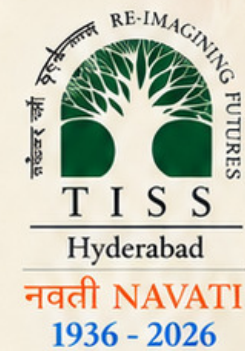


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AND CHILDREN'S
LEARNING OUTCOMES

*Longitudinal Evidence from Four Low- and
Middle-Income Countries*

Pintu Paul

School of Public Policy and Governance, TISS Hyderabad

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Unpaid Household and Care Work and Children's Learning Outcomes

Longitudinal Evidence from Four Low- and Middle-Income Countries

Pintu Paul^{*,**}

Abstract

This study examines the relationship between children's engagement in unpaid household and care work and their learning outcomes across four low- and middle-income countries: Ethiopia, India, Peru, and Vietnam. Drawing on longitudinal data from the Young Lives study (2006–2016), the study employs child fixed-effects and instrumental-variable (IV) models to estimate the association between time spent in unpaid work and standardised test scores in mathematics, reading, and vocabulary. Findings reveal substantial gender disparities, with girls consistently undertaking more unpaid work than boys do. Results from fixed-effects models indicate that an increase in unpaid work time is associated with lower mathematics performance among girls in pooled estimates. However, associations with reading and vocabulary are weaker and more heterogeneous. Nonlinear analyses suggest that moderate levels of unpaid work may not be detrimental, whereas high-intensity engagement (three or more hours per day), particularly when combined with no study time, is linked to significantly poorer learning outcomes. IV estimates suggest potentially stronger negative associations between unpaid work and mathematics achievement for both boys and girls. The study highlights important cross-country variations and gendered vulnerabilities, suggesting that excessive unpaid work burdens can constrain children's cognitive development. Policies should address time poverty and gender inequality to improve educational outcomes.

Keywords: unpaid care work, learning outcomes, cognitive development, time use, longitudinal analysis, Young Lives study

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Introduction

Children's daily activities and the way they allocate time within and outside the household have important implications for cognitive development, educational trajectories, and long-term well-being. A growing body of research shows that children's time-use patterns, including time spent studying, playing, resting, and working, shape their learning environments and educational outcomes.¹

Unpaid household and care work comprises a broad range of activities that do not generate monetary income but require substantial time and effort. These include domestic chores and caregiving responsibilities such as cooking, cleaning, fetching water or firewood, caring for siblings, and supporting older adults.² Beyond routine domestic and care tasks, unpaid work also includes family-based economic activities such as livestock rearing, farming, assisting in small retail shops, and artisanal production like weaving, basket making, and pottery. Much of this labour remains statistically and socially "invisible," as it is often not recognised as work because it lacks direct wages, despite its significant economic and social value. Such unpaid work is widespread across low- and middle-income contexts and is often socially normalised, particularly for girls.³ Time spent on unpaid domestic and caregiving work can hinder children's learning, rest, leisure, and other productive childhood activities, especially when the work is high-intensity or sustained for long hours.

Time-use research consistently highlights strong gender disparities in children's activity patterns.⁴ Girls typically shoulder a disproportionate share of unpaid domestic and care responsibilities, which can limit their participation in education, paid work, and social and civic activities.⁵ Evidence from India using Young Lives data shows that boys spend significantly more time on schooling and leisure, whereas girls devote more time to domestic and care responsibilities, reinforcing gender gaps in opportunities and outcomes.⁶ Similar patterns are observed in other contexts. Studies from informal urban settlements in Indonesia and Fiji indicate that girls spend more hours in unpaid labour than boys, resulting in reduced time available for schooling and home-

¹ E. Martey et al., "Child Labour, Schooling and Rural Economies in Ghana", *Journal of Development Studies* (2022).

² S. Sahoo, K. K. Sarkar, and A. Kumar, "Valuation of Unpaid Household Activities in India", *Economic and Political Weekly* 59, no. 39 (2024): 190–96.

³ UNICEF, *Time Spent on Unpaid Domestic and Caregiving Services by Children in India: Insights into Gender, Age and Learning* (United Nations Children's Fund, 2024).

⁴ UNFPA India, *An Analysis of Time Use Pattern among Young People in India: A Gender Perspective Based on the 2024 Time Use Survey* (UNFPA, 2026).

⁵ UNICEF, *Time Spent on Unpaid Domestic*.

⁶ K. Vikram, D. Ganguly, and S. Goli, "Time Use Patterns and Household Adversities: A Lens to Understand the Construction of Gender Privilege among Children and Adolescents in India", *Social Science Research* 118 (2024): 102970.

work.⁷ Recent evidence from the Indian Time-Use Survey (January–December 2024) indicates that women allocate nearly one-fifth of their daily time (19.7%) to unpaid domestic and care work, whereas men allocate only 2.6% of their time to such work.⁸ These unequal responsibilities often push women into part-time or low-wage informal employment that offers greater flexibility in managing unpaid work demands. Adolescent girls are also frequently drawn into unpaid domestic and care tasks, sometimes at the cost of continued schooling. The disproportionate allocation of unpaid work to women and girls both reflects and reinforces persistent gender inequalities across the life course.⁹

Existing research has extensively examined the effects of child labour and paid work on schooling and health outcomes.¹⁰ A multi-country study of low- and middle-income countries found a negative relationship between children's engagement in labour and school enrolment, indicating that child labour reduces school enrolment.¹¹ However, unpaid household and care work has received comparatively less empirical attention, despite being more prevalent and more gendered. Unpaid work is frequently excluded from labour statistics and policy debates, yet it constitutes a major share of children's daily responsibilities in resource-constrained settings. The invisibility of unpaid work obscures its potential developmental consequences and may lead to an underestimation of gendered inequalities in childhood environments.

Several studies have documented negative associations between unpaid work and educational outcomes, including lower school attendance, higher dropout rates, and reduced academic achieve-

⁷ M. Escobar Carías et al., "The Gender Gap in Children's Educational Time Investments in Informal Settlements", *Review of Economics of the Household* 23, no. 3 (2025): 1133–53.

⁸ D. Sinha, "Time Use Survey: Women Spent 20% of Their Time on Unpaid Care Work, Men Spent 2.6%", *The Wire*, 2025, <https://thewire.in/gender/what-the-time-use-survey-says-about-womens-work>.

⁹ UNFPA India, *Time Use Pattern*.

¹⁰ O. O'Donnell, E. Van Doorslaer, and F. C. Rosati, "Child Labour and Health: Evidence and Research Issues" (Understanding Children's Work Project Working Paper, ILO, World Bank and UNICEF, 2002), <https://documents1.worldbank.org/curated/en/832621468337828094/pdf/438690WPoBox321alth1Review01PUBLIC1.pdf>; K. Beegle, R. H. Dehejia, and R. Gatti, "The Education, Labour Market and Health Consequences of Child Labour" (2004); P. Mavrokonstantis, "The Impact of Child Labour on Educational Attainment: Evidence from Vietnam" (Young Lives Student Paper, Oxford: Young Lives, 2011); D. Boutin and M. Jouvin, "Child Labour Consequences on Education and Health: A Review of Evidence and Knowledge Gaps" (Working paper, 2022), https://hal.science/hal-03896700v1/file/BSE_BxWP2022_14_Boutin.pdf; A. M. Thi, C. Zimmerman, and M. Ranganathan, "Hazardous Child Labour, Psychosocial Functioning, and School Dropouts among Children in Bangladesh: A Cross-Sectional Analysis of UNICEF's Multiple Indicator Cluster Surveys (MICS)", *Children* 10, no. 6 (2023): 1021; J. Bai and Y. Wang, "Returns to Work, Child Labor and Schooling: The Income vs. Price Effects", *Journal of Development Economics* 145 (2020): 102466.

