in terms of the proportion of households that are time poor, and the ball represents the proportion of households that are consumption poor. The intensity of the color and ball size respectively depict the extent of time and consumption poverty in the regions. The data shows that consumption poverty is high in northern Ghana (Northern, Upper East, and Upper West regions) compared to other areas. However, except for the three northern regions, poverty levels in all the different regions decreased between 2012/2013 and 2016/2017 with the Upper West Region recording the highest consumption poverty in Ghana. The result indicates that Ghana made significant progress in poverty reduction over the study period.

Conversely, time poverty increased between 2012/2013 and 2016/2017 for all households except for the Upper West Region that recorded a decline in time poverty. The graph suggests that households that are time non-poor are consumption poor. The proportion of households in Greater Accra and Western regions that were time poor remained the same. However, they recorded a decline in consumption poverty throughout the study.

Fig. 3 Time poverty and child work – GLSS 6. Source: Authors construction using Ghana Living Standard Survey (GLSS) datasets

Fig. 4 Time poverty and child work – GLSS 7. Source: Authors construction using Ghana Living Standard Survey (GLSS) datasets

Fig. 5 Time poverty and schooling – GLSS 6. Source: Authors construction using Ghana Living Standard Survey (GLSS) datasets

Figures 3 and 4 show the relationship between parental time poverty and child work in 2012/2013 and 2016/2017, respectively, for each administrative region. The country's northern zone experienced the highest number of child work relative to the southern zone. The 2012/2013 data shows that the number of children working is highest in the Upper West Region, followed by Upper East, Brong-Ahafo, and Northern regions. Greater Accra recorded the lowest number of children working in the same period. For the 2016/2017 data, the Upper East Region recorded the highest child work, followed by Northern, Upper West, Volta, and Brong-Ahafo regions. Comparing across survey periods, Ashanti, Brong-Ahafo, Eastern, Upper West, and Western regions recorded a decline in child work between 2012/2013 and 2016/2017. The rest of the regions experienced an increase in children working.

Figures 5 and 6 show the association between parental time poverty and the proportion of children attending school in 2012/2013 and 2016/2017, respectively, for each administrative region. Comparatively, households in Eastern, Upper West, and Volta regions experienced an increase in the proportion of children attending school from 2012/2013 to 2016/2017, while the rest of the regions recorded a decline in the number of children attending school for the same periods. Volta and Western regions have the highest proportion of children attending school in 2016/2017 and 2012/2013.

Figures 7 and 8 show the relationship between time poverty and children walking hours to and from school in 2012/2013 and 2016/2017, respectively, for each administrative region. The figures show that Ghana experienced a decline in

Fig. 6 Time poverty and schooling – GLSS 7. Source: Authors construction using Ghana Living Standard Survey (GLSS) datasets

Fig. 7 Time poverty and walking hours – GLSS 6. Source: Authors construction using Ghana Living Standard Survey (GLSS) datasets

Fig. 8 Time poverty and walking hours – GLSS 7. Source: Authors construction using Ghana Living Standard Survey (GLSS) datasets

children walking hours to and from school between 2012/2013 and 2016/2017. The construction of several community basic schools may explain the findings. In 2016/2017 (Fig. 8), households in Upper East Region recorded the highest children walking hours to and from school followed by Northern, Upper West, and Brong-Ahafo regions. The results suggest that children in the northern and transition zones of Ghana walk long hours to and from school compared to children in the southern zones of Ghana.

2.2 Descriptive Statistics

Table 2 shows the differences in the means of the outcome variables and the explanatory variables based on time poverty. The result shows that the groups are balanced based on the *p* values computed using the Welch t-tests. The GLSS 6 show statistical significance in the outcome variables where the time poor household heads recorded relatively higher child outcomes (number of children attending private school and number of children working) than the time non-poor households except for the number of children attending public schools. The explanatory variables show that time nonpoor household heads are older with a higher proportion of males than time poor households. Regarding the household characteristics, time poor households recorded a relatively higher ratio of children, household size, and located in urban areas than the time non-poor households. With reference to the GLSS 7, the results show that time poor (time nonpoor) households recorded a statistically significant and higher

Table 2 Descriptive statistics by time poverty

Variables	GLSS 6 (2012/2013)			GLSS 7 (2016/2017)		
	Mean	Std. Dev.	Difference	Mean	Std. Dev.	Difference
Child work and schooling outcomes						
Number attending public school	1.228	1.640	0.081***	1.248	1.755	−0.019
Number attending private school	0.405	0.904	−0.080***	0.406	0.899	−0.117***
Hours walking to and from school	1.200	2.750	−0.145***	0.473	1.015	−0.049***
Number of children working	0.341	0.869	−0.035**	0.238	0.426	−0.102***
Household head characteristics						
Age	45.840	15.898	5.690***	46.241	15.912	5.639***
Age in years squared/100	23.540	16.414	6.133***	23.914	16.355	6.192***
Years of completed schooling	5.168	5.085	0.135	6.472	5.357	−0.476***
Household characteristics						
Ratio of children (0–15 years)	0.326	0.260	−0.026***	6.904	6.765	−0.244**
Household size	4.264	2.784	−0.174***	0.259	0.396	−0.025***
Household size squared/100	0.259	0.370	−0.015**	0.259	0.396	−0.025***
Categorical variables						
	Mean	%	Difference	Mean	%	Difference
Gender (1 = male)	0.282	28%	0.104***	0.312	31%	0.096***
Marital status (1 = married)	0.675	68%	−0.089***	0.641	64%	−0.082***
Employment status	0.853	85%	−0.206***	0.791	79%	−0.222***
Location (1 = urban dwellers)	0.444	44%	−0.097***	0.430	43%	−0.094***

Difference is the mean of time nonpoor minus the mean of time poor households. Source: Authors' computation using Ghana Living Standard Survey (GLSS) datasets

number of children attending private school (walking hours to and from school) than the time non-poor households. Similarly, the time non-poor households have a higher proportion of married heads, years of schooling, and employed heads relative to the time poor households. Time-poor households recorded higher household size, ratio of children, and urban dwellers than time nonpoor households.

3 Empirical Specification

3.1 Inverse Probability Weighted Regression Adjustment (IPWRA)

The study assumes that time poverty is likely to be correlated (endogenous) with child welfare outcomes, resulting in bias estimates. The possible sources of endogeneity could emanate from unobserved heterogeneities among household heads and household characteristics that can affect time poverty. Second, reverse causality between parental time poverty and child welfare outcomes is a potential threat to the identification. Our interest is to compute the average treatment effect on the treated (ATET) using the propensity score matching (PSM) technique that controls for observables. The basic idea of the PSM method is to match observations of time poor and time nonpoor households to the predicted propensity of being

time poor (Rosebaum & Rubin, 1983; Heckman et al., 1998; Smith & Todd, 2005; Wooldridge, 2005). Following Takahashi and Barrett (2014), the ATET is formally expressed as:

$$ATET \equiv E\{Y_{iT} - Y_{iNT}|G_i = 1\} = E(Y_{iT}|G_i = 1) - E(Y_{iNT}|G_i = 1) \quad (1)$$

where Y_{iT} is the potential child welfare outcome of time poor household i , Y_{iNT} is the potential child welfare outcome of time non-poor household i , $E\{\bullet\}$ is the expectation operator, and G_i is the treatment indicator equal to 1 if the household is time poor and 0 otherwise. Estimating Eq. (1) will lead to a biased estimate given that the counterfactual $E(Y_{iNT}|G_i = 1)$ is not observed (Takahashi & Barrett, 2014). Following Wooldridge (2010), the biased estimation of Eq. (1) is solved using the IPWRA estimation method. The IPWRA is doubly robust as it combines regression adjustment (parameter or linear regression model) model and propensity score weighting.

According to Rosenbaum and Rubin (1983), the probability of receiving treatment is specified as:

$$P(X) = P_r(G_i = 1|X) = F\{h(X)\} = E(G_i|X) \quad (2)$$

where X is a vector of observed characteristics that includes socio-demographics and geographic controls and $F\{\bullet\}$ is a cumulative distribution function. Based on the approach of Manda et al. (2018), we assign simple inverse weights equal to 1 for the time-poor households and $\frac{\hat{P}(X)}{1-\hat{P}(X)}$ for the time non-poor households, therefore the propensity weights are formally defined as:

$$\tau_i = G_i + (1 - G_i) \frac{\hat{P}(X)}{1 - \hat{P}(X)} \quad (3)$$

where $\hat{P}(X)$ are the estimated propensity scores. Following Manda et al. (2018) the ATET for the regression adjustment model is specified as:

$$ATET_{RA} = n_T^{-1} \sum_{i=1}^n G_i [r_T(X, \delta_T) - r_{NT}(X, \delta_{NT})] \quad (4)$$