¹¹ D. L. Putnick and M. H. Bornstein, "Is Child Labor a Barrier to School Enrollment in Low- and Middle-Income Countries?", *International Journal of Educational Development* 41 (2015): 112–20.

ment.¹² A recent study using youth data from India's Understanding the Lives of Adolescents and Young Adults (UDAYA) survey found that longer time spent on unpaid domestic work was associated with a higher likelihood of dropping out of school, increased absenteeism, and lower proficiency in reading and arithmetic, with some evidence of greater adverse effects for girls.¹³ Another study in Andhra Pradesh, India, utilising data from the Young Lives Survey, found that children who spent more than three hours on domestic work at age 12 were 70% less likely to complete secondary education than those who worked fewer than three hours.¹⁴ Similarly, a study in Côte d'Ivoire found that girls aged 6–11 who were engaged in domestic work were more likely to repeat a school year.¹⁵ A Young Lives study in Ethiopia found that children's involvement in household work is associated with less time spent in school.¹⁶

Notwithstanding, research also suggests that children's engagement in household chores can support the development of essential life skills and strengthen their sense of cooperation, responsibility, independence, and self-esteem.¹⁷ Some studies report a positive association between participation in household work and academic performance. For example, research from Zambia indicates that engagement in chores and related tasks is positively linked with mathematics and reading achievement among out-of-school children.¹⁸ Similarly, a study from China finds that children's involvement in household chores is positively correlated with problem-solving ability.¹⁹ However, these benefits are likely to be sustained only when household responsibilities are not excessive and do not displace study time or school attendance.

Unpaid household and care work can influence learning outcomes via multiple mechanisms. First, time allocated to household tasks may directly displace study time, reduce sleep, or limit engage-

¹² Martey et al., "Child Labour, Schooling"; S. Kyei-Gyamfi, "Household Chores and Their Effects on Children: Perspective from Ghana", *Humanities and Social Sciences Communications* 12, no. 1 (2025): 1–9.

¹³ A. Sharma and A. Shah, "The Role of Time Spent in Unpaid Domestic Work on Educational Outcomes among Adolescents and Young Adults: Quantitative Evidence from India", *Discover Education* 4, no. 1 (2025): 22.

¹⁴ R. Singh and P. Mukherjee, "‘Whatever She May Study, She Can’t Escape from Washing Dishes’: Gender Inequity in Secondary Education—Evidence from a Longitudinal Study in India", *Compare: A Journal of Comparative and International Education* 48, no. 2 (2018): 262–80, <https://doi.org/10.1080/03057925.2017.1306434>.

¹⁵ P. E. Abou, "Does Domestic Work Affect the Academic Performance of Girls in Primary School in Côte d'Ivoire? Empirical Evidence from Probit Model", *European Scientific Journal* 12, no. 35 (2016): 368–81.

¹⁶ Y. Dinku, D. Fielding, and M. Genç, "Counting the Uncounted: The Consequences of Children's Domestic Chores for Health and Education in Ethiopia", *Review of Development Economics* 23, no. 3 (2019): 1260–81.

¹⁷ J. J. Goodnow, "Children's Household Work: Its Nature and Functions", *Psychological Bulletin* 103, no. 1 (1988): 5–26; Kyei-Gyamfi, "Household Chores".

¹⁸ J. Reich et al., "Associations between Household Responsibilities and Academic Competencies in the Context of Education Accessibility in Zambia", *Learning and Individual Differences* 27 (2013): 250–57.

¹⁹ L. Xia et al., "The Relationship between Involvement in Household Chores and Problem-Solving Abilities among Preschool Children and the Moderating Role of Parental Scaffolding", *Acta Psychologica* 260 (2025): 105629.

ment in cognitively stimulating activities, thereby reducing learning efficiency.²⁰ Second, the physical and emotional fatigue resulting from sustained labour may impair concentration and memory consolidation.²¹ Third, unpaid work may interact with schooling demands, gender norms, and socioeconomic constraints in ways that vary across contexts. These potential pathways suggest that the relationship between unpaid work and learning outcomes may be nonlinear and context-dependent, including threshold effects in which moderate levels of engagement may coexist with schooling, whereas heavy burdens are more detrimental.

Two recent studies are especially important to positioning the contribution of this study. Using data from the same four Young Lives countries, Keane, Krutikova and Neal²² show that the relationship between children's work and cognitive development depends critically on whether work displaces school time or leisure time: work that competes with schooling is harmful for mathematics and reading, whereas work that displaces leisure is not. Chang²³ applies a related time-use framework to socio-emotional, rather than cognitive, development. However, less attention has been paid specifically to unpaid household and care work in understanding children's educational trajectories. Comparative evidence on the role of unpaid work in shaping cognitive outcomes across diverse low- and middle-income country (LMIC) settings remains limited. Only a few studies exist that are primarily conducted in a single country, are cross-sectional, or focus on attendance and attainment rather than standardised cognitive test scores. This gap limits understanding of whether observed relationships reflect universal developmental constraints or context-specific institutional and cultural dynamics.

Against this backdrop, we examine how time spent in unpaid household and care work relates to children's cognitive outcomes in mathematics, reading, and vocabulary across four LMIC contexts (Ethiopia, India, Peru, and Vietnam), using longitudinal data from the Young Lives study. We also examine nonlinear threshold and compound work/study-time specifications in the association. We estimate child fixed-effects models to account for time-invariant unobserved characteristics, examine gender differences and nonlinear thresholds, and use instrumental variables to explore poten-

²⁰ S. C. Yeo et al., "Associations of Time Spent on Homework or Studying with Nocturnal Sleep Behavior and Depression Symptoms in Adolescents from Singapore", *Sleep Health* 6, no. 6 (2020): 758–66.

²¹ A. Molarius and A. Metsini, "The Association between Time Spent in Domestic Work and Mental Health among Women and Men", *International Journal of Environmental Research and Public Health* 20, no. 6 (2023): 4948.

²² M. Keane, S. Krutikova, and T. Neal, "Child Work and Cognitive Development: Results from Four Low to Middle Income Countries", *Quantitative Economics* 13, no. 2 (2022): 425–65, <https://doi.org/10.3982/QE1745>.

²³ G. Chang, "How Is Adolescents' Time Allocation Associated with Their Self-Esteem and Self-Efficacy? Evidence from Four Developing Countries", *Journal of Development Studies* 58, no. 11 (2022): 2237–62, <https://doi.org/10.1080/00220388.2022.2079621>.

tial causal pathways. Based on the longitudinal data across multiple contexts, the study contributes new evidence on the hidden role of unpaid work in shaping educational trajectories and gendered learning inequalities.

Materials and Methods

Data Source and Study Sample

This study uses longitudinal child-level data from the Young Lives study, an international cohort study on childhood poverty that has tracked approximately 12,000 children over a 15-year period in Ethiopia, India (in the states of Andhra Pradesh and Telangana), Peru, and Vietnam. Young Lives follows two birth cohorts: an Older Cohort (born in 1994) and a Younger Cohort (born in 2001). The survey collects detailed information on children's and households' socio-economic conditions, access to services, work patterns, schooling, nutrition, and cognitive development.

The original Young Lives sample in each country was drawn using a sentinel-site approach designed to capture socio-economic diversity while over-representing poorer areas. In Peru, for example, sites were randomly selected across the country, with the richest 5 per cent of districts excluded from the sampling frame. The panel structure enables within-child comparisons over time and supports fixed-effects estimation strategies.

We use data from the second to fifth rounds (2006–2016) from both cohorts for which consistent information is available on children's time use, cognitive test scores, and covariates.