Combining Eqs. (3) and (4) produces the IPWRA estimator which is specified as:

$$ATET_{IPWRA} = n_T^{-1} \sum_{i=1}^n G_i [r_T^*(X, \delta_T^*) - r_{TN}^*(X, \delta_{NT}^*)] \quad (5)$$

The estimation of Eq. (5) must satisfy three assumptions to ensure an unbiased estimate of ATET. Assumption one is the conditional independence (CI), which stipulates that conditional on the probability of adoption, given observable covariates, an outcome of interest in the absence of treatment, Y and time poverty status, G are statistically independent (Takahashi & Barrett, 2014). Second, the PSM assumes a common support condition which requires substantial overlap in covariates between the adopters and nonadopters, such that households being compared have a common probability of being time poor and time non-poor, such that $0 < p(X) < 1$ (Takahashi

and Barrett, 2014; Winters et al., 2010). The third assumption is the independent and identically distributed (i.i.d) sampling assumption which ensures that the outcome and treatment status are independent of the outcome and treatment status of other households in the population.

3.2 Robustness Check: Lewbel Two-Staged Least Square (2SLS)

We complemented the IPWRA with Lewbel's (2012)⁵ two-stage least square (2SLS) estimation technique for robustness check. This method addresses the potential reverse causality between time poverty and the outcome indicators (schooling, child work and travel time to and from school) given that parental time poverty affects schooling, child work and travel time to and from school while the outcome indicators (for example, the number of children working) may reduce parental time poverty. The Lewbel 2SLS is useful when valid external instruments are unavailable or considered weak. This method exploits heteroskedasticity in the data to generate internal instruments used to address endogeneity. The model deals with endogeneity that the IPWRA does not address and ensures robust results estimates. The choice of the Lewbel 2SLS over the traditional 2SLS approach is due to the unavailability of an external instrument that addresses the exclusion restriction in our dataset. The Lewbel 2SLS generates an internal instrument to address the endogeneity problem (Churchill et al., 2017; Churchill & Farrell, 2017; Lewbel, 2012).

Our estimation model is specified as:

$$Y_{ij} = \alpha_0 + \beta' G_i + \gamma' X_i + H_j + \omega' R_v + \varepsilon_{ij} \quad (6)$$

where Y_{ij} represents child welfare outcomes as previously defined, i and j denote individual and household, respectively, and ε_{ij} is an independent and identically distributed (i.i.d.) error term; β , ϑ , γ , and ω are parameters to be estimated. The variables of interest, time poverty G_i is an indicator variable of household head being time poor (i.e., 1 is time poor and 0 is otherwise), X_i is a vector of the household head characteristics; H_j is a vector household characteristics, and R_v are regional dummies. The regional dummies in the model capture the geographical differences in population dynamics, access to infrastructure, prices, donor and government support programs, and cost of schooling (Martey et al., 2021). We conducted a multicollinearity test to ascertain the suitability of the explanatory variables in the models (Table A3).

We estimated Lewbel 2SLS with internally generated instruments to overcome this potential bias. The IV approach requires the use of an instrument in the first stage regression in which parental time poverty is determined by an instrument and a set of covariates as shown in Eq. (7):

⁵ Lewbel's (2012) approach is an instrumental variable (IV) approach, based on internally generated instruments, which is useful in dealing with endogeneity in the absence of traditional external instrumental variables.

$$G_i = \varphi + I_i\vartheta + H_j\xi + v_i \quad (7)$$

where $I_i = [X_i, Z_i]$ is a vector of explanatory variables X_i and the internal generated instrument Z_i ; φ , ϑ and ξ are parameters to be estimated, and v_i is the random error term.

4 Empirical Results

We present the baseline results, IPWRA and Lewbel result for the effect of time poverty on child welfare outcomes (measured as the number of children attending public and private school, walking hours to and from school, and the number of children working) in Tables 3, 4 and 5 respectively.

4.1 Baseline Results

The complete version of the baseline results with all covariates is presented in Tables A4 and A5 of the Supplementary Materials. Our results differ across the survey periods (2012/2013 and 2016/2017). Comparatively, the magnitude of time poverty effect on the number of children attending public school (i.e., full sample, urban and rural) is more significant for the GLSS 7 model than the GLSS 6 model. However, the time poverty effect on private school attendance and walking hours to and from school are statistically and significantly different from the models of the GLSS 7 and GLSS 6, respectively. We observed a significant positive time poverty effect of child work in urban households only from the GLSS 7 model.

4.2 IPWRA Estimates of Time Poverty on Child Work and Schooling

Figure 9 shows the Common support region for time poor and nonpoor households. Panels A and B respectively show the overlap condition of the IPWRA for the GLSS 6 and GLSS 7. Households outside the region of common support were dropped. The good overlap between the density distribution of propensity scores for time and time nonpoor justifies the use of IPWRA.

Secondly, the overidentification test for covariate balance ($\text{Chi2}(17)=7.587$ and $\text{Prob}>\text{Chi2}=0.975$) indicates acceptance of the null hypothesis, which states that the covariates are balanced. The balancing test table is shown in Table A6 of the Supplementary Materials. The results indicate that the weighted variables are balanced since the means, and variances of the weighted covariates are close to zero and one, respectively. The balancing test results further justify the use of the IPWRA estimation technique.

Regarding the results from the models of the GLSS 6 (Table 3), time poverty is negatively associated with the number of children attending public school and positively associated with the walking hours to and from school. A time poor household records approximately 6% reduction in the number of children attending public school and approximately 23% increase in the walking hours to and from school,

Table 3 IPWRA estimates of time poverty on child work and schooling outcomes

	GLSS 6 (2012/2013)				GLSS 7 (2016/2017)			
	Number of children attending public school	Number of children attending private school	Hours walking to and from school	Number of children working	Number of children attending public school	Number of children attending private school	Hours walking to and from school	Number of children working
Panel A: Full								
Time poor	-0.056* (0.030)	0.021 (0.024)	0.231*** (0.079)	-0.001 (0.008)	-0.093*** (0.026)	0.092*** (0.022)	-0.080 (0.064)	0.007 (0.015)
Observations	12,758	12,758	12,758	12,758	13,381	13,381	13,381	13,381
Panel B: Urban								
Time poor	-0.058* (0.034)	0.029 (0.032)	0.214** (0.098)	0.011 (0.015)	-0.064** (0.029)	0.059** (0.028)	-0.052 (0.083)	0.030** (0.014)
Observations	6821	6821	6821	6821	5957	5957	5957	5957
Panel C: Rural								
Time poor	-0.043 (0.059)	-0.004 (0.032)	0.294** (0.131)	-0.018 (0.031)	-0.008 (0.042)	0.074*** (0.025)	-0.087 (0.081)	0.018 (0.032)
Observations	5937	5937	5937	5937	7991	7991	7991	7991

Geographic variables reported in Table 2 are included in the estimation models. Time Poverty is computed as committed time > 1.5 times median. Robust standard errors in parentheses. Significance at 10%, 5%, and 1% are indicated by *, ** and *** respectively. *Source:* Authors' computation using Ghana Living Standard Survey (GLSS) datasets

Table 4 Time poverty and school enrolment – Lewbel 2SLS with internal instruments

	Public school attendance				Private school attendance							
	GLSS 7 (2016/2017)			GLSS 6 (2012/2013)			GLSS 7 (2016/2017)			GLSS 6 (2012/2013)		
	All	Urban	Rural	All	Urban	Rural	All	Urban	Rural	All	Urban	Rural
Time poor	-0.040 (0.028)	-0.037 (0.044)	-0.062 (0.046)	-0.106*** (0.025)	-0.041 (0.032)	-0.140*** (0.043)	0.054** (0.023)	0.053 (0.038)	0.091*** (0.033)	0.012 (0.022)	0.011 (0.030)	-0.002 (0.029)
Socio-demographic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geographic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time nonpoor mean category	[1.258]	[0.805]	[1.567]	[1.250]	[0.859]	[1.534]	[0.376]	[0.554]	[0.256]	[0.386]	[0.583]	[0.244]
Diagnostic tests												
Underidentification test	4346***	2544***	1504***	3544***	2467***	1099***	4346***	2544***	1504***	3544***	2467***	1099***
F-Statistic	6313	97	18,000	8487	1083	46,000	6313	97	18,000	8487	1083	46,000
Observations	14,009	6018	7991	16,772	7445	9327	14,009	6018	7991	16,772	7445	9327
R squared	0.517	0.443	0.517	0.546	0.466	0.564	0.168	0.276	0.093	0.225	0.340	0.107