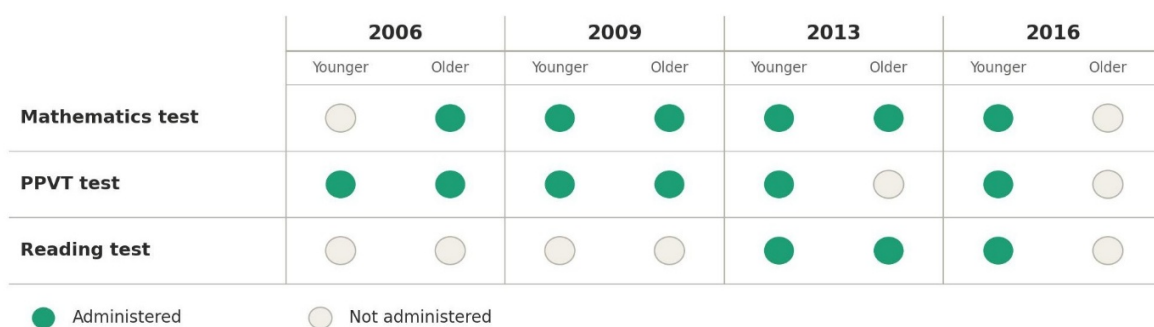


Figure 1. Cognitive tests administered across survey years and cohorts

Figure 1 presents the distribution of cognitive tests administered across survey years and cohorts. The analytic sample is restricted to observations with non-missing values for unpaid work time, educational outcomes, and control variables. Because cognitive tests were administered selectively

by round and cohort, sample sizes vary across outcomes. Models are estimated separately by country and gender, and for pooled cross-country samples stratified by gender.

Outcome Variables

Our outcomes of interest are learning test scores. Learning outcomes are measured using standardised cognitive and achievement test scores in mathematics, vocabulary, and reading comprehension.

Young Lives administered multiple cognitive assessments across rounds and cohorts to ensure comparability of children's cognitive abilities and academic achievement over time. The only test administered consistently across multiple rounds is the Peabody Picture Vocabulary Test (PPVT), a widely used measure of receptive vocabulary. Mathematics and reading assessments varied across rounds; however, anchor items common to all rounds and cohorts were retained to enable score equating and comparability.

The PPVT is an individually administered, oral, untimed, norm-referenced test of receptive vocabulary. Children are asked to select the picture that best represents a word spoken by the enumerator. Ethiopia, India, and Vietnam used PPVT-III, while Peru used the Spanish adaptation, the Test de Vocabulario en Imágenes Peabody (TVIP). Test administration follows standard basal and ceiling rules, with raw scores based on the number of correct responses. Due to ceiling effects observed among the Older Cohort in earlier rounds, PPVT from Round 4 onward was administered only to the Younger Cohort. In later rounds in Ethiopia, India, and Vietnam, a reduced subset of well-performing items was selected using Item Response Theory methods to maintain longitudinal comparability. In Peru, the fully adapted version continued to be used. Mathematics achievement tests were introduced from Round 2 for the Older Cohort and Round 3 for the Younger Cohort. Although test instruments differed across rounds, a core set of anchor items was retained to equate scores across survey waves and cohorts. Reading comprehension assessments were introduced for both cohorts from Round 4 onward, again using common anchor items to enable cross-round comparability. These tests capture skills ranging from basic decoding to comprehension and interpretation.

To ensure cross-country and cross-round comparability in the present analysis, all raw test scores are converted to z-scores within each country-survey-round combination. Higher scores indicate better performance. While equating procedures improve comparability, differences in instruments and administration across rounds may introduce some measurement noise, particularly for mathe-

maths and reading scores.

Explanatory Variable

The main explanatory variable is children's daily time spent in unpaid household and care work. This measure aggregates reported time spent in household chores, caregiving for household members, and unpaid domestic production activities, including agricultural work and work in a family enterprise. Time use is recorded in hours per day based on child or caregiver reports.

This measure is conceptually distinct from, but partly overlapping with, standard definitions of child labour. Widely used definitions (e.g., the statistical standards of the International Labour Organization) classify children's economic activity as child labour depending on age, weekly hours, and hazard conditions, and typically include work in agriculture and family enterprises within this scope. The agricultural and family-enterprise components of our unpaid work measure therefore fall, in part, within existing child labour definitions once age and intensity thresholds are applied, whereas domestic chores and caregiving are more often excluded from child labour statistics even though they impose comparable time burdens. What is distinctive about our measure is its focus on the non-remunerated character of the activity, irrespective of whether it would separately qualify as child labour, and its inclusion of caregiving and domestic tasks that conventional child labour statistics tend to omit.

Three measures of the unpaid and care work burden are constructed:

- **Continuous measure:** total hours per day spent in unpaid work
- **Categorical measure:** unpaid work grouped into zero hours (reference), below three hours per day, and three or more hours per day
- **High-burden with no time spent on study:** a binary variable, coded as '1' if the child spends three or more hours per day in unpaid work and reports zero time spent studying, and '0' otherwise. The three-hour threshold follows precedent in research on children's domestic work in comparable settings, where three or more hours per day has been associated with substantially worse educational outcomes.²⁴

The categorical specification is used to assess potential nonlinear or threshold effects. The combined variable on excessive unpaid work burden with no time spent on study captures children

²⁴ Singh and Mukherjee, "Whatever She May Study".

facing simultaneous time pressure from unpaid work and complete displacement of study time, representing a more severe constraint on learning time.

Covariates

All models adjust for time-varying child and household characteristics that may be associated with both unpaid work and educational outcomes. These include child age in months, current school enrolment status, household size, and household wealth index. These covariates account for observable changes in household conditions and schooling participation over time.

Empirical Strategy

Fixed-Effects Models

We estimate child fixed-effects regression models to examine the association between unpaid work time and educational outcomes. This approach exploits within-child variation across survey rounds and controls for all time-invariant observed and unobserved characteristics of the child and household, including baseline ability and persistent socio-economic factors.

The baseline econometric specification is:

$$\gamma_{ict} = \beta_1 UW_{ict} + \beta_2 X_{ict} + \alpha_i + \lambda_t + \varepsilon_{ict} \quad (1)$$

where γ_{ict} denotes the standardised test score of child i in country c at survey round t ; $\beta_1 UW_{ict}$ is time spent in unpaid work; $\beta_2 X_{ict}$ is a vector of time-varying child and household covariates; α_i represents child fixed effects; λ_t represents survey-round fixed effects; and ε_{ict} is the idiosyncratic error term.

All specifications include child fixed effects and survey-round fixed effects. Standard errors are clustered at the child level to account for within-child correlation over time. The main specification models unpaid work time as a continuous predictor, with additional models using categorical exposure measures and the high-burden/no-study indicator to assess nonlinear associations. Models are estimated separately by country and gender, and for pooled cross-country samples stratified by gender.

Instrumental-Variable (IV) Models

To address potential endogeneity of unpaid work time arising from time-varying unobserved factors, such as household shocks or changes in children's circumstances, we estimate instrumental-variable (IV) models using two-stage least squares (2SLS) with fixed effects. Unpaid work time is treated as endogenous and instrumented using measures of household exposure to economic and environmental shocks.

Household shock measures are derived from household survey modules that record whether specific adverse events occurred during the reference period. Each shock is recorded as a binary variable (coded as '1' if experienced, '0' otherwise). Two additive indices are constructed by summing binary shock indicators: the economic shock index and the environmental shock index. The economic shock index aggregates nine indicators related to livelihood and financial disruptions, including income loss, employment or business shocks, asset and production losses, and price shocks. The environmental shock index aggregates 11 climate- and environment-related events, including droughts, floods, irregular rainfall, crop failures, pest attacks, storms, forest fires, and earthquakes. Each index is computed as the row-wise sum of its component indicators, with higher values reflecting greater shock exposure.