Geographic variables reported in Table 2 are included in the estimation models. Time Poverty is computed as committed time > 1.5 times median. Robust standard errors in parentheses. Means of the dependent variable for the omitted comparison group (time nonpoor) are presented in brackets. Significance at 10%, 5%, and 1% are indicated by *, **, and *** respectively. *Source:* Authors' computation using Ghana Living Standard Survey (GLSS) datasets

Table 5 Time poverty, walking hours and child work – Lewbel 2SLS with internal instruments

	Hours attending school						Number of children working					
	GLSS 7 (2016/2017)			GLSS 6 (2012/2013)			GLSS 7 (2016/2017)			GLSS 6 (2012/2013)		
	All	Urban	Rural	All	Urban	Rural	All	Urban	Rural	All	Urban	Rural
Time poor	-0.076 (0.069)	-0.127 (0.110)	-0.082 (0.105)	0.295*** (0.064)	0.189*** (0.082)	0.347*** (0.102)	0.024 (0.017)	0.047*** (0.021)	-0.005 (0.031)	0.006 (0.015)	0.025 (0.016)	-0.022 (0.030)
Socio-demographic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geographic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time non-poor mean category	[3.469]	[3.814]	[3.234]	[3.310]	[3.564]	[3.126]	[0.423]	[0.159]	[0.603]	[0.344]	[0.135]	[0.496]
Diagnostic tests												
Underidentification test	4346***	2544***	1504***	3544***	2467***	1099***	4346***	2544***	1503***	3545***	2467***	1099***
F-Statistic	6313	97	18,000	8487	1083	46,000	6313	97	18,000	8487	1083	46,000
Observations	14,009	6018	7991	16,772	7445	9327	14,009	6018	7991	16,772	7445	9327
Centered R squared	0.420	0.470	0.398	0.502	0.558	0.470	0.297	0.135	0.295	0.267	0.182	0.274

Geographic variables reported in Table 2 are included in the estimation models. Time Poverty is computed as committed time > 1.5 times median. Robust standard errors in parentheses. Means of the dependent variable for the omitted comparison group (time non-poor) are presented in brackets. Significance at 5%, and 1% are indicated by ** and *** respectively

Fig. 9 Common support region for time poor and time non-poor households (GLSS 6/GLSS7). Panel A – Pooled Sample (GLSS 6). Panel B – Pooled Sample (GLSS 7)

ceteris paribus. We explore whether the effects of time poverty on child welfare outcomes differ by location. Time poverty is associated with a 21% and 29% increase in walking hours to and from school in urban and rural households, respectively. Time poverty is negatively associated with a 6% decrease in the number of children attending public schools in urban households.

Focusing on the results from the models of the GLSS 7 (Table 3), we observed that time poverty is negatively and positively associated with the number of children attending public schools and the number of children attending private schools, respectively. A time poor household records approximately a 9% reduction in the number of children attending public school and a 9% increase in the number of children attending private school. Regarding location disaggregation, time poverty increases the number of children attending private schools by 6% and 7% in urban and rural households but decreases the number of children attending public school by 6% in urban households. Our results show that time poverty is positively associated with child work suggesting that time poor households observed a 3% increase in the number of children working in urban households. The rural-urban differences in child work and schooling outcomes can be attributed to income differential across locations. Household heads in urban locations are more likely to earn higher income on average than rural household heads, although they may both work the same number of hours.

4.3 Robustness Checks: Lewbel 2SLS Estimation

The results of the multicollinearity tests are presented in Table A5. The results suggest very low multicollinearity since the mean variance inflation factor (VIF) values of 1.65 and 1.68 are less than the minimum cut-off value of 10. To test the robustness of our estimates, we perform a sensitivity test using the Lewbel (2012) 2SLS method to examine the sensitivity of our IPWRA estimation of time poverty on child welfare outcomes. The results of the robustness check are reported in Tables 4 and 5. The Lewbel 2SLS employs heteroskedasticity to generate internal instruments used

to address endogeneity. Consistent with the IPWRA estimate, the Lewbel 2SLS estimation shows that time poverty is negatively associated with the number of children attending public school and positively associated with the number of children attending private school, walking hours to school and child work. Nevertheless, the magnitude of the effect is relatively higher for the Lewbel 2SLS than the IPWRA estimates.

Table 5 reports the results of time poverty on walking hours to and from school and child work. Our results show that time poverty decreases the number of children attending school by approximately 11% in 2012/2013 and increases the number of children attending private school by 5% in 2016/2017 (Table 4). In terms of location, time poverty reduces the number of children attending public school by 14% and increases the number of children attending private schools by approximately 9% in rural households. Time poverty increased walking hours to and from school by approximately 30% in 2012/2013. Regarding location disaggregation, we observed that time poverty increases walking hours to and from school by 19% and 35% in urban and rural households, respectively, while the number of children working increased by approximately 5% in urban households for the 2016/2017 period.

4.4 Heterogeneity Analysis Based on Sex

We report the findings of parental time poverty on child schooling and hours walking to and from school based on sex disaggregation in Table 6. Our results suggest that the parental time poverty effect on schooling is more pronounced among male children than female children in 2016/2017. Parental time poverty decreases the number of male children attending school and walking hours to and from school by 5.2% and 8.8%, respectively. However, parental time poverty increases male and female child walking hours to and from school by 29% and 30%, respectively, in 2012/2013. Comparing the results across years, we find that Ghana has made significant progress in minimizing the school access gap among male children between 2012/2013 to 2016/2017. Improvement in infrastructure such as roads and building of basic community schools may have contributed to reducing travel time to and from school.

Table 7 presents the effect of parental time poverty on child work across survey years. Results show that parental time poverty did not affect child work in 2016/2017 but reduced male child work by 9% in 2012/2013. The modest negative effect may be attributed to substitution between child home production and labour market participation. Parents who work long hours beyond the committed time of labour engagement may have insufficient time for home production. Given this, children's participation in the labour market will be reduced to increase their involvement in home production.

4.5 Potential Channel Analysis

We explore one channel (net income) through which time poverty influences child welfare outcomes. We test whether time poverty is significantly associated with net

Table 6 Lewbel 2SLS estimates of time poverty on schooling: male - female

Variables	GLSS 7(2016/2017)				GLSS 6 (2012/2013)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Male Schooling	Female Schooling	Male walking hours	Female walking hours	Male Schooling	Female Schooling	Male walking hours	Female walking hours
Time poor	-0.052* (0.031)	0.031 (0.031)	-0.088** (0.043)	-0.047 (0.041)	-0.034 (0.030)	0.003 (0.030)	0.288*** (0.105)	0.304*** (0.104)
Controls								
Socio-demo-graphic	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geographic	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Diagnostic tests								
Underidenti-fication test	1810***	1991***	1007***	1065	1516***	1457***	1313***	1280***
F-Statistic	9641	7746	8082	6647	8197	9062	8158	9271
Observations	6356	6837	3739	3630	8138	7808	6657	6664
R squared	0.273	0.300	0.067	0.067	0.334	0.298	0.073	0.073

Table 7 Lewbel 2SLS estimates of time poverty on child work: male - female

Variables	GLSS7 (2016/2017)		GLSS6 (2012/2013)	
	(1)	(2)	(3)	(4)
	Male child work	Female child work	Male child work	Female child work
Time poor	-0.005 (0.028)	0.001 (0.035)	-0.085* (0.049)	-0.008 (0.059)
Socio-demographic	Yes	Yes	Yes	Yes
Geographic	Yes	Yes	Yes	Yes
Diagnostic tests				
Underidentification test	353***	291***	238***	216***
F-Statistic	245	91	7009	6838
Observations	812	739	2058	1907
R squared	0.073	0.241	0.230	0.170