These shocks are expected to influence children's participation in unpaid work through household coping responses and adjustments in labour allocation. Conditional on observed covariates and fixed effects, they are assumed not to directly affect children's cognitive test scores except through their effect on unpaid work time. This assumption is supported by the existing literature, which suggests that household shocks increase the burden of household work and reduce investment in children's education.²⁵

The first-stage equation of IV models is specified as:

$$UW_{ict} = \pi_1 EconShock_{ict} + \pi_2 EnvShock_{ict} + \pi_3 X_{ict} + \alpha_i + \lambda_t + v_{ict} \quad (2)$$

²⁵ S. Dhanaraj, C. M. Paul, and S. Gade, "Household Income Dynamics and Investment in Children: Evidence from India", *Education Economics* 27, no. 5 (2019): 507–20; H. Kazianga, "Income Risk and Household Schooling Decisions in Burkina Faso", *World Development* 40, no. 8 (2012): 1647–62; S. Wongmonta, "The Impact of Parental Health Shocks on Child Schooling and Labour: Evidence from Thailand", *Asia & the Pacific Policy Studies* 11, no. 3 (2024): e70000; C. J. Nordman, S. Sharma, and N. Sunder, "Here Comes the Rain Again: Productivity Shocks, Educational Investments, and Child Work", *Economic Development and Cultural Change* 70, no. 3 (2022): 1041–63.

The second-stage equation is:

$$\gamma_{ict} = \beta_1 \widehat{UW}_{ict} + \beta_2 X_{ict} + \alpha_i + \lambda_t + \epsilon_{ict} \quad (3)$$

where $\widehat{UW}_{ict}$ denotes the predicted value of unpaid work time from the first stage.

All IV models include child and survey-round fixed effects, as well as the same time-varying covariates as the fixed-effects models. Standard errors are clustered at the child level. We report standard IV diagnostic statistics, including the Kleibergen–Paap rk Wald F statistic for instrument strength, the Kleibergen–Paap Lagrange multiplier (LM) test for under-identification, and the Hansen J test of over-identifying restrictions.

Heterogeneity and Nonlinear Analysis

To examine heterogeneity, all models are estimated separately for boys and girls. Country-specific estimates are presented alongside pooled cross-country results to assess contextual variation across settings. Nonlinear associations are evaluated using categorical measures of unpaid work exposure and the high-burden/no-study indicator to test whether higher work intensity is differentially associated with learning outcomes.

Results

Descriptive statistics for child- and household-level characteristics are presented in Table 1. Age distributions are broadly similar across genders within each country, ranging from 11.6 years to 12.5 years. School enrolment rates are generally high across the study countries, though they are lowest in Ethiopia and highest in Vietnam for both boys and girls. The average household size is largest in Ethiopia and smallest in Vietnam. The mean score for the household wealth index indicates a higher socioeconomic status in Peru and Vietnam than in Ethiopia.

Time allocated to unpaid household and care work reveals pronounced and consistent gender disparities. In all countries, girls spend more time in unpaid work than boys, with the widest gaps observed in India and Ethiopia. Mean unpaid work time is highest in Ethiopia (approximately 3.8 hours per day for boys and 4.1 hours for girls) and lowest among boys in India (about 1.1 hours), whereas girls in India and Vietnam spend roughly two hours per day in unpaid work. In the pooled sample, girls spend about 30 minutes more per day on unpaid work than boys (2.71 vs. 2.19 hours)

Table 1. Child- and household-level characteristics of the study sample across countries and gender

Variables	Ethiopia		India		Peru		Vietnam		Pooled Sample	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Age (mean) in months	147.2 (59.3)	147.2 (59.1)	146.4 (58.8)	149.9 (59.8)	140.9 (57.4)	139.1 (56.9)	147.7 (59.9)	149.4 (60.6)	145.7 (59.0)	146.6 (59.3)
Currently enrolled	0.641 (0.480)	0.667 (0.471)	0.714 (0.452)	0.683 (0.465)	0.717 (0.450)	0.714 (0.452)	0.786 (0.410)	0.808 (0.394)	0.714 (0.452)	0.719 (0.450)
Household size (mean)	5.94 (2.07)	5.87 (2.13)	5.08 (2.03)	5.09 (1.97)	5.28 (1.97)	5.26 (1.98)	4.42 (1.47)	4.53 (1.49)	5.17 (1.98)	5.17 (1.96)
Wealth index (mean)	0.376 (0.189)	0.371 (0.188)	0.552 (0.187)	0.552 (0.186)	0.570 (0.207)	0.561 (0.212)	0.625 (0.183)	0.626 (0.180)	0.530 (0.213)	0.529 (0.214)
Number of Observations	4,282	3,906	4,422	4,058	3,902	3,711	4,213	4,136	16,819	15,811

Notes: Values are means with standard deviations in parentheses. Sample sizes vary slightly across variables due to missing data.

(Figure 2).

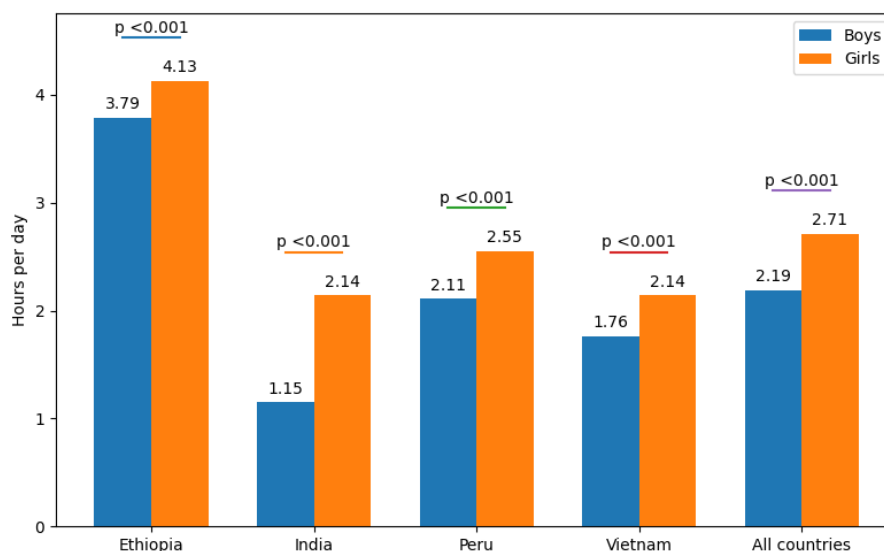


Figure 2. Gender differences in time use in unpaid household and care work across countries

Note: p-values are derived from the t-test.

Average standardised mathematics scores are lowest in Ethiopia and India and highest in Vietnam, with Peru close to the pooled mean. Gender differences in mean mathematics performance are modest but context-specific: girls score slightly below boys in Ethiopia, India, and Peru, but slightly above boys in Vietnam. Similar cross-country heterogeneity is observed for vocabulary (PPVT) and reading scores, with greater dispersion in Peru and Vietnam. In the pooled sample, mean cognitive z-scores are close to zero for both genders, as expected given score standardisation (Figure 3).

Pearson's correlation coefficients were used to assess the bivariate associations between unpaid work hours and children's cognitive outcomes. Unpaid work is negatively correlated with mathematics

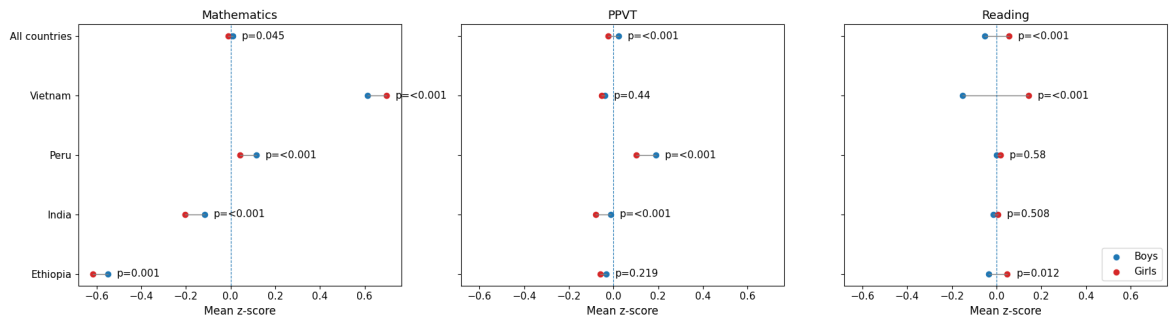


Figure 3. Gender differences in test scores across countries

Note: p-values are derived from the t-test.

performance in most contexts, with pooled correlations of -0.19 for boys and -0.15 for girls. A similar pattern is observed for reading scores, where correlations are consistently negative across countries and genders (pooled $r = -0.14$ for boys and -0.15 for girls), indicating that greater time spent in unpaid work is associated with lower reading achievement. In contrast, correlations with vocabulary (PPVT) scores vary across countries: they are slightly negative in Ethiopia but positive in India, Peru, and Vietnam, yielding small positive pooled correlations ($r = 0.09$ for boys and $r = 0.15$ for girls). The correlation analysis suggests that higher unpaid work burdens are generally associated with poorer academic outcomes, particularly in mathematics and reading (Figure 4).

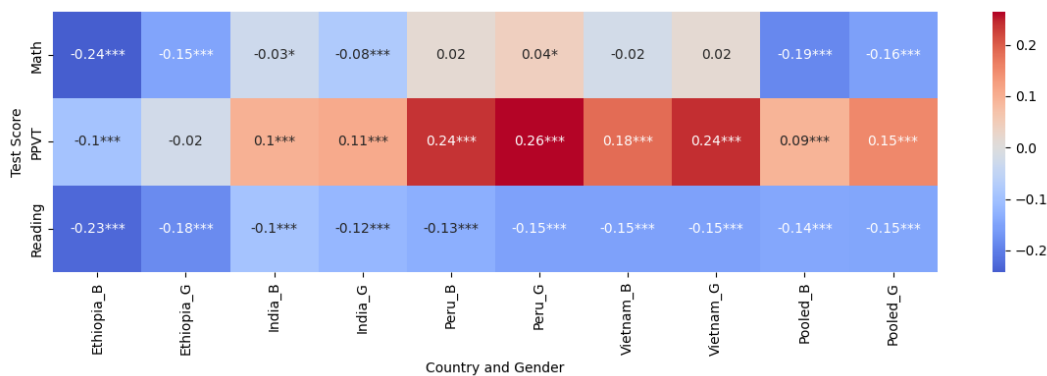


Figure 4. Pearson correlation coefficients between unpaid work hours per day and cognitive test scores

Note: Values represent Pearson correlation coefficients. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Figure 5 further illustrates clear gradients in test performance across three categories of unpaid work burden. In the pooled sample, children engaged in moderate unpaid work (less than three hours per day) have the highest mean mathematics scores for both boys (0.215) and girls (0.181), compared with children reporting no unpaid work (-0.012 and -0.063 , respectively) and those with high unpaid work (three or more hours per day: -0.213 and -0.186). Reading scores decline with higher work intensity, especially among boys (0.092 for no unpaid work versus -0.224 for high un-

paid work), with a smaller decline among girls (0.255 to -0.082). PPVT scores exhibit a nonlinear pattern, with the lowest means among children reporting no unpaid work and the highest among those with moderate or high participation. Average unpaid work time rises from roughly 1.4–1.5 hours in the moderate category to more than five hours in the high-burden group for both genders. Country-specific patterns by unpaid work burden and gender also show substantial variation (Figure 5). Multivariate fixed-effects and instrumental-variable estimates are reported in the following section.

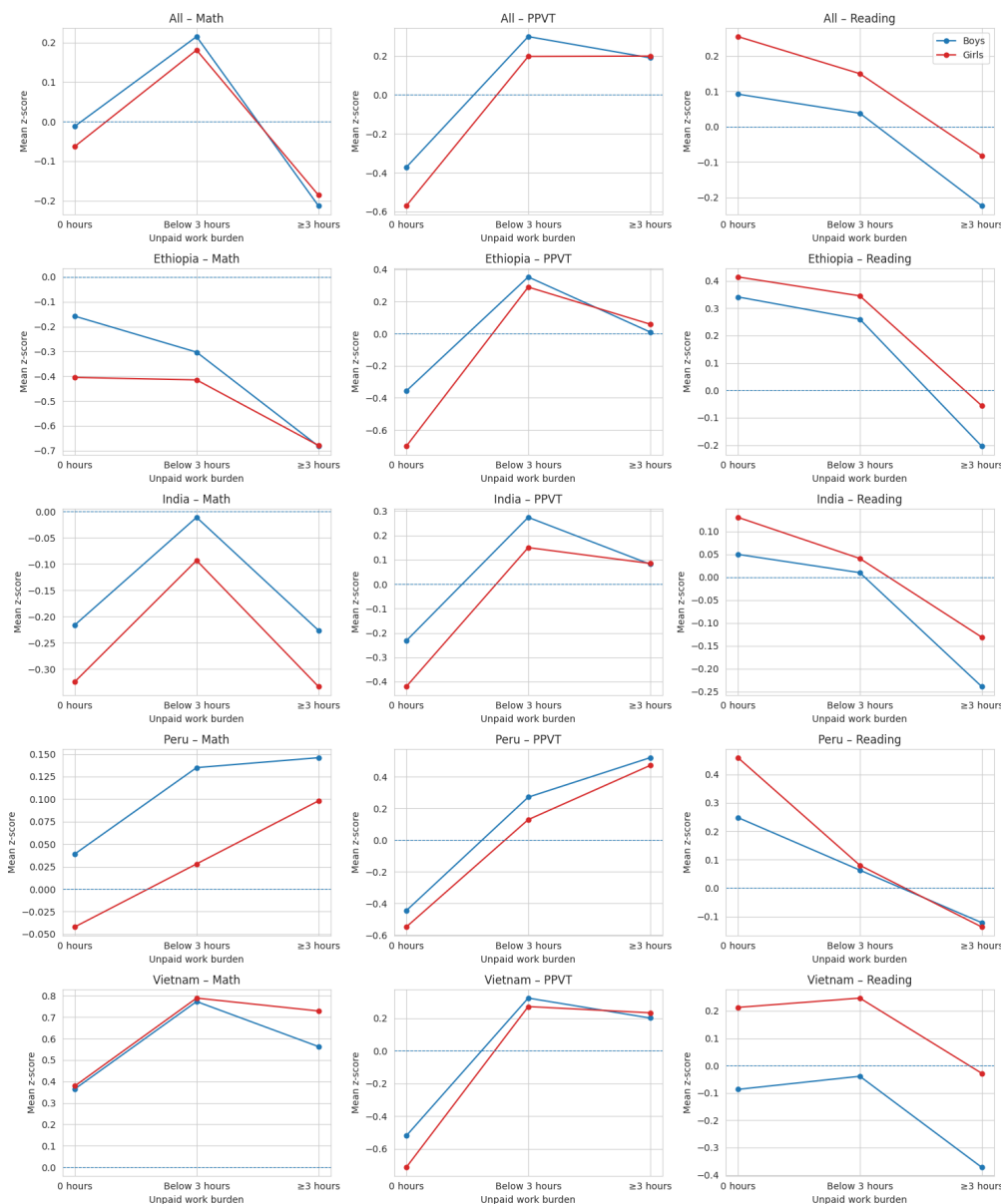


Figure 5. Mean test scores by time spent in unpaid work across countries and gender

Estimates from Fixed-Effect Models

Table 2 presents child fixed-effects estimates of the association between time spent in unpaid work and test scores in math, vocabulary, and reading, estimated separately by country and gender and pooled across countries. In the pooled sample, additional time spent in unpaid work was negatively associated with girls' math scores ($\beta = -0.008$, $p < 0.05$), whereas the association for boys was small and not statistically significant. For vocabulary and reading outcomes, pooled associations were close to zero for both boys and girls. Country-specific estimates reveal substantial heterogeneity in both magnitude and direction. In India, greater unpaid work time was negatively associated with vocabulary scores for both boys ($\beta = -0.016$, $p < 0.05$) and girls ($\beta = -0.024$, $p < 0.01$). In contrast, in Peru, unpaid work time was positively associated with boys' math ($\beta = 0.023$, $p < 0.01$) and vocabulary scores ($\beta = 0.016$, $p < 0.01$), whereas no comparable effects were observed for girls. Reading scores showed fewer statistically significant associations for the overall category, though a positive association was observed for boys in India ($\beta = 0.041$, $p < 0.05$).