Table 8 Lewbel 2SLS - time poverty and log of net income

Variables	GLSS 6 (2012/2013)	GLSS 7 (2016/2017)
	Net income (log)	Net income (log)
Time poor	0.071** (0.032)	0.185*** (0.059)
Socio-demographic controls	Yes	Yes
Geographic controls	Yes	Yes
Diagnostic tests		
Underidentification test	3660***	1411***
Weak identification test	1035	54
Hansen J statistic	60***	33**
Observations	16,048	11,868
R squared	0.208	0.397

Geographic variables reported in Table 2 are included in the estimation models. Time Poverty is computed as committed time > 1.5 times median. Robust standard errors in parentheses. Significance at 5%, and 1% are indicated by ** and *** respectively

Source: Authors' computation using Ghana Living Standard Survey (GLSS) datasets

income based on a two-step procedure proposed by Koomson and Churchill (2021) and Awaworyi Churchill and Smyth (2020). In the first stage, we regress the log of net income on time poverty and other covariates, and the results are reported in Table 8. The result indicates that time poverty is associated with approximately 7% and 19% increase in the log of net income in 2012/2013 and 2016/2017, respectively.

Secondly, we included the log of net income as a covariate in the child welfare outcomes and reported the results in Table 9. For eligibility as a potential channel, the magnitude of time poverty in the model is expected to decrease or become insignificant if the log of net income is included as a covariate in the child welfare

Table 9 Lewbel 2SLS - Time poverty and child welfare outcomes (potential channel analysis)

	GLSS 6 (2012/2013)				GLSS 7 (2016/2017)			
	Mediator: Net income (log)				Mediator: Net income (log)			
	Public school	Private school	Walking hours	Child work	Public school	Private school	Walking hours	Child work
Time poor	-0.045 (0.029)	0.007 (0.022)	0.103 (0.063)	0.005 (0.019)	-0.0574 (0.049)	0.033 (0.033)	-0.055 (0.102)	0.006 (0.034)
Net income (log)	-0.017** (0.007)	0.030*** (0.005)	-0.046*** (0.016)	0.008* (0.004)	-0.174** (0.008)	0.044*** (0.005)	0.470*** (0.042)	0.004 (0.006)
Socio-demographic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geographic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Diagnostic tests								
Underidentification test	3677***	3677***	3677***	3677***	1393***	1393***	1393***	1393***
Weak identification test	968	968	968	968	50	50	50	50
Hansen J statistic	9	13	18	41***	17	13	27*	23
Observations	16,048	16,048	16,048	16,048	11,868	11,868	11,868	11,868
R squared	0.548	0.210	0.502	0.265	0.520	0.158	0.422	0.308

Geographic variables reported in Table 2 are included in the estimation models. Time Poverty is computed as committed time > 1.5 times median. Robust standard errors in parentheses. Significance at 10%, 5%, and 1% are indicated by *, ** and *** respectively. *Source:* Authors' computation using Ghana Living Standard Survey (GLSS) datasets

outcome models. Our results show that time poverty is not significant in any models (Table 9). For the 2012/2013 period, we observed that time poverty is associated with a decrease in the number of children attending public school and walking hours to and from school while positively related to the number of children attending private school and working. Similarly, we observed a positive association between time poverty and the number of children attending private school and walking hours to and from school while negatively associated with the number of children attending public school.

Comparing the results of Tables 4, 5 and 9, we observed that inclusion of log net income in the regression (Table 9) led to a decrease in the magnitude of the coefficient of time poverty (though not significant) compared to those in Tables 4 and 5. Based on the results, we can conclude that net income serves as an important channel through which time poverty influences child welfare outcomes. Our results suggest that improving employment opportunities coupled with capacity building and infrastructure support will increase household income and reduce household time poverty, likely translating to improved child welfare outcomes.

5 Discussion

The results show that time poverty is positively associated with walking hours to and from school, and private school attendance while negatively associated with public school attendance. Time poverty is more likely to be observed among the income non-poor households (Kizilirmak & Memis, 2009; Lawson, 2007). Orkoh et al. (2020) suggest that households engaged in an economic activity are more likely to experience time poverty than their counterparts who did not work due to illness, retirement or active schooling. Time poor household heads spend greater proportion of their time in the labour market with low remuneration than the time non-poor households, thus generate income to accommodate the cost of private school enrolment of their children.