To assess potential nonlinearities and graded vulnerabilities, Table 3 reports fixed-effects models estimated using a categorical exposure variable for unpaid work: zero time spent on unpaid work, moderate burden (below 3 hours/day) and high burden (3+ hours/day). Results indicate that associations are not uniformly linear and vary with the intensity of the time burden. For math scores, children who reported some unpaid work often had higher scores than those who reported zero hours, particularly in Peru, Vietnam, and the pooled sample. In the pooled estimates, both boys and girls who reported less than three hours or more than three hours of unpaid work had higher math scores than those who reported no unpaid work, with effect sizes ranging from 0.04 to 0.06 standard deviations. For vocabulary, patterns were mixed across contexts. Positive associations with both lower and higher levels of unpaid work were observed in Ethiopia and Vietnam, particularly among girls. In India, however, greater unpaid work (three or more hours) was negatively associated with girls' vocabulary scores ($\beta = -0.105$, $p < 0.05$). Pooled estimates indicate small positive associations for both boys and girls across categories of unpaid work. Reading outcomes showed weaker, mostly non-significant associations across unpaid work categories, with a few exceptions, including a positive association among boys in India who reported three or more hours of unpaid work.

Table 4 presents child fixed-effects estimates examining the association between a compounded time-use constraint, defined as excessive engagement in unpaid work combined with no time spent

studying, and test scores in mathematics, vocabulary, and reading, separately by gender and country, and pooled across settings. A consistent negative association is observed between excessive unpaid work combined with zero study time and mathematics performance, particularly among girls. In the pooled sample, girls exposed to this combined constraint score 0.18 standard deviations lower in math ($\beta = -0.177$, $p < 0.01$), compared with 0.07 standard deviations lower among boys ($\beta = -0.065$, $p < 0.05$). Country-specific estimates indicate statistically significant deficits for girls in Ethiopia, India, Peru, and Vietnam, with the largest penalty observed in Vietnam ($\beta = -0.176$, $p < 0.05$). For boys, significant negative associations are observed only in Ethiopia.

Associations with vocabulary scores are more heterogeneous across countries and genders. In pooled models, the coefficients are small and not statistically significant for both boys and girls, indicating no consistent overall relationship between the combined unpaid work + no study time and vocabulary outcomes. However, country-level estimates reveal contrasting patterns. Among girls in India, excessive unpaid work, combined with no study time, is associated with substantially lower vocabulary scores ($\beta = -0.168$, $p < 0.01$), whereas no meaningful associations are observed in Peru or Vietnam. In Ethiopia, boys show a modest positive association ($\beta = 0.086$, $p < 0.05$). This mixed pattern suggests that vocabulary acquisition may be less uniformly sensitive to time-use constraints than mathematics, or may depend more strongly on contextual and household learning environments.

For reading scores, most country- and gender-specific estimates are statistically insignificant, and pooled associations are close to zero. The only clear negative association is observed among boys in Vietnam ($\beta = -0.290$, $p < 0.05$). Confidence intervals are wide across several country-gender cells, reflecting smaller sample sizes for reading assessments, and suggesting lower statistical precision for these estimates.

Instrumental Variable Results

Table 5 reports two-stage least squares (2SLS) estimates of the association between children's time spent in unpaid work and cognitive test scores, instrumenting unpaid work time with household economic and environmental shocks. All specifications include child and survey-round fixed effects and adjust for age, school enrolment, household size, and household wealth, with standard errors clustered at the child level.

The IV estimates differ from the fixed-effects results in both magnitude and direction and are not

uniform across outcomes or gender. For mathematics, higher time spent in unpaid work is associated with significantly lower scores for both boys ($\beta = -0.129$, $p < 0.01$) and girls ($\beta = -0.463$, $p < 0.05$). In contrast, the IV coefficients for vocabulary (PPVT) and reading outcomes are statistically indistinguishable from zero for both sexes. Although point estimates of reading scores are positive for boys and negative for girls, they are imprecise and not statistically significant.

Instrument diagnostics suggest uneven instrument performance across models. Kleibergen–Paap rk Wald F statistics exceed conventional thresholds in the boys' mathematics and PPVT models and in the girls' PPVT model, but fall below 10 in the girls' mathematics and both reading models, indicating potential weak-instrument concerns in those specifications. Under-identification tests reject the null across models, supporting the relevance of the instruments. However, Hansen J tests indicate possible over-identification concerns in several PPVT and reading specifications. These diagnostics suggest that the IV results are more reliable for mathematics outcomes than for vocabulary and reading.

Table 2. Fixed-effect estimates of time spent in unpaid work on test scores

Variables	Ethiopia		India		Peru		Vietnam		All countries	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Math Test Scores										
Time spent in unpaid work	0.005	0.002	-0.006	-0.006	0.023***	-0.001	0.000	-0.001	0.003	-0.008**
	(0.005)	(0.005)	(0.007)	(0.006)	(0.005)	(0.005)	(0.007)	(0.007)	(0.003)	(0.003)
All Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,202	3,761	4,373	3,980	3,799	3,618	3,895	3,868	16,269	15,227
Vocabulary Scores (PPVT)										
Time spent in unpaid work	0.008	-0.001	-0.016**	-0.024***	0.016***	0.009	-0.009	0.014	0.004	0.002
	(0.005)	(0.006)	(0.007)	(0.007)	(0.005)	(0.005)	(0.008)	(0.008)	(0.003)	(0.003)
Observations	3,781	3,282	4,470	4,093	3,938	3,813	4,336	4,208	16,525	15,396
Reading Scores										
Time spent in unpaid work	0.023	-0.010	0.041**	-0.003	0.008	-0.006	-0.024	-0.007	0.009	-0.005
	(0.013)	(0.016)	(0.018)	(0.018)	(0.013)	(0.013)	(0.013)	(0.014)	(0.007)	(0.007)
Observations	1,544	1,360	1,304	1,210	1,784	1,744	1,832	1,728	6,464	6,042

Notes: Predictor is time spent in unpaid work per day (continuous). Outcomes are standardised z-scores for math, vocabulary (PPVT), and reading tests. Estimates are from fixed-effects models estimated separately by country and pooled across all four countries by gender. All models include child and survey-round fixed effects. Controls include age in months, school enrolment status, household size, and wealth index. Robust standard errors clustered at the child level are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3. Fixed-effect estimates of time spent (non-linear) in unpaid work on test scores

Variables	Ethiopia		India		Peru		Vietnam		All countries	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Math Test Scores										
<i>Time spent in unpaid work</i>										
<i>Zero hours (Ref.)</i>										
Below 3 hrs	0.102*** (0.035)	0.014 (0.048)	0.011 (0.020)	0.084*** (0.023)	0.096*** (0.026)	0.062** (0.028)	0.142*** (0.028)	0.045 (0.036)	0.045*** (0.013)	0.040** (0.016)
3+ hrs	0.113*** (0.034)	0.059 (0.050)	0.023 (0.036)	0.084** (0.035)	0.166*** (0.028)	0.086*** (0.031)	0.081** (0.036)	0.062 (0.041)	0.055*** (0.016)	0.040** (0.018)
Observations	4,202	3,761	4,373	3,980	3,799	3,618	3,895	3,868	16,269	15,227
Vocabulary Scores (PPVT)										
<i>Time spent in unpaid work</i>										
<i>Zero hours (Ref.)</i>										
Below 3 hrs	0.079** (0.033)	0.156*** (0.043)	-0.011 (0.023)	-0.030 (0.027)	0.020 (0.019)	0.029 (0.018)	0.112*** (0.029)	0.186*** (0.030)	0.038*** (0.013)	0.052*** (0.015)
3+ hrs	0.113*** (0.035)	0.169*** (0.047)	-0.066 (0.042)	-0.105** (0.042)	0.080*** (0.023)	0.032 (0.022)	0.057 (0.038)	0.179*** (0.036)	0.070*** (0.017)	0.075*** (0.018)
Observations	3,781	3,282	4,470	4,093	3,938	3,813	4,336	4,208	16,525	15,396
Reading Scores										
<i>Time spent in unpaid work</i>										
<i>Zero hours (Ref.)</i>										
Below 3 hrs	-0.059 (0.088)	-0.183 (0.117)	0.035 (0.063)	-0.098 (0.089)	-0.042 (0.064)	0.067 (0.073)	0.057 (0.070)	0.017 (0.083)	0.013 (0.035)	-0.005 (0.044)
3+ hrs	0.042 (0.091)	-0.193 (0.125)	0.175* (0.096)	-0.040 (0.112)	0.037 (0.069)	0.085 (0.081)	-0.052 (0.081)	-0.075 (0.087)	0.023 (0.041)	-0.024 (0.049)
Observations	1,544	1,360	1,304	1,210	1,784	1,744	1,832	1,728	6,464	6,042

Notes: Predictor is time spent in unpaid work per day: 3 groups (no unpaid work is the reference category). Outcomes are standardised z-scores for math, vocabulary (PPVT), and reading tests. Estimates are from fixed-effects models estimated separately by country and pooled across all four countries by gender. All models include child and survey-round fixed effects. Controls include age in months, school enrolment status, household size, and wealth index. Robust standard errors clustered at the child level are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 4. Fixed-effect estimates of time spent (excessive time spent in unpaid work + no time spent on studying) in unpaid work on test scores

Variables	Ethiopia		India		Peru		Vietnam		All countries	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Math Test Scores										
Excessive time spent in unpaid work × No time spent on studying	-0.104**	-0.127***	-0.019	-0.137**	-0.061	-0.137*	-0.083	-0.176**	-0.065**	-0.177***
	(0.043)	(0.048)	(0.070)	(0.056)	(0.075)	(0.083)	(0.061)	(0.076)	(0.029)	(0.032)
Observations	4,210	3,765	4,375	3,994	3,809	3,626	3,931	3,906	16,325	15,291
Vocabulary Scores (PPVT)										
Excessive time spent in unpaid work × No time spent on studying	0.086**	0.036	-0.134*	-0.168***	-0.036	0.144	-0.035	-0.017	0.024	0.005
	(0.040)	(0.048)	(0.076)	(0.065)	(0.093)	(0.092)	(0.068)	(0.074)	(0.031)	(0.034)
Observations	4,018	3,514	4,578	4,187	3,944	3,815	4,461	4,313	17,001	15,829
Reading Scores										
Excessive time spent in unpaid work × No time spent on studying	0.114	-0.276	0.199	0.160	0.438	-0.014	-0.290**	0.007	0.007	0.028
	(0.185)	(0.254)	(0.183)	(0.203)	(0.367)	(0.211)	(0.116)	(0.163)	(0.087)	(0.109)
Observations	1,546	1,362	1,312	1,216	1,800	1,770	1,832	1,738	6,490	6,086

Notes: Predictor is the excessive time spent in unpaid work + no time spent on studying (Binary). Outcomes are standardised z-scores for math, vocabulary (PPVT), and reading tests. Estimates are from fixed-effects models estimated separately by country and pooled across all four countries by gender. All models include child and survey-round fixed effects. Controls include age in months, school enrolment status, household size, and wealth index. Robust standard errors clustered at the child level are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5. Instrumental Variable (IV) estimates of time spent in unpaid work on test scores (pooled across all four countries)

Variables	Math (Boys)	Math (Girls)	PPVT (Boys)	PPVT (Girls)	Reading (Boys)	Reading (Girls)
Time spent in unpaid work	-0.129*** (0.049)	-0.463** (0.201)	0.026 (0.043)	-0.070 (0.054)	0.253 (0.176)	-0.091 (0.130)
Age (months)	0.010** (0.004)	-0.014 (0.014)	0.006 (0.004)	0.025*** (0.004)	0.006 (0.018)	-0.012 (0.019)
Currently enrolled	0.200*** (0.069)	-0.517 (0.434)	0.366*** (0.030)	0.333*** (0.038)	0.742* (0.381)	-0.165 (0.337)
Household size	0.014** (0.006)	0.009 (0.010)	0.006 (0.005)	0.002 (0.005)	0.014 (0.017)	-0.004 (0.011)
Wealth index	-0.130* (0.067)	-0.223 (0.159)	0.381*** (0.061)	0.328*** (0.066)	0.193 (0.191)	0.119 (0.155)
<i>Diagnostic</i>						
KP rk Wald F	17.34	3.43	21.30	16.41	3.13	4.00
KP LM p-value	0.000	0.033	0.000	0.000	0.048	0.020
Hansen J p-value	0.193	0.973	0.034	0.000	0.035	0.016
Observations	16,269	15,227	16,525	15,396	6,464	6,042
Clusters (childid)	5,608	5,247	5,269	4,934	3,232	3,021

Notes: Estimates are from two-stage least squares (2SLS) regressions. The endogenous variable is time spent in unpaid work. Excluded instruments are household economic shock and environmental shock. All models include child and survey-round fixed effects. Standard errors (in parentheses) are clustered at the child level. KP = Kleibergen–Paap weak instrument diagnostics. Models with KP F < 10 indicate potential weak instrument concerns (Math–Girls and Reading models). Significance levels: *** p < 0.01, ** p < 0.05, * p < 0.10.

Discussion

This study examined the relationship between children’s time spent in unpaid household and care work and their cognitive outcomes across four low- and middle-income settings (Ethiopia, India, Peru, and Vietnam). Using longitudinal data and child fixed-effects models, we found important patterns that advance understanding of the interplay between children’s time use and learning outcomes. Consistent with prior evidence, greater unpaid work was, on average, associated with lower math performance among girls in pooled analyses. This aligns with studies suggesting that domestic responsibilities disproportionately borne by girls can reduce available time for study and school engagement, thereby negatively affecting numeracy skills.²⁶ The stronger association among girls is also consistent with gendered time-use research, which shows that girls allocate more hours to unpaid household tasks, displacing study and leisure time.²⁷

The categorical models underscore the complexity of the relationship. Children reporting some unpaid work often had test scores comparable to or higher than those reporting none, whereas

²⁶ Sharma and Shah, “Unpaid Domestic Work”; UNICEF, *Time Spent on Unpaid Domestic*.

²⁷ ILO and UNICEF, *Child Labour: Global Estimates 2020, Trends and the Road Forward* (New York: International Labour Office and United Nations Children’s Fund, 2021).

children with high burdens (3+ hours) showed more mixed results. This threshold pattern is consistent with time-budget frameworks and task substitution theory, which suggest that low levels of unpaid work may coexist with schooling without displacing study time, whereas high intensities impose time constraints and fatigue that negatively affect learning.²⁸ Similar nonlinear patterns have been observed in research on child labour, where moderate engagement sometimes correlates with better outcomes due to selection processes (e.g., more capable children taking on household tasks), but high intensity is harmful.²⁹

Our IV estimates, which use household economic and environmental shocks as exogenous sources of variation in unpaid work, indicate stronger negative associations between unpaid work and math outcomes, particularly for girls, than the fixed-effects estimates. This pattern suggests that fixed-effects models may understate adverse effects because of positive selection: children with higher innate ability or stronger school attachment may take on household tasks without compromising learning, attenuating linear associations.³⁰ The IV approach partially addresses this concern, showing that shock-induced increases in unpaid work are associated with lower math performance, but caution is warranted given weak-instrument diagnostics in some specifications. Similar methodological caveats have been noted in recent child time-use IV analyses (e.g., on school absenteeism and labour shocks).³¹ Vocabulary and reading outcomes showed divergent IV results; positive associations for some groups may reflect differences in task content, measurement, or the sensitivity of these domains to time reallocations. Reading and vocabulary skills are often built across multiple settings, including informal interactions, and may be less vulnerable to short-term displacements than mathematics, which requires sustained practice and instruction.³²

We found suggestive gender differences in the association, although these have not yet been confirmed with a formal test of coefficient equality across the male and female models. Across fixed-effects and IV models, girls exhibited larger negative associations between unpaid work and math outcomes. This mirrors broader evidence on gendered divisions of labour and educational disad-

²⁸ G. S. Becker, "A Theory of the Allocation of Time", *Economic Journal* 75, no. 299 (1965): 493–517; K. Basu and P. H. Van, "The Economics of Child Labor", *American Economic Review* (1998): 412–27.