Walking long hours to and from school by children from time poor households reflects the costs of education. Private schools are associated with regular monitoring of child performance and are relatively costly. Time poor household heads prefer to enroll their children in schools that offer quality education with the objective of increasing the probability of the child securing good employment opportunities in the future. Schools outside the community of residence of the household head is associated with a high cost that requires a corresponding income to sustain enrolment. Household heads may work long hours to earn more income to accommodate the cost of child's enrolment.

Given that time poor households spend most of their time in the labour market. They can generate the required income to adjust the cost of travel, assuming the income is enough to accommodate all other household expenditures. To a large extent, the household bargaining power influences the allocation of resources between child investment and other equally essential household activities. A benevolence dictator may allocate resources in such a way that leads to a Pareto optimal condition. Our results suggest that the inequality in education can be addressed

through policies that ensure equitable distribution of education infrastructure, and adequate staff motivation to attract quality teachers and reduce staff attrition.

The results show that time poverty is positively associated with child work and negatively associated with public-school attendance. Households that are time poor are more likely to spend several hours in the labour market, which may not necessarily generate high income to meet the household budget. Under such circumstances, children are more likely to participate in the labour market to complement household income and smoothen consumption. However, such a strategy may have a long-term adverse effect on children's education and labour market opportunities. Children in sub-Saharan Africa work at higher rates than children in any other continent (Sakurai, 2013), and 40% of Ghanaian children (aged seven to 14) engage in harmful work to their well-being (UNICEF, 2013). Policies that ensure equitable distribution of employment opportunities irrespective of geographical locations to offer fairly active household members employment opportunities while discouraging children from working. The situation is more critical in the rural areas and has recently gained traction in the urban areas, especially for migrants. Time poor households are less likely to attend public school. According to Ainsworth et al. (2005), high rates of child labour discourage children from attending school even if they are already enrolled. In Ghana, the statistics show that 20% of children engaged in work while attending school, while 18% work but do not attend school (UNICEF, 2013).

6 Conclusion

Several studies have examined the determinants of time poverty and the relationship with food security, energy choice, eating, physical activity, and parenting. However, no study has looked at the relationship between time poverty and child work, schooling and travel time to and from school. In this study, we fill this gap by using data from the sixth and seventh rounds of the Ghana Living Standard Survey. We employed the inverse probability weighted regression adjustment as the primary estimation technique and used the Lewbel 2SLS estimation technique as a robustness check.

The study has two main findings. First, time poverty is positively associated with walking hours to and from school, private school attendance, and the number of children working. Second, time poverty negatively affects the number of children attending public school. The results suggest that the main channel or mechanism of causal impact is through an increase in income given that time poor households spend more time in the labour market than non-poor household heads. Active participation in the labour market may generate income to overcome the burden of time poverty by employing labour for home production.

Overall, the results indicate that while time poverty improves children's enrolment in private schools, increasing child work in urban areas cannot be underestimated. This suggests that longevity of participation in the labour market may not necessarily reduce child work. Given that labour is the main asset of the poor, it is essential to increase labour productivity through infrastructure and labour-improving programs to reduce household time in unrewarding labour opportunities. The

second implication of the study is that the Ministry of Employment and Labour Relations (specifically the National Labour Commission) must consult with employers' associations to create flexible working conditions that motivate household heads to work shorter hours to reduce time spent in the labour market without necessarily becoming consumption poor.

The study is limited in the following ways: Cross-sectional data limits the discussion on the role of time poverty on child work and schooling. Our study is unable to discuss the dynamic effect of time poverty. Second, our study lacks key child indicator welfare outcomes such as child poverty, health, and school performance. Finally, excluding some essential explanatory variables such as child health indicators may not have captured the variation in time poverty fully. Thus, the results must be interpreted with caution.

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Category 1.

Conception and design of study: E. Martey, I. Koomsom and P.M. Etwire; acquisition of data: E. Martey; analysis and/or interpretation of data: E. Martey.

Category 2.

Drafting the manuscript: E. Martey, I. Koomsom and P.M. Etwire; revising the manuscript critically for important intellectual content: E. Martey, P.M. Etwire, and I. Koomsom.

Category 3.

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Data Availability The authors do not have the right to share the data but available upon request.

Declarations

Competing Interests The authors declare that they have no competing interests both financial and non-financial.

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