²⁹ E. V. Edmonds and N. Pavcnik, "Child Labor in the Global Economy", *Journal of Economic Perspectives* 19, no. 1 (2005): 199–220.

³⁰ Xia et al., "Involvement in Household Chores".

³¹ S. Baird et al., "Relative Effectiveness of Conditional and Unconditional Cash Transfers for Schooling Outcomes in Developing Countries: A Systematic Review", *Campbell Systematic Reviews* 9, no. 1 (2013): 1–124.

³² P. Glewwe and M. Kremer, "Schools, Teachers, and Education Outcomes in Developing Countries", in *Handbook of the Economics of Education*, vol. 2 (Amsterdam: Elsevier, 2006), 945–1017.

vantages arising from unequal domestic burdens.³³ Differential task types, in which girls tend toward time-rigid caregiving and chores, whereas boys tend toward more flexible or seasonal tasks, may accentuate these effects, as caregiving often has fixed daily time slots and is less compatible with school schedules.³⁴

At the same time, results varied substantially by context. In some country-gender groups, continuous measures of unpaid work showed null or even positive associations with vocabulary and reading scores, echoing findings in other settings where moderate engagement in household tasks is not detrimental and may signal structured daily routines.³⁵ These heterogeneous patterns may reflect differences in schooling regimes, task types, social norms, and household labour organisation across contexts. For instance, in Ethiopia and India, where average unpaid work burdens are higher, the negative associations are more pronounced, whereas in Peru and Vietnam, the effects are more muted or mixed. This supports the idea that broader institutional factors, such as school quality, labour market structures, and social norms, mediate the consequences of unpaid work on learning outcomes. For instance, when schooling quality is poor, or schedules are flexible, children may be better able to accommodate unpaid tasks without academic penalty. Conversely, high curriculum demands make time reallocations more costly.³⁶

The contextual differences at the country level are important. In broad terms, Ethiopia's education system combines lower average enrolment and retention, particularly in rural areas, with high dependence on children's labour in smallholder agriculture and pronounced gender norms favouring girls' domestic responsibility; both features are consistent with the comparatively larger unpaid-work burdens and stronger negative associations we observe there. In the Indian context (Andhra Pradesh and Telangana), school enrolment is closer to universal, but a strong gendered division of domestic labour persists within households, which may explain why unpaid work is associated with lower vocabulary and, for the compound indicator, lower mathematics scores specifically among girls. Peru has achieved comparatively high primary enrolment and a smaller measured gender gap in unpaid work, alongside a more market-oriented rural economy in which some unpaid work (e.g., family enterprise or livestock activities) may be compatible with schooling; this is broadly consis-

³³ J. S. Chafetz, "The Gender Division of Labor and the Reproduction of Female Disadvantage: Toward an Integrated Theory", *Journal of Family Issues* 9, no. 1 (1988): 108–31; O. Sullivan, "The Gendered Division of Household Labor", in *Handbook of the Sociology of Gender* (Cham: Springer International Publishing, 2018), 377–92.

³⁴ E. Espen, *Gender and Care: Overview Report* (Brighton: Institute of Development Studies, 2009).

³⁵ Xia et al., "Involvement in Household Chores".

³⁶ E. A. Hanushek and L. Woessmann, *The Knowledge Capital of Nations: Education and the Economics of Growth* (Cambridge, MA: MIT Press, 2015).

tent with the more muted or positive associations found there. Vietnam combines high average learning outcomes, near-universal enrolment, and strong policy emphasis on education, which may make schooling more resilient to moderate unpaid work but also means that the severe compound constraint (high work with zero study time) is associated with a particularly large penalty for the (smaller) group of children who experience it. This is a plausible interpretation of the observed heterogeneity rather than a formally tested explanation, since the paper does not include country-specific institutional indicators (e.g., pupil-teacher ratios, school fees, or measured gender-norm indices) that would allow these channels to be tested directly.

The study contributes to the existing literature by highlighting that unpaid household and care work is not a homogeneous exposure but varies in intensity, context, and developmental implications. Our findings extend time-use and child labour research by explicitly focusing on unpaid work and standardised cognitive outcomes, and by utilising longitudinal data to mitigate time-invariant biases. Yet, they also reaffirm that gender and socioeconomic context condition these relationships. Notwithstanding, a few limitations should be acknowledged. First, while child fixed effects and IV approaches reduce some biases, residual confounding may persist, and causal claims remain tentative. Second, although comprehensive, the measurement of unpaid work does not capture task quality, cognitive load, or emotional strain, which may influence learning in different ways. Third, although theoretically grounded, some instruments are weak in certain models, reducing confidence in causal estimates. Fourth, our aggregate unpaid work measure is not decomposed into domestic/caregiving and unpaid-economic-activity components, so we cannot rule out that results are driven by the components that overlap with conventional child labour definitions. Fifth, the gender contrasts we describe are based on separately estimated models and have not been formally tested for statistical difference. Sixth, pooling the Older and Younger Cohorts imposes a common age-outcome relationship across children observed at different developmental stages. Finally, our shock-based instruments rely on self-reported household exposure, which is itself plausibly endogenous to household vulnerability; a community-level imputed shock measure would provide a more robust treatment of endogeneity.

Policy Implications

Findings suggest that policies aimed at reducing excessive unpaid work burdens, particularly for girls, could improve learning outcomes, particularly in mathematics proficiency. Social protec-

tion interventions that buffer households against economic and environmental shocks may reduce shock-induced reallocations of child labour. For instance, protection against these shocks in India and Ethiopia, where extreme household poverty is prevalent, could be instrumental in improving children's educational outcomes. Additionally, gender-sensitive policies that redistribute household responsibilities and expand access to time-saving technologies could mitigate inequities. More broadly, educational policies should recognise the role of out-of-school time constraints in shaping learning. Interventions that integrate time-use considerations, such as community childcare support or flexible school scheduling, could help children balance household responsibilities with learning activities.

Conclusion

This study examined the relationship between time spent on unpaid household and care work and children's cognitive outcomes across four low- and middle-income countries using longitudinal data. The results show that the association between unpaid work and learning outcomes is heterogeneous across countries, genders, and cognitive domains. In pooled models, greater unpaid work is linked with lower math performance among girls, while associations with vocabulary and reading are more mixed. Nonlinear models suggest that moderate levels of unpaid work are not uniformly harmful, whereas higher work intensity is more likely to be associated with adverse outcomes. Findings further indicate that shock-induced increases in unpaid work may have stronger negative effects on certain learning domains. Gender disparities in exposure to unpaid work are substantial and appear to translate into unequal academic risks. At the same time, cross-context variation highlights the importance of institutional, social, and economic environments in shaping how children's time use affects learning. Future research would benefit from more detailed task-level time-use measures, stronger causal identification strategies, and deeper examination of mechanisms such as study time, sleep, and school engagement. Despite these limitations, the evidence suggests that reducing excessive unpaid work burdens, especially for girls and during household shocks, should be part of broader strategies to improve child development and educational equity. Round 7 Young Lives data, collected in 2023 and recently made publicly available, offer scope to extend this analysis with an additional survey wave and an older, post-adolescent sample; incorporating Round 7 is a promising direction for future revision of this work.

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